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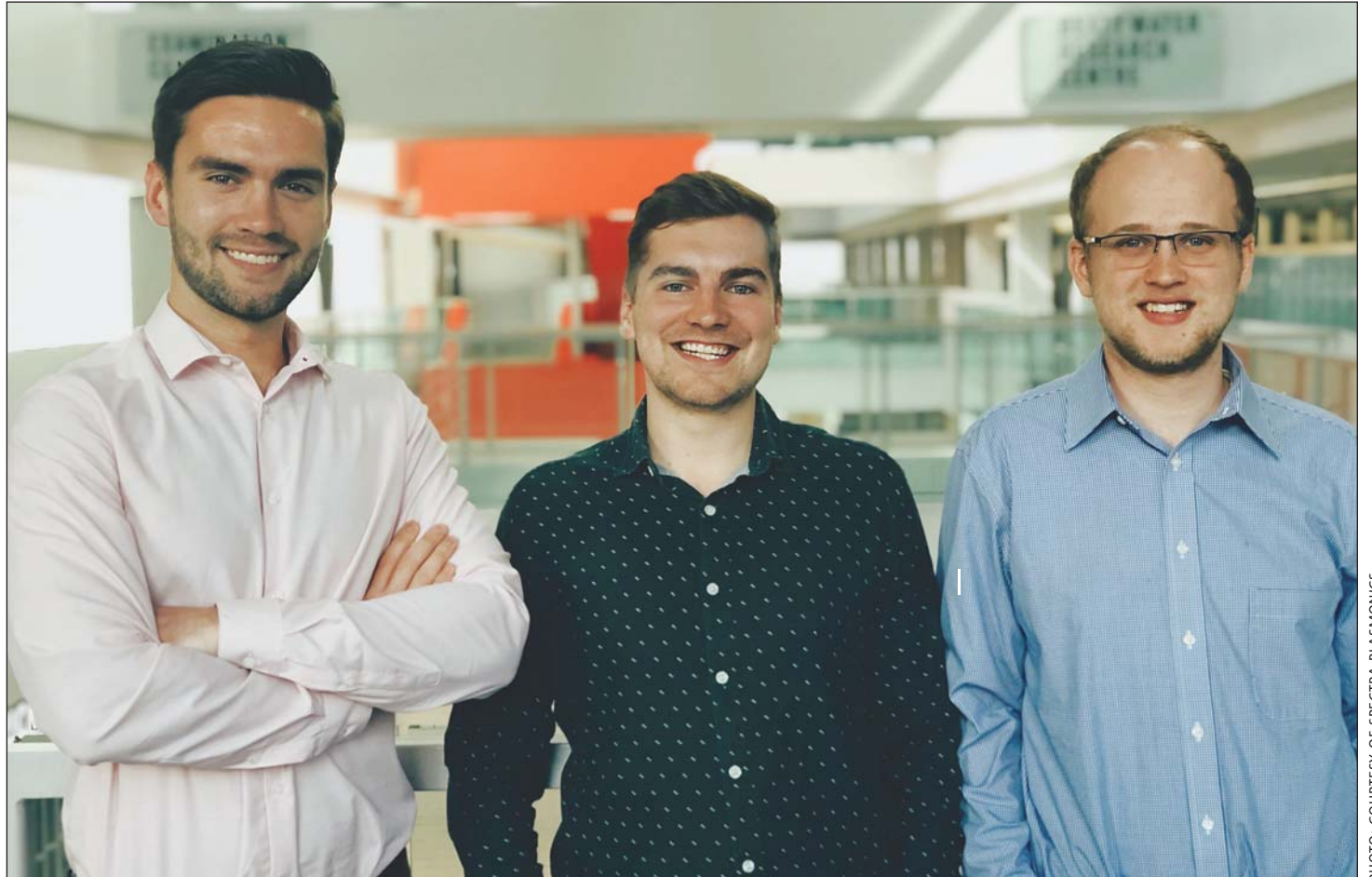**Page 12**

PHOTO: COURTESY OF SPECTRA PLASMONICS

Kingston builds health-technology hub

Assisted by a $3 million investment from the federal government, the city of Kingston, Ontario is creating a health-tech cluster that aims to devise and market new technologies. The city's Spectra Plasmonics has developed the Amplifi ID Kit, which produces near real-time analysis of opioids and other substances. Pictured are co-founders Malcolm Eade, Christian Baldwin and Tyler Whitney. **SEE STORY ON PAGE 4**

PEI to create 'medical neighborhoods' using new EMR

BY JERRY ZEIDENBERG

Prince Edward Island recently announced it will invest $8.4 million to provide family doctors throughout the province with the Telus Health Electronic Medical Record (EMR), a project that will result in a common platform for community-based practitioners. As well, Canada Health Infoway is contributing an additional $3 million to the project, largely to establish e-Prescribing between physicians and pharmacists.

"We evaluated several EMRs, and we were impressed with the core capabilities of the Telus system, but also by several additional functions that will be very valuable," said Dr. Kristy Newson, a general practitioner who is president of the PEI College of Family Physi-

cians. She is also the medical leader of the province's EMR project.

The additional capabilities she mentioned include embedded video, which has proved so important to clinicians during the COVID-19 pandemic, data analytics for quickly determining patient trends, outliers

> **The Telus Health EMR will be used to connect community and hospital clinicians with patients.**

and physician performance, and secure communications among users.

Not only will the EMR be used by all physicians once they express their interest but the province is also embarking on a unique project that will build medical "homes" and

"neighbourhoods" to connect patients and physicians to other allied professionals, such as diabetic care nurses and dieticians.

The patient's family doctor will become his or her "medical home", while the network of allied health professionals will make up a "medical neighborhood". Using the secure electronic medical records, each of the caregivers will have access to the patient's information, enabling them to better coordinate services.

Moreover, by using the Telus Health EMR, caregivers will have a secure method of quickly communicating with each other – one that is much more effective than the traditional methods of phone and fax.

The EMR will also be integrated with the province's hospitals, which use their own

Prince Edward Island to create 'medical neighborhoods' using EMR

Cerner electronic health record. By connecting to the Cerner system, physicians and allied professionals will have access to the medical laboratory results of their patients, along with diagnostic imaging test reports, discharge reports and clinical notes.

Other Canadian jurisdictions have started to create groups of clinicians and allied professionals working together, such as the Ontario Health Teams in Ontario. However, Dr. Newson said the teams in Prince Edward Island are likely to be the first in the country to be connected by a common electronic medical record that is also tied into the hospital system.

"It will be the first 'all-in-one' network in Canada to combine care-givers, patients and an EMR," she observed.

She noted that the Telus Health EMR will be rolled out to community physicians in July, initially as pilot projects in a few locations, and then throughout the province during the second half of 2021. The medical neighbourhoods will be established at the same time as the rollout begins, she said.

Dr. Damon Ramsey, the new chief medical informatics officer and vice-president, Collaborative Health at Telus Health, observed that PEI's project, which creates systems of physicians and other caregivers all collaborating on patient care through an EMR, "could become a model for other provinces."

Dr. Ramsey recently joined Telus Health after his own company, Input Health, was acquired by the larger corporation.

For his part, Dr. Ramsey created an innovative technology that allowed patients to fill out digital questionnaires before their encounters with doctors, reducing the time needed during the appointment to fill out forms. This, in turns, speeds up the encounter and promotes the efficiency of the practice.

As well, the system can be used by patients to contribute electronic forms after the encounter, to report on their outcomes. In this way, doctors can see how various therapies perform in the "real world", and they can establish best practices using an evidence-based methodology.

"The self-assessment feature using questionnaires was seen by our doctors as one of the most beneficial aspects of the Telus

Dr. Kristy Newson

Health EMR," said Dr. Newson. "It's key to gathering data that can be used to improve the quality of care and for planning."

She added, "It gives us a window on patient care that we haven't had in the past."

Dr. Ramsey noted the EMR project, through Canada Health Infoway, will also provide PEI doctors with e-prescribing tools that will improve their communication with pharmacists.

The system will allow them to send prescriptions through their EMR, connecting primary care doctors with pharmacies. And instead of seeing just the prescribed medication, the pharmacist will be able to access the patient's electronic record and list of medications.

In this way, he or she will be able to check for possible adverse reactions and to conduct a medication reconciliation, if needed.

"We know that medication reconciliation is a complicated problem," said Dr. Ramsey. "An e-prescribing system helps to make sure that the patient is getting the right medications."

He noted that pharmacists and doctors can see all the medications that a patient is taking and can determine whether there might be a problem before an accident happens.

As well, by using the same electronic platform, communication between pharmacist and doctor becomes much easier. Instead of communicating by phone or fax, electronic messages can be exchanged.

There are about 240 physicians on PEI who are eligible to acquire the Telus Health EMR (about 160 other doctors work primarily in hospitals, where they use the Cerner health information system).

Dr. Newson said that PEI has trailed other provinces in the use of physician I.T. systems, and that only 30 percent are already using EMRs.

However, she predicts that most will switch to the new system, as it offers so much more connectivity. "Instead of having to go from one system to another for clinical data, for lab information and diagnostic imaging, the Telus Health EMR will integrate it all. It makes sense for them to use it, because it offers one place to go for all information."

The common platform will also enable fast, secure electronic communication between clinicians – something that isn't available if a doctor uses a different EMR.

Additionally, the province will be paying for the implementation, so doctors won't have to pay for it out of their own pockets.

As part of the project, doctors who were using a different EMR will have their data migrated into the new system.

Dr. Newson stressed that adopting an EMR is a major undertaking for physicians, especially if doctors haven't been using an electronic system.

For this reason, the stakeholders are putting a good deal of effort into change management. "We don't want to overwhelm our physicians," she said, noting that support teams will be visiting physician practices to help them – and their staff members – with the transition to working with digital systems.

Integration of XERO® with Teams enables clinicians and specialists to share images

New solution streamlines communication among radiologists and other providers, improving clinical collaboration

The integration of Agfa HealthCare's XERO® diagnostic imaging viewer with Microsoft Teams allows for easy sharing of images among groups of healthcare professionals. Save time tracking down colleagues in the hospital when a review of images is needed—instead, images can be sent quickly and securely in a way that is already used by many physicians and allied professionals.

Physicians requesting a consult can tag specific members of the channel to review an image. If they fail to respond, the request can be escalated via email and repeated notifications.

Physicians participating in a consult can view the images and communicate with each other using audio, video and chat. Also available is a markup tool allowing clinicians to interact with the images using their cursor and to share the markups in real-time.

The solution can be customized to meet the needs of specific hospitals or clinicians. For example, a COVID button can be added to the navigation bar in the XERO viewer and programmed to transmit images to a 'channel' of predetermined specialists, including pulmonologists and infectious disease experts. Channels can be added for critical care and cardiology specialists, ophthalmology, dermatology, and others.

The XERO/Microsoft Teams app can save valuable time over the course of a week, month or year. Agfa HealthCare estimates that with a time saving of 10 minutes per consult, an average hospital could save 75 days of productive time per year. The app can also be life-saving, if a patient has COVID-19 and needs to be placed in quarantine before infecting someone else.

Installation is via a simple plug-in with no downtime or interruption to viewer use. Following successful implementations in the UK, the companies are now offering the solution to North American customers.

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HealthCare

enterpriseimaging@agfa.com

Kingston builds healthtech hub, with on-ramp to customers in the US

BY NORM TOLLINSKY

Kingston, Ontario, a mid-sized city of 137,000 people almost halfway between Toronto and Montreal, is leveraging its research and academic infrastructure to emerge as Canada's newest health technology hub.

Kingston City Council identified the idea of creating a health tech hub two years ago, said Craig Desjardins, the City's director of strategy, innovation and partnerships.

"We did a mapping exercise to identify the assets, the organizations, the infrastructure and the human capital in the community, and found that we had a serious cluster in the health innovation space."

Thanks to an investment of $3 million from the Federal Economic Development Agency for Southern Ontario in January, the means to realize the objectives of the hub are now in place.

The city's assets are impressive. Queen's University itself boasts the Centre for Advanced Computing, one of Canada's leading high performance computing environments. There's also the Queen's Ingenuity Labs, specializing in artificial intelligence, robotics and human machine interaction and the Queen's Partnership and Innovation Group, which offers services to support entrepreneurs and startups.

Other assets in the city include Kingston Health Sciences Centre, St. Lawrence College and GreenCentre Canada, which operates a state-of-the-art lab focused on chemistry solutions for industry and the environment.

"A lot of these pieces weren't as connected as they could be and, without those connections, we weren't harnessing and leveraging the potential synergies," said Desjardins.

The City is currently recruiting a pro-
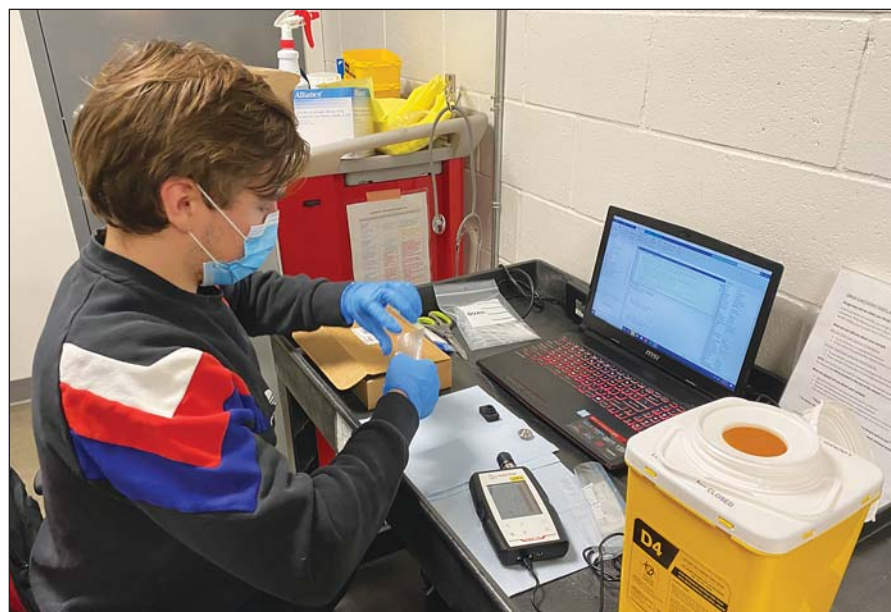
An employee at the Kingston Consumption Treatment Centre preparing an opioid sample for analysis by the Amplifi ID Kit, which was developed by the Kingston,Ontario startup company, Spectra Plasmonics.

ject lead for the hub, ideally someone with 25 years of experience in the health innovation space who is close to retirement but looking for an opportunity to put their knowledge and expertise to good use.

The majority of the $3 million, however, will be used to support startup businesses, to fund the projects they're working on, and to make available the resources and expertise to help them scale, noted Desjardins.

St. Lawrence College and Queen's University will engage frontline healthcare workers to identify healthcare challenges and match them with local entrepreneurs. New products and ideas will be tested and validated through use of the labs at Queen's and GreenCentre Canada.

Uniquely, the Kingston-Syracuse Pathway, a collaboration between the Kingston Economic Development Corporation and partner organizations in upstate New York, will be leveraged to access markets in the United States and attract foreign investment to the region.

Kingston has already produced a number of health technology startups. One example is Spectra Plasmonics, which has developed the Amplifi ID Kit, which produces near real-time analysis of opioids. The cell-phone sized device identifies harmful additives in street drugs likely to result in drug overdose and death.

"The technology was initially developed in the Department of Chemical Engineering at Queen's University under the supervision of Dr. Aris Docoslis," said co-founder and CEO Malcolm Eade, a recent Queen's graduate with a degree in Life Sci-

ences. "It was a general sensing technology that could be used for a variety of applications. When we came in as co-founders, we decided to take it and build a product around drug sensing and analysis."

The kit, currently being trialed at the Kingston Consumption Treatment Centre, a supervised consumption site, detects fentanyl, benzodiazepines and fentanyl analogues, including carfentanil, which is 100 times more potent than fentanyl and 10,000 times more potent than morphine.

The mixture of benzodiazepines and fentanyl is an especially dangerous combination that has been causing a lot of fatal overdoses, said Eade.

Last year, Canada recorded more than 4,000 deaths due to opioid overdoses, while the United States has been recording approximately 70,000 opioid related deaths per year.

Staff at the Kingston Consumption Treatment Centre test the drugs brought to the site and are able to educate users about any additives that can cause bad outcomes. Results take five minutes – most of which is related to sample preparation.

"It definitely has a lot of potential to revolutionize how communities respond to the overdose crisis in Canada," said Eade. "Now, most of the testing is done in labs, so we think this can become the new portable standard for drug analysis in Canada."

Spectra Plasmonics is aiming for a nationwide rollout in 2022.

Another company that has emerged from Kingston's health tech hub is MeshAI, which uses artificial intelligence to produce staffing schedules for hospital, clinics and public health agencies.

Founded by Dr. Sean Yousefi, a PhD in Electrical Engineering and Communications, and Dr. Ethan Heming, PhD in neu-

Michener Institute creates new program in digital health and analytics

TORONTO – The Michener Institute of Education at UHN is creating a new full-time program to meet the needs of the healthcare system for digitally literate healthcare professionals.

The new Digital Health and Data Analytics Program is designed to be pragmatic, practical and job oriented – anticipating the needs of the workplace of the future and using the best education science and methodologies to meet those needs.

A combination of in-class teaching and hands-on learning at high-profile public institutions and businesses will give graduates the skills and knowledge to care for patients in an increasingly machine and data-driven healthcare environment.

"If we look at what's happening in healthcare currently, digital health, technology and artificial intelligence are already changing clinical practice and healthcare delivery," said Harvey Weingarten, principal of Michener's School of Applied Health Sciences. "Our consultations have continually reinforced that there is a serious need for digitally literate and data savvy individuals who un-

derstand how healthcare systems work and how healthcare is now delivered."

Catherine Wang is the vice president, Clinical, at the University Health Network (UHN), and administrative lead for the Joint Department of Medical Imaging (JDMI), which encompasses medical imaging across UHN, Women's College Hospital and Sinai Health System. She says she is seeing the need for this type of professional in her daily practice.

"In the past, it has always been about how to make a better tool, but the conversation is no longer about equipment," said Ms. Wang. "Now the next frontier is taking the imaging and manipulating and extracting better data, taking analytics and mapping the patient journey in a longitudinal approach ... all of which requires data science."

Key components of the curriculum include:
• Digital health, including virtual care, simulation and virtual reality;
• Data science, including the analysis and use of clinical data;
• Machine learning, AI and robotics, in-

cluding personalized medicine and ethics;
• Project management, product development and change management;
• Design thinking, including user experience; and
• Hands-on learning, including practicums and placements.

Harvey Weingarten

Catherine Wang

The program is geared toward healthcare providers, graduate students and IT professionals who want to advance their careers in healthcare and work on cutting-edge digital, analytics and AI healthcare initiatives. The program will be delivered entirely online.

Students can sub-specialize in areas such as artificial intelligence and robotics, and can exit after four successful semesters, having met their Post-Diploma Certificate requirements. Those students continuing with the program will have two semesters of workplace practicum experience, in addition to a possible sub-specialty course in order to complete the six-semester Advanced Diploma program.

The Digital Health and Data Analytics programs will begin in September 2021. Enrolment for the full-time program will open in April 2021. Interested candidates can visit Michener.ca/choose for more information.

As Canada's only "school within a hospital" dedicated exclusively to healthcare education, Michener is uniquely positioned to prepare healthcare professionals in these emerging fields. Michener's new program will support healthcare professionals at every point in their career pathway through virtual learning, workplace learning, data simulation and modelling, micro-credentialing and collaboration with other institutions.

PHC collaborates with Microsoft and UBC to mitigate spread of COVID-19

The project uses leading-edge Artificial Intelligence technology, combined with sensors, to determine if patients, staff and visitors are respecting social distancing guidelines and using protective equipment.

VANCOUVER, BC – As Canadian health officials continue to double down on mitigating the spread of COVID-19, a multidisciplinary collaboration has begun between Providence Health Care (PHC), Microsoft Canada and computer vision researchers at the University of British Columbia (UBC).

Together, these organizations have developed an artificial intelligence (AI) powered solution to monitor the effectiveness of COVID-19 social distancing policies and guidelines at PHC's St. Paul's Hospital campus in Vancouver, B.C. This solution will help them plan for and maintain daily operations and routine procedures in the coming months.

Following the initial outbreak earlier this year, PHC began planning in expectation of a second wave of COVID-19 infection rates with a mission to improve patient outcomes, particularly among the most vulnerable in long-term care and acute care settings.

By leveraging Microsoft's expertise in the Internet of Things (IoT), edge computing and AI platforms in combination with UBC researchers' capabilities in algorithm development, PHC has implemented – in pilot – deep learning AI tools to further prevent the spread of COVID-19.

These tools are designed to monitor personal protective equipment (PPE) use, social distancing and occupancy counting for the continued safety of patients, staff and visitors.

First rolled out in the hospital's emergency and radiology waiting rooms, and laboratory services, the project is facilitated using cameras that detect face mask usage and social distancing levels with a goal of eventually scaling to hundreds of cameras within high-traffic areas. Although they enable real-time compliance, the cameras do not collect personally identifiable information.

"Multidisciplinary collaborations with industry and academia expedited our development process, thereby directly assisting our efforts to plan for the urgent and ever-evolving nature of the COVID-19 crisis. Our collaboration with Microsoft and UBC provided invaluable domain knowledge to help us move quickly, safely and effectively to help all stakeholders involved," says Soyean Kim, Director of Digital Products at Providence Health Care. "The project could not have moved from inception to pilot at St. Paul's Hospital so quickly without this spirit of collaboration for the common good."

"The COVID-19 crisis has created new challenges and has placed unprecedented demands on Canada's healthcare system. At Microsoft, we have been collaborating with our partners throughout the pandemic to solve big challenges by connecting data and systems in the cloud and putting safety measures and health guidelines in place for our healthcare organizations to better support patients and healthcare professionals," says Dr. Helia Mohammadi, Chief Data Scientist and Healthcare Lead, Microsoft Canada. "Microsoft's cloud and AI offerings, in particular solutions developed to address the COVID-19 pandemic, accelerate research findings and improve patient outcomes."

As part of this project, PHC has implemented various Microsoft solutions including:
• Vision AI DevKit: Smart cameras for the Intelligent Edge enabling superior inferencing performance while ensuring privacy for hospital patients and staff;
• Microsoft Power BI: Data visualization tools to ingest real time data from the cameras and quickly generate reports; and
• Azure IoT Edge: Connecting the cameras and the Azure cloud environment, all while running Azure machine learning modules to ensure personal identifiable information is not collected.

"This initiative marks an exciting advancement for Providence Health Care in working to mitigate the spread of COVID-19 and improve patient outcomes for all, including the most vulnerable. It's also an important milestone for Microsoft, providing major learnings for other healthcare environments regarding the deployment and adoption of AI and IoT technology in their operations," says Moe Tanabian, Vice President and General Manager, Azure Edge Devices, Microsoft.

Emergency Department Live Dashboard leveraging Microsoft Power BI to showcase real time detection and monitoring of PPE.

"AI-driven computer vision has come a long way, yet reaching the levels required for robust and widespread deployment in an ever-changing real world still holds many open challenges," says Helge Rhodin, Assistant Professor, Department of Computer Science, UBC. "This joint project on handling the new normal yields a stimulating playground for algorithm development within a framework of privacy and ethical computing."

"It has been exciting to work with a multidisciplinary team to see how we can best apply AI technology in hospital settings to reduce the chance of transmitting respiratory viruses in small spaces. The team has been responsive to iterative improvements with the goal of effectively monitoring adherence to measures we have in preventing the transmission of COVID-19 in some key areas at St. Paul's Hospital," says Dr. Victor Leung, Medical Director, Infection Prevention and Control, St. Paul's Hospital.

In addition to adopting cutting-edge technology to mitigate the spread of COVID-19 among patients and visitors, PHC has recently been approved for and begun working with Microsoft Azure Edge Devices' new IoT DevKit private preview program. With this technology, PHC plans to build and pilot new solutions for non-contact patient monitoring and monitoring of hand hygiene.

While the chapter is not yet closed on COVID-19, the lessons learned from PHC's leadership implementing technology to control the spread of the virus and inform best practices across their organization's operations will remain long after the pandemic has ended.

Clinicians using Hypercare to replace pagers and improve scheduling

BY NORM TOLLINSKY

Clinicians at the Huron Perth Healthcare Alliance in southwestern Ontario are surrendering their pagers in favour of a smartphone and web-based messaging and scheduling solution from Toronto-based Hypercare Inc.

"Pagers are old technology and aren't being fully supported anymore," said Dr. Tom Haffner, an internal medicine specialist and physician champion for the Hypercare project. "We were running into issues with reception and missing pages frequently because of dead zones in the hospital. Medicine is probably one of the last vestiges of pager use, so it was really out of necessity that we began looking for a new solution."

Established in 2003, the Huron Perth Healthcare Alliance includes the Stratford General Hospital, Clinton Public Hospital, Seaforth Community Hospital and St. Marys Memorial Hospital.

Huron Perth acquired the Hypercare app in the spring of 2020 and rolled it out as a pilot project to the Internal Medicine group, the ICU and the telemetry stroke unit in Stratford. In November, it was rolled out to the rest of the hospital, including nursing units, pharmacists and allied healthcare professionals. One month later, it was made available to the three community hospitals.

Hypercare is a HIPAA and PHIPA-compliant solution designed to meet the distinct needs of clinicians in the healthcare environment, while still providing the ease of use that is similar to commonly used messaging apps in use by the general public.

It also addresses several shortcomings associated with pager use. For example, "it was not infrequent at all that a page would fail to send and the nurse wouldn't know that we didn't receive it," said Dr. Haffner. Additionally, there's no way with a pager to tell if you need to return a page right away because it's an emergency or if you can wait 10 or 20 minutes because it's just a simple question."

Hypercare has an urgent alert function that allows users to prioritize emergency messages and overrides smartphone silent and do not disturb settings.

"Another thing the staff like is that there's an indicator that tells you the physician or the person you're communicating with has seen your message," said Brenda Murray, an applications analyst and project manager for the rollout. "That's a great feature for nurses because they know the physician has seen the message and that he or she is going to get back to you."

Hypercare also accommodates consult messages. For example, nurses can select a simple, one sentence message requesting a call back.

"Physicians don't want to see a whole textbook on what's happening with a patient. That's communicated verbally when the physician returns the call," said Murray.

Like other messaging apps, Hypercare users are able to include clinical images, videos, and documents with their messages, but Huron Perth is taking it one step at a time.

"We're not using the image feature yet," said Dr. Robert Davis, Huron Perth IT physician lead. "We decided to get as many physicians on board and comfortable using the app first, but this is a great feature to have if you're in a wound clinic and the physician isn't there at the time. Once we get the physicians and staff using Hypercare comfortably, that's our next step."

Huron Perth is looking forward to a full rollout of Hypercare's scheduling functionality once more physicians make the transition.

"At this time, we have not made it mandatory for physicians to sign up for

Dr. Tom Haffner, Internal Medicine Specialist

Hypercare," noted Dr. Haffner. "We are encouraging them to do so. You have to show them the benefits of the application and have them come along rather than tell them what they have to do, but that's not to say that at some point we won't ask everyone to sign up."

Resistance to change, added Dr. Davis "is best addressed by having one's peers say they like it and spreading that kind of positivity."

As of mid-February, the Hypercare scheduling functionality was being used by the internal medicine and pediatrics groups.

"Instead of calling the switchboard to see who's on call for pediatrics, for example, you can just check Hypercare on your smartphone," said Murray.

Currently, "physician admins and others responsible for paper-based scheduling have to fax out 20 different schedules to different places and if there's a change, they have to do it all over again," noted Annette Stelmachuk, RN clinical analyst. "With Hypercare, they can log on, make a change and it's available instantly to everyone."

Physicians can also make use of Hypercare's scheduling marketplace, said Ismail Moola, Hypercare's director of business development. "If I have a shift that I want to trade with a team member or give away, I can post it to the department using the marketplace function and someone else can pick it up. All of the changes in the Hypercare scheduling platform are updated in real-time."

As a cloud-based solution independent of the hospital's existing communication systems, Hypercare isn't necessarily restricted to hospital staff. Community healthcare organizations and general practitioners affiliated with the Huron Perth and Area Ontario Health Team could also sign up and connect with hospital staff and each other. Currently, one of their OHT partners, ONE CARE Home and Community Support Services, is undergoing a pilot with Hypercare as well.

Hypercare notes that it is able to customize the solution to address the specific needs of its customers. At Barrie's Royal Victoria Hospital, for example, it developed a messaging application to contact the cath lab team in response to Code STEMI activations. "A high priority message is sent out through Hypercare to the appropriate people based on the on-call schedule," said Ismail Moola. At Michael Garron Hospital – formerly Toronto East General – an integration with the hospital's EMR alerts the most responsible physician and the infection control team through Hypercare when a patient tests positive for COVID-19 and when their blood oxygen level drops below a certain threshold. This informs the team that their patient needs an urgent assessment.

Guardian Radiology to modernize workflow and reporting with AI

To achieve productivity, efficiency, and quality improvements, Guardian Radiology plans to modernize its workflow with a suite of AI-powered technologies from Nuance. Together, the new technologies will automate and augment the radiology reporting workflow with speech recognition and natural language processing capabilities.

This practice will become the first in Canada to deploy both PowerScribe One and PowerScribe Workflow Orchestration.

"We want to spend as much time as possible on what's most important in radiology – looking at the images. That's where our referring physicians and patients benefit most, and that's where the Nuance solutions will help us most," said Dr. Casey Young, medical director, Guardian Radiology.

A community-based radiology provider with locations throughout Alberta and Saskatchewan, Guardian Radiology provides both onsite and teleradiology services to meet the needs of the providers and communities they serve.

Until recently, the practice had relied on a traditional dictation-based reporting system in conjunction with their RIS/PACS. In the fall of 2020, however, they were ready to move to a new RIS/PACS solution.

Concurrently, they wanted best of breed technologies that incorporated speech recognition and addressed overall workflow and communication processes to support their radiologists' need for enhanced productivity, faster turnaround times, and more robust workflow distribution management.

Guardian Radiology expects the new solutions from Nuance – PowerScribe One, PowerScribe Workflow Orchestration, and PowerConnect Communicator – to deliver the quality, efficiency, and accuracy improvements they're looking for.

Introduced in the U.S. in 2019, PowerScribe One harnesses modern, user-centric design principles coupled with AI-driven clinical intelligence to automate and augment radiology reporting.

This spring, the cloud-based PowerScribe One platform will become available in Canada, and Guardian Radiology will become the first practice to deploy this solution.

"Canadian healthcare organizations continue to innovate and transform their technology strategies in ways that enable a multi-disciplinary, integrated

team approach to patient care. We are honored to partner with Guardian Radiology in this endeavor and thrilled to be able to bring PowerScribe One to Canada," said Ben Hebb, national director, healthcare diagnostics, at Nuance.

"We provide a broad array of services here, and so we strive to implement new technologies and imaging techniques for all of our locations in a synergistic way. PowerScribe One will integrate our applications so we can be more efficient and effective," commented Dr. Young.

PowerScribe One uses continuous learning and "context-aware language understanding technology" to automatically convert the radiologist's unstructured text into structured data.

A voice-enabled workflow control turns free-form dictation into organized, structured reports, making it easier for radiologists to create accurate, comprehensive, and consistent imaging reports that communicate a patient's radiology findings.

"Efficiency comes in many forms, but when it comes to caring for patients, it can't just be about how fast you can get things done," said Karen Holzberger, senior vice president and general manager

BC cancer researchers turn to the Microsoft cloud to meet fast-growing requirements

The search for precision-medicine therapies is now assisted by unlimited storage and computing power that is shareable among different organizations.

A cancer-free world – that's the ambitious mission of BC Cancer. Based in Vancouver, the agency conducts leading-edge cancer prevention, screening, research, and treatment.

Within the Department of Molecular Oncology at BC Cancer, the Aparicio lab focuses on precision medicine, which is far more effective than treating cancer patients as a homogenous group. It studies individual cancer cells because each type of cancer in each patient is different. The lab's scientists do single-cell genome sequencing to understand the diversity that exists within a cancer, learn how those tumors become resistant to treatment, and create the most targeted treatment possible.

The methodology is ground-breaking – and computationally intensive. The research creates a massive amount of data that the Aparicio lab stored and processed in an expensive on-premises environment. "We had millions of dollars of on-premises servers that we purchased through grant funding," says Daniel Lai, Senior Bioinformatics Scientist at BC Cancer. "They powered our research for almost a decade, but they had limited lifespans and capabilities. We needed to move to the cloud to continue supporting research at the scale we need."

Data for machine learning: As the lab continued to generate a huge volume of data, it turned to AI and machine learning to find patterns in its genome research. "By using machine learning algorithms, researchers are able to rapidly create virtual machines that are capable of pinpointing mutations in the haystack that is the human genome," says Lai.

To store its data and support its computational needs, the Aparicio lab adopted the Microsoft Azure cloud platform three years ago. Data experts at the lab create their own machine learning algorithms that they run in Azure by using Azure Virtual Machines. A 2019 paper published in a Cell Press scientific journal detailed their sequencing methods and algorithms and how the lab solved computational challenges with innovative tools and techniques. "Because we use genomic approaches to study cancers in newer and newer ways, we have to develop our own algorithms," says Samuel Aparicio, Chair of Breast Cancer Research at BC Cancer.

However, the lab still ran its clusters primarily in an on-premises environment, and more of its hardware was reaching end of service. The lab knew it needed to move its entire genome database to the cloud to get the compute power and scale that it needed. Lai explains just how much data the lab works with: its single-cell sequencing approach creates a thousand input files every two days. In a week, researchers face 4,000 individual novel files that its system must analyze, which takes a few minutes to an hour each. "The amount of computation we need exploded and grew out of scale very rapidly," says Lai. "Our 600-core cluster of 40 computers couldn't keep up anymore."

Collaborative migration and data sharing: The Aparicio lab began migrating its massive 1-petabyte genome database to the cloud. It received technical support from local company Invero, a member of the Microsoft Partner Network with Gold competencies and the Cloud Summit 2019 Canadian Microsoft Azure Partner of the Year. Invero met with the lab re-

searcher team to understand its data requirements and how it interacts with the data. "We wanted to ensure that the Aparicio lab had a method of cataloging its data so the metadata was consistent and staff could easily search it later," says Craig Slack, Chief Executive Officer and Co-Founder of Invero.

The lab also worked with a team of Microsoft cloud solution architects who answered Azure-specific questions for the BC Cancer software developers and offered guidance and best practices. The Microsoft team held onsite training for the Aparicio lab on how to best administer the cloud environment

> **"Previously, we'd get held up for a year on something that we can now resolve in less than a month," says Daniel Lai, Senior Bioinformatics Scientist at BC Cancer.**

while also helping ensure that researchers could access data they need.

Part of the lab's vision around partnerships also extends to other research institutes. A researcher from BC Cancer recently moved his lab operation to Memorial Sloan Kettering Cancer Center in New York, but he planned to continue collaborating with former colleagues for several years.

By moving its data to Azure, the Aparicio lab created a shared computing environment from which many researchers in the field can benefit. "Thanks to Azure, researchers in different countries can share knowledge and collaborate seamlessly on the same datasets that could lead to treatments," says Aparicio. "Our field increasingly will need this type of partnership with other institutions and a common computing environment, so we're trying to lead the way."

Increased computation, reduced costs: The Aparicio lab now processes the high volume of data it needs, generating a terabyte (TB) of data a week

and 400–500 TB of data per year. "We would need to buy a new hard drive every couple days and a new server rack every couple of months just to keep up with this pace," says Lai. "We've solved that completely with Azure because we have effectively limitless computational power."

Those files must be processed every night after they're uploaded. According to Lai, it ranges from several cents to several dollars per hour to run the virtual machines, which can add up quickly with thousands of machines. So, the lab adopted Azure Batch, a job scheduling service that triggers the tens of thousands of jobs that are required to process these files. Batch uses low-priority servers that are idle in the datacenter and that aren't immediately used or required.

"On average, using Azure Batch costs about 10 percent of a normal virtual machine," says Lai. "By using these low-priority instances with Batch, we can process tens of thousands of files every 72 hours and do 10 times the work for the same price compared to standard virtual machines."

Scalability and speed: The lab gained the scalability and speed it needed by moving its genome database, running its machine learning in Azure, and using Batch to trigger processing jobs. Ultimately, its improvements in data management and analysis will help inform cancer diagnoses and treatments as research eventually moves into clinical applicability. "With our flexible computing environment in Azure, we now have a way to accelerate and scale our processes so we can learn more by operating with more data," says Aparicio. "The more patient information we can aggregate, the more power we have to learn about important but subtle effects that are easy to miss without enough data."

Adds Lai, "Previously, we'd get held up for a year on something that we can now resolve in less than a month. Our lab uses machine learning on Azure to make predictions about tumors with a speed and accuracy that humans can't do."

Nursing embraces virtual tools to keep skills sharp during pandemic

BY ROSALIND STEFANAC

Nursing student Victoria Ahmadi hasn't been able to participate in any clinical rounds in the hospital because of COVID-19 restrictions. But a virtual reality platform allows her to experience life-like hospital scenarios with patients directly from her home computer.

"We're even given scenarios that we wouldn't [necessarily] be able to experience as students, like this one patient with an allergic reaction who broke out into hives while I was talking to her," says Ahmadi, who will graduate from Seneca College's School of Nursing in Toronto this year. "It forced my critical thinking skills, and it was awesome."

The platform offered through Oxford Medical Simulation is just one of several ways nursing schools like Seneca and other learning institutions across the country are embedding technology into their curriculums to better prepare health care graduates for what they'll encounter in the workplace.

"While the pandemic has been horrible for the world, one benefit has been this push to VR platforms," says Seneca's Sharon Cassar, academic chair in the School of Nursing. "When we come back to campus and do in-person simulations with mannequins, we also have these VR headsets where students can immerse themselves in a room and safely engage in scenarios."

Developing nursing instincts: Cassar says much of students' online learning experiences in the past have been one-dimensional, watching videos and exploring the web. "With this, they're in a platform where they're forced to do something and

A new generation of VR headsets and software enable nurses to learn in a safe and interactive way.

that's stimulating them to think like nurses," she says.

"When a nurse walks into a room, they're quickly gathering data like skin colour, bed position and how a patient is breathing. This platform is fostering that ability to synthesize multiple data points and formulate them into a decision."

In a typical nursing program, Cassar says it would be impossible to give every student the same practical experiences in a clinical

setting. "But now we can standardize the experiences our students will be exposed to so they can do it again and again – until it becomes part of their muscle memory," she says. "It's exciting for educators because we're helping build a stronger nurse."

The University of British Columbia is another innovative university using a web-based learning platform – developed in-house – to help medical students gain confidence with patient encounters. Their

program, called CyberPatient, allows students to follow their patients through a continuum of care, take medical histories, perform exams, order tests and come up with a diagnosis and treatment plan.

At the Daphne Cockwell School of Nursing at Ryerson University, a virtual hospital houses a series of simulation games to help students develop skills in a way that is both fun and informative. (See https://de.ryerson.ca/games/nursing/hospital)

The first game on pediatric health assessment was launched in 2013, and since then, the nursing program has launched games covering topics such as mental health, gerontology and medical surgery. "When we first started making these games, we found a topic and then a course where it would work," says Daria Romaniuk, associate director of the collaborative degree program. "Now we're identifying areas of a course where a simulation game would work and developing one to fit."

The free games, offered in collaboration with nursing schools at Centennial College and George Brown College, are open to anyone online. (See https://www.coursecompare.ca/best-nursing-schools-nursing-colleges-and-universities/) They take up to 60 minutes to play, can be repeated several times to improve responses, and provide the user with a summary report with suggested links to further reading modules as needed. "We've certainly seen an uptake throughout the pandemic and have lots of inquiries from different faculties about our games," says Romaniuk.

The latest stats from October 2020 show the mental health assessment game was played by 97,000 people a total of

Cerner collaborates with partners to improve digital healthcare in Canada

BY JIM SHAVE

Cerner is proud to be a member of the Canada Health Infoway Alliance, helping healthcare organizations across the country to accelerate their adoption of digital health solutions.

The focus of the Infoway Alliance is improving access for Canadian citizens – making sure that medications are distributed more safely and linking individuals and their healthcare providers with the right digital health information whenever and wherever they need it.

Cerner has served the Canadian healthcare sector for more than 35 years. The experience gained over that time puts us in the ideal position to partner with the Infoway Alliance to make this shared vision a reality. We work with more than 400 sites in nine provinces. We have worked in concert with numerous Canadian healthcare organizations to help them adopt new, enabling technologies that support their drive to improve the quality and safety of patient care.

During the past year, the goals of the Infoway Alliance have been more important than ever, as we all came to terms with the COVID-19 pandemic. During this busy and tumultuous time, Cerner Canada's COVID-19 task force has been holding regular calls with Canadian healthcare organizations to keep abreast of new learnings and push relevant information updates to frontline care workers.

Cerner's commitment to encouraging better adoption of digital health solutions in Canada hasn't just been about COVID-specific innovation. Other elements of healthcare still need to be attended to during a pandemic and we have been able to ensure that our clients have been able to better support their obligations to provide safe, effective care in a virtual environment wherever possible.

In 2020, COVID-19 did not halt our progress in HIT-enabled transformation and we supported large implementation projects remotely with the TransForm Shared Service Organization – five hospitals in Erie St. Clair, Ontario – and the Clinical & Systems Transformation project, which continued to go live with new enabling technology support across facilities in Vancouver Coastal Health, the Provincial Health Services Authority and Providence Health Care.

Patient portals are proving to be a very effective tool to engage with patients in support of a virtual care model. Many of our clients, including CAMH, Island Health and Northern Health, are taking it a step further than the standard results viewing portals. They are advancing to a more interactive, bi-directional integration to the electronic health record (EHR). Northern Health is currently working on integrating video visits to make these virtual interactions more seamless and in context to the clinical record to ensure positive provider and patient experiences.

Jim Shave

Across the country, we have been working with clients to focus on our Get Current, Stay Current campaign, so they and their patients can benefit from the

most up to date EHR functionality available. Concurrently, we are also working with Infoway to develop PrescribeIT integration within health information systems, to ensure safer medication dispensing.

Cerner is working closely with AWS, our long-term hosting and transformation partner, to better leverage the benefits of the Software-as-a-Service model and further investigate the possibilities of AI and machine learning. The value of this model has already been proven through the rollout of some of Cerner's cloud solutions in Canada, including HealtheLife patient portal, Command Centre dashboard, PowerChart Touch mobility, CareAware Connect Nursing and CAMM7 image archive.

Embracing the cloud in Canada will, among other things, enable infrastructure expansion and the delivery of updates for client adoption, as well as provide resource savings and give clients the ability to use Cerner HealtheDataLab to support broad clinical research and advance learning and innovation.

Jim Shave is President of Cerner Canada.

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New systems emerge to help connect patients to care-givers by using online tools

The systems are making it easier for care-givers to improve their operations and reputations

BY DR. SUNNY MALHOTRA

When choosing a medical practice, prospective patients often turn to online platforms to help them search for the right physician. These decisions are based on reviews by other patients on the services rendered and care received.

These reviews are imperative for practice growth and development. Reputation management is here to stay and provide accountability.

In the United States, healthcare organizations are starting to integrate digitally enabled medical practice management solutions into their daily operations to grow their practices. As quality and patient-centred care takes off in Canada, such practices will likely make their way north of the border – especially with the rise of group practices and corporate-owned medical practices.

Invigo Media is a medical marketing business that offers comprehensive services to help medical practices reach their potential. Invigo uses a proven 'C3 Process' that follows a phase-by-phase approach which begins by capturing the attention of the patient market through the use of web design, influential copywriting, authority building, "direct-booking" medical pay-per-click campaigns, Facebook advertising, and search engine optimization on sites like Google.

This is closely followed by the second phase of the process in which Invigo works to connect patients with the medical practice via e-mail, social media, and mobile marketing strategies that promote online existence and ease of access to information about the practice.

Live chat availability outside of normal business hours, video marketing that illustrates the goals of the practice, and sales scripting that sells the practice from the first encounter to end-of-visit further secures patient satisfaction and retention.

Invigo's third phase utilizes referral marketing and sales funneling to aid in achieving the right patient population for a medical practice to ensure growth through patient relations. The company offers healthcare consultations to implement the right tools for expansion and data analysis to help track development.

EverGenius, a software program developed to scale and grow practices in the third phase, is another service offered by Invigo. EverGenius can track prospects and patients in sales cycles, manage patient

> **Solutions are appearing that allow patients to self-schedule their appointments, receive reminders, and send back quality surveys.**

retention through automated appointment follow-ups via text, e-mail, and voice calls. It can generate insightful growth reports that pinpoint weak areas of the practice and track reviews across multiple online sources to boost online presence and improve overall review scores.

This three-phase process allows Invigo Media to target and promote businesses to ensure growth and success in all aspects of reputation management and marketing.

PatientPop is a company designed to

Dr. Sunny Malhotra is a US trained sports cardiologist working in New York. He is an entrepreneur and health technology investor. He is the winner of the national Governor General's Caring Canadian Award 2015, NY Superdoctors Rising Stars 2018 and 2019.
Twitter: @drsunnymalhotra

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assist providers in achieving success by offering products like search engine optimization, online advertising, reputation management, website management, healthcare marketing, and more that work collectively to enhance and promote medical practices.

PatientPop can guide patient satisfaction by focusing on every aspect of the online platform that a patient encounters. PatientPop does this by optimizing practice presence from web profiles such as Google and Yelp, taking into consideration patient reviews, practice website, and web listings.

Patients can access online scheduling to get in touch 24/7, have automated alerts for appointment confirmation, and automated patient surveys from a practice portal to advocate positive patient reviews.

PatientPop improves patient retention through strategic marketing emails that encourage future appointment scheduling. It allows other sites to link to the medical practice website when referencing the practice to accelerate search engine optimization, publish and manage social media, leverage paid advertising, and boost online reputation through frequent patient review feedback.

PatientPop also promotes efficient and secure data sharing, creates a practice portal that allows practices to view performance metrics and action incoming appointment requests, and allows for the integration of EMR to gain more positive online reviews, reduce no-shows, and streamline administrative tasks.

Solutionreach is a company dedicated to patient relationships and their management. Solutionreach focuses on technology designed to improve patient experiences and promote lasting patient-practice connections. Products at Solutionreach aim to enhance medical

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Managed Equipment Services effective solution to avoid lawsuits

BY DENIS CHAMBERLAND

Hospitals in Canada are going through trying times, and not always because of the pandemic. Perhaps nothing is as trying as being faced with a $22 million class action lawsuit related to breast cancer screening, which is what Health Sciences North (HSN) in Sudbury, Ontario, is facing.

The lawsuit, launched in mid-December against the hospital, several senior administrators and several physicians, alleges "systemic negligence of the radiology service … in the performance and interpretation of breast imaging, including mammography, ultrasound and magnetic resonance imaging (MRI)."

The claim alleges there was "an overwhelming, objective decline in the standards of practice in the per-

formance and interpretation of breast imaging" at HSN.

A 2018 internal letter sent to the leadership of HSN and now in the hands of the plaintiff's lawyers describes how a group of physicians at HSN expressed concerns relating to systemic quality deficiencies in breast imaging at HSN.

The physicians note how the current environment is "leading to significant impairments on their ability to deliver effective surgical care" to patients. And separately, a senior radiologist filed a detailed complaint with the College of Physicians and Surgeons of Ontario citing concerns regarding the quality and management of the radiology service at HSN.

The lawsuit was filed on behalf of patients and their family members by a former HSN patient, who alleges that her breast cancer was missed

when she was examined in July 2018.

By mid-2019 the plaintiff discovered at another hospital that she had grade 3 metastatic breast cancer. Her lawyers say that since the class action lawsuit was launched in December 2020 more than 100 women have joined in, which means the claim could easily escalate well beyond $22 million.

Denis Chamberland

The claim will take several years to work its way through the courts before it is dealt with on the merits. If in fact the former patient's cancer was missed at HSN, it will become

clear through the legal proceedings how much of the blame is put on aged equipment or on substandard radiology practices which caused human error, or very possibly both.

Managed Equipment Services: While human error can never be fully eradicated, much can be done about the state of the equipment. Managed equipment services (MES) are a viable solution for hospitals, which are under enormous pressure to cut costs while at the same time continuing to face the pressures of improving patient care, often working with aged equipment. Technology obsolescence is a serious problem for most hospitals.

MES addresses many of the challenges faced by hospitals in relation to medical equipment. MES involves the outsourcing of all aspects of a

Technology procurement needs to consider more than price alone

BY LAURIE LAFLEUR
AND SHIRLEY FENTON

Healthcare innovation has been recognized as essential for improving the accessibility, scalability, and quality of healthcare delivery in Canada.

Unfortunately, these benefits are yet to be fully realized as procurement is often cited as a significant barrier to the adoption of innovative healthcare technologies within Canadian hospitals.

Challenges include fragmentation of governance and funding across our healthcare system, tight budgets, and outdated procurement models that tend to favour established solutions and penalize newer companies and technologies.

Shirley Fenton

So, how can MedTech innovators and healthcare providers better navigate procurement to enable faster, and more widespread digital transformation of our healthcare system? The National Institutes of Health Informatics and McMaster University Continuing Education present the answer to this question through a joint course, "Navigating Healthcare Procurement", which explores updated procurement frameworks that emphasize a value-based mindset, foster collaboration, and better enable successful diffusion and adoption of innovation. This article introduces key topics that will be examined in this course.

Laurie Lafleur

The price-value paradox: Managing tight budgets and cost containment are typically top objectives for procurement agencies. Therefore, significant favour is often given to vendors that are able to offer the lowest price.

However, price is not the single most important metric to consider when quantifying value. Other factors including risk mitigation, quality improvement, patient outcomes, and others must also be considered alongside the dollars-and-cents associated with licensing and support fees, potential savings, and revenue potential.

How can we ensure that a procurement project not only fits within cost constraints, but also results in improved outcomes for patients over the longer term? One method is to build a value-matrix that maps qualitative benefits to measurable results, resulting in a more complete and comprehensive cost-benefit analysis of competing MedTech solutions.

The other is to ensure procurement processes reinforce communication and collaboration between vendors and providers to facilitate value-based conversations and enable creative problem solving.

Moving from commodity to innovation-based procurement: Unfortunately, traditional procurement models (RFPs) are designed for acquiring well-defined and established commodities and are often based on a 'checklist' of required functionality.

This approach looks for proven solutions and does not support creativity or collaboration very well. In fact, vendors offering novel solutions are often prevented from or penalized for proposing capabilities or features in an RFP that do not fit into the rigid pre-defined requirements.

If we are to make any impactful changes to how healthcare is delivered, then an innovative mindset that seeks creative solutions and allows new technologies to be considered is needed. This can be achieved with innovative and value-based procurement models that reinforce collaboration between vendors and the public sector where focus is on the problems to be solved and how providers and innovators can best work together to achieve the greatest value and outcomes.

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AI systems are assisting with the diagnosis and treatment of mental health issues

Computers are helping clinicians deal with the overwhelming numbers of people who are suffering.

BY DIANNE DANIEL

With one in two people experiencing trauma or adversity related to the COVID-19 pandemic, the global toll on mental health is – and will continue to be – profound.

That's a key finding of the Inaugural Mental State of the World 2020 Report from Sapien Labs, which used the Mental Health Quotient online assessment tool to obtain data from roughly 49,000 people in the U.S., Canada, U.K., Australia, New Zealand, South Africa, India and Singapore.

The study found that the percentage of respondents with clinical-level risk jumped from 15 percent in 2019 to 26 percent in 2020, and that the U.S. and Canada have experienced the most severe mental-health impact from COVID-19.

This suggests "a long-term fallout from the pandemic on the mental health front" with younger generations expected to be hit hardest, stated Sapien Labs founder and chief scientist Dr. Tara Thiagarajan.

It's a bleak forecast, yet a bright spot is on the horizon: With the ongoing work of innovative Canadian start-ups like Montreal's Aifred Health and Toronto's Pentavere Research Group Inc., artificial intelligence is quickly changing how Canadian clinicians understand, diagnose and even treat mental health.

"Every day in Canada, 200 people wake up and try to commit suicide and 11 people succeed, and yet we know very little because we have very little data on these people," said Aaron Leibtag, CEO and co-founder of Toronto-based Pentavere, a rapidly growing company that is applying AI to ensure data utilization in healthcare is on par with other industry sectors like finance.

"We know very little from a data perspective about patients who are dealing with horrible depression, patients who are dealing with suicidal ideation, patients who are going further and further down the hole of addiction, and the reason for that is so much of the data we have isn't in drop-down boxes, isn't in registries, it's in the clinical notes of the psychiatrist," said Leibtag.

Launched in 2016, Pentavere is on a mission to "quickly and economically" extract data from electronically inaccessible documents such as clinical notes, transcription texts, lab tests and diagnostic and pathology reports, allowing information to be more easily aggregated, analyzed and digested to support good decision making in mental health.

The idea was born in response to a devastating personal tragedy suffered by Pentavere CTO and co-founder Steven Aviv, whose mother died during a routine medical procedure because life-saving information was buried in a clinical note.

Five years later, the company's proprietary AI engine – called DARWEN™ to reference both the evolution of health care (Darwin) and the need for real world evidence (RWE) to drive decision making – is successfully applying several AI models and methodologies to extract clinical information from digital sources with a very high degree of accuracy.

Emerging as an AI-as-a-Service model that can be applied to any healthcare discipline, DARWEN is empowering researchers and clinicians to gain a better understanding of patient populations without having to incur the time, cost and inaccuracies associated with manual chart review.

A project under way in Hamilton, Ontario, is using the platform to extract information from roughly 30,000 medical records to better understand the impact of COVID-19 on mental health.

Dr. Zena Samaan, a psychiatrist at St. Joseph's Healthcare and associate professor at McMaster University, said it would "not have been humanly possible" to comb through that many records to unlock data with the same degree of accuracy and consistency as DARWEN.

Researchers will be looking to understand what transpired over the past year by analyzing patient demographics; treatments received; changes in treatment; whether substance abuse started, ended or relapsed; suicidal attempts or thoughts; and, whether or not psychotherapy was received, for example.

"I can't wait to get my hands on this data to see what is really happening," said Dr. Samaan. "Did COVID make people's depression worse? Did it make suicidal thoughts worse? Did they start to use more cannabis and alcohol? We think it did, but imagine the confidence you have in your conclusions when you're basing it on thousands of people who are real people, not an experimental model."

Researchers will also be looking to gather information from medication records, lab results, imaging and radiology in a tabular form that provides a rich picture of a patient's healthcare journey, including the treatments they received and how they got to where they are today, she added. The information will be used to help design healthcare delivery models and improve outcomes for patients, and to look for predictors of relapse or death by suicide.

"It's usually years before you can get even 10 percent that size of data collection," said Dr. Samaan. "(With DARWEN) we can generate and answer much bigger questions than we could have answered if we had an individual human opening each file separately, reading what's in it, and taking down the notes."

Since the start of the pandemic, Dr. Samaan is seeing a growing number of referrals and requests for mental health services, particularly for depression. The increase is not just in new onset of depression cases due to distress over loss of finances or employment stability, but also in known cases that have destabilized during the crisis. Substance use has also increased.

She's excited about the possibilities ahead as DARWEN helps to paint a clearer picture of the impact of COVID.

"At the moment, the whole world is suffering from this pandemic and the effect of stress could be different in different people. But if those people have one thing in common – which is depression disorder – we want to see what kept the people who didn't decline better," she said. "If we can get a fast result while we are still going through this crisis, can we do differently? Can we do better? I'm very optimistic that when we find something actionable, services would be responsive to change."

To better understand the uses and trends of AI and machine learning in mental health in Canada, the Mental Health Commission of Canada (MHCC) undertook an environmental scan, literature review and stakeholder map with the Canadian Agency for Drugs and Technologies in Health (CADTH) in 2019.

Maureen Abbott, manager of the MHCC's Access to Quality Mental Health Services team, said the goal was to learn "more about the effectiveness and safety of AI and how best to support its integration into mental health."

One finding that stood out from the collaboration is that algorithms used in AI are only as good as the data that forms them, and many of the existing training algorithms don't reflect specific groups such as older adults, refugees, immigrants, ethnocultural or racialized populations, First Nations, Inuit and Metis people, she said.

"We've seen stories about face recognition software that doesn't work with different ethnic groups … so you can imagine the same thing happening when you're trying to predict a response to a treatment," explained Chris Kamel, CADTH director of Health Technology Assessment and Rapid Response. "If the training data of the algorithm doesn't reflect the diversity of the possibilities, then it's less likely to be as effective for that diverse use in clinical practice."

At the time of its assessment, CADTH found that most AI applications in mental health were still at the research and development stage, but rapidly evolving. The study included conversational agents or chatbots designed to support treatments like cognitive behavioural therapy, as well as emerging decision support tools or tools to predict responsiveness to treatment.

Abbott identified Kids Help Phone as a leader in the area, pointing to the organization's recently launched navigation technology called Kip as an example. Kip is

a chatbot designed to make it easier for anyone seeking mental health resources to explore and find support at their own pace.

"Organizations like Kids Help Phone use AI to detect words in chats and text messages that are then correlated to suicidal thoughts, and they're then able to triage clients in that way," she explained, noting

> **Using Aifred gives doctors a better understanding of the effectiveness of various treatment options.**

that much of the work takes place behind the scenes. "Many of us have virtual assistants at home, so I think it's only natural that AI for mental health is also happening and helping to make our processes, knowledge and prevention easier."

One of the challenges in evaluating and understanding the effectiveness of AI in mental health is the speed at which the technology is evolving, added Kamel. "The development cycle is quite rapid," he said. "The volume of different technologies and the pace with which they change will be a challenge for the healthcare system broadly."

Rapid change is something Aifred Health can attest to. Not that long ago, the company's four founders were McGill University students who came together as a club to look at the issue of how mental healthcare gets delivered in Canada. Now they are poised to start clinical trials of a first-of-its-kind clinical decision support tool in mental healthcare that uses AI to support better treatment management, matching patients to the right treatment.

And it's all because a professor urged them to enter the global IBM Watson AI XPRIZE in 2016, a competition to accelerate AI technologies that are solving societal grand challenges.

"So, this very young team of brilliant

McGill students entered the competition and the only reason they even incorporated in August 2017, was because it was a requirement of the XPRIZE," said Aifred Health CEO Marina Massingham, who came on board in 2019 to assist the startup with financing and commercialization.

The original four founders – Dr. David Benrimoh, Sonia Israel, Kelly Perlman and Robert Fratila – all have leadership roles as the company forges ahead on its journey, now one of three global finalists in the competition with the $5 million prize to be awarded this June. Regardless of the outcome, Aifred is already making a difference, said Massingham.

"Today 90 percent of patients within Canada who have major depression only ever get to see their family doctor; they will not get to see a specialist or psychiatrist," she said. "Family doctors are wonderful, but they are not well equipped in the treatment of complex mental health conditions. Our tool is designed to help physicians understand where the patient is in on the disease cycle and, based on the behavioural information of that patient, what to do next."

Aifred Health has been running clinical pilot projects in Quebec since October 2020. North American clinical trials are expected to start later this year, as the company begins the process of obtaining both FDA and Health Canada approval as a class II medical device.

Aifred replaces the traditional 'trial and error' approach to treatment selection by using a deep learning model to predict the optimal recommended treatment for an individual patient. Predictive models are trained on high-quality and reliable clinical data sets and are continuously fed de-identified patient outcomes to further refine and improve their predictive capability.

Core to the solution is a clinician-patient application that works in a browser on any device, with a downloadable version expected soon.

Patients use the app to answer standard questionnaires about their mental state and quality of life and their unique inputs are combined with the company's proprietary clinical treatment algorithms to guide treating physicians as they decide the best course of treatment.

"It's like having a consult with your colleagues where you need it: at the point of care," said Dr. Fanny Hersson-Edery, a family doctor in Montreal and an early user of Aifred.

Similar to Dr. Samaan, Dr. Hersson-Edery is also seeing a rise in the number of patients reporting anxious and depressive symptoms related to the pandemic.

Using Aifred in her practice gives her a better understanding of the effectiveness of treatment options, according to a patient's specific symptomology, and enables

her to digest a patient's responses to the questionnaires ahead of their scheduled appointment. An added benefit is that the tool keeps patients interested in their diagnosis and care.

"The decision-aiding tool is very helpful in closing gaps in terms of knowledge for the patient and the physician, and the fact that it's a tool that you're using together really engages the patient in a different way that wasn't previously possible," said Dr. Hersson-Edery.

"I think mental health sometimes suffers from this aspect of it's not really a medical diagnosis but more of a social construct; 'You didn't try hard enough' or 'Pull yourself up,'" she added. "Having a tool that uses best evidence, as well as objective data, helps to reiterate the point that mental health is a medical diagnosis."

Kingston healthtech hub has on-ramp to US

roscience, MeshAI had its origins in a near death experience caused by a medical error that was a direct result of bad scheduling and fatigue.

"I was in hospital and being cared for by someone who had been working 16 hours straight and shouldn't have been there," said Yousefi. "It really opened my eyes to some of the challenges in healthcare and the more I read about it, the more it became my passion."

According to Yousefi, 500,000 people die in the United States every year as a result of medical errors.

"Of those, 60 to 65 percent are related to stress and fatigue."

Scheduling in healthcare, he claims, has been primarily a unidirectional process carried out by a chief of staff or someone in management using a spreadsheet.

"MeshAI is democratizing that process. It allows everyone in healthcare to go into the system and put in their preferences," said Yousefi.

"Mesh AI builds the healthcare organization-wide needs into the system. You press a button and the engine first takes care of the needs of the organization, so no ICU or unit is left without the people they need." After that, the engine goes and finds solutions that take into consideration the preferences identified by staff.

If someone has an emergency and can't make it to their shift, the system suggests the next best choice, the schedule is updated and everyone gets notified by email or text.

The solution is currently being used by several healthcare organizations, including KFL&A Public Health serving Kingston and area, Northumberland Hills Hospital in Cobourg and Louisiana Women's Healthcare in Baton Rouge, Louisiana.

AI detects breast cancer in images produced through mass-spectrometry

BY JONATHAN WOODS

The main advantage of a lumpectomy for patients with early-stage breast cancer is that it conserves the maximum amount of healthy breast tissue possible. The surgery involves removing only the tumor and a margin, a thin band of healthy tissue that surrounds the cancer. When successfully performed and followed by adjunctive therapy such as radiation treatment or chemotherapy, the treatment can be just as effective as a mastectomy.

However, success hinges on what's in that margin. If a pathologist's analysis reveals lingering cancer cells near the margin's outer edges, the patient will likely require a second surgery. This isn't the odd case: an estimated 20%-25% of lumpectomies require re-excision to clear the margins. Unfortunately, because a pathologist's analysis can take weeks to perform, any remaining cancer cells have the opportunity to grow in the interim, potentially requiring the removal of even more tissue in the second operation.

New machine learning research shows promise for speeding up this analysis and, as a result, potentially reducing the amount of tissue requiring removal in re-excisions. The research, led by Queen's University master's student Rachel Theriault in collaboration with Dr. Randy Ellis

from Queen's School of Computing, demonstrates how a machine learning algorithm typically used for facial recognition can be repurposed to detect cancer cells in breast tissue samples.

The algorithm analyzes metabolic patterns in DESI-MS scans – images produced through mass-spectrometry. Theriault's research determined that the algorithm can successfully distinguish tissue from an image's background and can detect enough metabolic difference between tissue types to separate and classify malignant, benign, and artifact tissues such as cauterized tissue and fibrous bands. When the researchers compared the algorithm's tissue classifications to those made by pathologists on the same samples, they matched.

These results mark important progress for computational analysis of cancer tissue. Previous efforts to apply machine learning to classify breast tissues via DESI-MS scans have fallen short due to the sheer volume of metabolite-related data that needs to be accounted for. Theriault explains, "There are lots of differences between the tissues that are very hard to capture, and the cancer itself is heterogeneous, so it's hard to determine what is cancer and what is benign. We needed a complex algorithm to solve this complex problem."

That advanced algorithm is sparse subspace clustering, which clusters in high di-

mensional data and is typically used for facial recognition and video processing.

Theriault says, "We thought, if the algorithm can capture the complex patterns in video processing, it can probably capture the tissue's heterogeneity."

She and Dr. Ellis hypothesized that sparse subspace clustering should be able to cluster pixels based on the similarities of mass spectra (representing various ions) to identify tissue types in the same way that it clusters features like edges, shapes, or colourings in the pixels of an image to detect objects or to identify a specific face.

The confirmation that sparse subspace clustering can treat ions as features to

Rachel Theriault

distinguish and classify tissue types opens the door to using machine learning to expedite the analysis of tissue samples from lumpectomies. However, Theriault stresses that this remains fundamental research, and still requires significant study and development before it is ready for application in a health care setting.

"These results aren't the end. They're just the beginning," Theriault says.

The next step is to determine whether sparse subspace clustering can accurately classify tissue types across samples. Ambient air pressure affects DESI-MS, and because air pressure is not a constant, scans of a sample taken at different times can produce different image results.

Research must determine whether sparse subspace clustering reliably detects metabolic patterns across such differing results.

Theriault continues this work in a master's program at Queen's University, where in addition to this project, she is also exploring the application of sparse subspace clustering to the analysis of skin, liver, and prostate cancers.

To support her work, Theriault was awarded a Vector Scholarship in AI by the Vector Institute, a Toronto-based institute advancing AI development and adoption across Canada, with a strategic pillar dedicated to health-related research and application.

Ultimately, Theriault's aspiration is that her work with sparse subspace clustering can lead to real impact in a clinical setting. She says, "When we have computational strategies that can do intraoperative analysis or help guide a pathologist to do faster analysis by flagging certain samples, we hope that we can decrease the need for second surgeries."

Enhancing access to system-wide data for Ontario's healthcare providers

TORONTO – Health system integration has been a long-standing goal for both healthcare providers and governments alike. One thing is clear, beyond today's model used to drive integration – Ontario Health Teams and bundled care being good examples – access to shared, linked, cross-sector patient data, is a must if the province is to fulfill this vision.

However, access to these data has been a persistent and common challenge to integration and as such, the solution needs to be a collaborative one. The vital importance and power of coming together as a system has been demonstrated most urgently by the COVID-19 pandemic because of the level of collaboration required to respond effectively to the many complex issues that have emerged over the past year.

Recognizing these frustrating data "blind spots", over a decade ago, Hamilton Health Sciences (HHS) led local partners in the development of Integrated Decision Support (IDS), a data sharing platform across a host of subscribers, which today includes hospitals, home and community care, primary care, Community Health Centres, EMS Paramedic Services and public health.

It offers quality improvement data on shared-care patients across a continuum of healthcare services – not just what occurs within the purview of a single

organization or provider. Since then, IDS has evolved into Ontario's most mature and widely used collaborative solution for sharing integrated health partner data for planning, system-wide improvements, and analytics.

Earlier this year, IDS was acquired by the Ontario Hospital Association (OHA) which has been a long-time and vocal advocate for integrated care and cross-sector collaboration. Coming under the stewardship of the OHA marked the next level in IDS' maturity by creating the opportunity to leverage the OHA's provincial perspective, relationships with key system partners and experience in scaling critical, province-wide initiatives. IDS will maintain its collaborative approach to data collection and sharing, allowing partners to continue to shape the network's priorities so they realize the greatest collective value with respect to patient and client care information.

The IDS value-proposition: Because patients have the right to choose where they receive care, many times crossing regional boundaries, IDS offers viable and effective tools that give providers a line of sight into the patient journey. This equips providers with greater insight into potential solutions aimed at generating efficiencies and enabling better system planning – and most importantly, improving patient outcomes by being more responsive to their needs.

Currently, IDS links patient data for

more than 80 health service providers across several regions. It has 900 plus users and over 149 million encounters for more than 9.4 million unique patients.

Using a near real-time longitudinal patient record, IDS clients can follow the patient from acute care (inpatient, ED, day surgery and medical day care) to post-acute care (inpatient rehabilitation, acute mental health, and complex continuing care), to homecare, to community health centres (CHC, including abo-

> **Currently, IDS links patient data for more than 80 health service providers across several regions.**

riginal and French language), to primary care (FHT/FHO's), and via EMS paramedic data.

These data are used for system planning, performance management and efficiencies, analytics, reporting, patient transition tracking, outcome measurement and evaluation, and population health management.

IDS also holds province-wide Statistics Canada Population Census information and the Ontario Marginalization Index, allowing population health equity concerns to be married with healthcare data. Currently, a project is underway with one region's community mental health data to pilot

adding understanding of this important piece of the patient journey.

Timeliness of the data available through IDS is critical for providers' analytics, and as such, any new data, when submitted, are made available weekly in IDS, with most organizations submitting new data each month.

IDS is continuously growing due to its unique ability to support Ontario Health Teams (OHTs), integration activities, and bundled care. Continued expansion to a full provincial dataset would give all OHTs the benefits enjoyed by current IDS users and provide limitless possibilities and opportunities to evaluate changes to programs and services as teams mature and bring on new partners.

Because it is a collaborative, provider-led and locally developed solution – IDS is able to be responsive to its clients' needs. This shared resource is a pathway for organizations who are looking to address data gaps which have impeded their efforts to integrate care.

The more healthcare providers participate in the network, the richer the data available to improve health service delivery across the province. Ultimately, IDS has great potential in supporting the province's vision of an integrated and patient-focused system of care.

Healthcare organizations that want to learn more about IDS can contact Wendy Gerrie, director Integrated Decision Support at wgerrie@oha.com or 905-870-2437.

Dr. Sunny Malhotra

practice growth through services that engage patients like reliable communication and patient satisfaction. The company offers software that can send appointment reminders to cut no-show rates, automate recall messaging to aid in bringing back patients with chronic conditions or follow-ups, and customize newsletters that are personalized to be relevant to patients.

Solutionreach also improves the efficiency of practices through secure two-way messaging, online patient scheduling, digital patient registrations, and easy payment options offered on mobile platforms.

Solutionreach can automate patient surveys to track patient satisfaction and automate patient review requests for feedback on services received.

Combining these reviews and surveys can aid practices in targeted promotions, social media, and referrals through the Solutionreach marketing platform that offers tools to further expand and develop medical practice presence.

Another company, Health Performance Services, is a physician-led firm with the primary objective to optimize the potential of medical practices. Health Performance Services helps medical practice growth by reviewing patient experiences and outcomes and integrating strategic marketing in line with development goals.

It offers EMR integrations with HIPAA compliant document management to en-

sure safe and secure software storage. Health Performance Services also offers marketing analysis and planning through online services like search engine optimization, e-mail marketing, social media maintenance, paid advertising, and reputation management.

Because Health Performance Services is led by a team of physicians, the company can provide unique services to individual practices to establish successful training methods and support systems for staff members to ensure high levels of performance.

In addition, Health Performance Services provides continuous evaluations and benchmarks of practice data in comparison to other practices to promote and establish top-performing practices.

Demandforce, a business geared toward reputation management, also offers med-

ical practices all-in-one web, reputation, and communications solutions. Demandforce allows medical practices to generate reviews by automating review requests to patients and enabling practices to access a review engagement dashboard that ensures every review is seen.

> **Health Performance Services, a physician-led company, reviews patient experiences and outcomes.**

It also enables practices to compare online reviews with competitors and works with search engines like Google and WebMD to increase reviews. Demandforce allows practices to optimize search engine rankings by bulk updating business listings

to increase traffic to websites. Demandforce can offer products that can scan online platforms for inaccurate information allowing for surveillance and control of misinformation.

It offers a platform for patient satisfaction by offering patient communications through two-way text on patient portals that are integrated on existing practice management systems, automating appointment reminders, and sending appointment confirmation to reduce no-shows. Demandforce also allows practices to retain patients with recall reminders to bring back patients that haven't been seen for some time.

These businesses are some of the many all-in-one medical practice growth platform solutions for healthcare organizations that exist to ensure the success of medical practices.

Tech procurement needs to consider more than price

Innovative procurement: Innovative procurement introduces collaboration and solution design into the procurement process by allowing purchasers to seek and procure novel solutions that may not yet exist in the market or need to be adapted to meet the unique needs and create value for the procuring organization.

There are a number of innovation procurement models, each with pro-

gressing levels of invention, including:
 • Early conversations that enable procuring healthcare organizations and MedTech innovators to explore problem statements and potential solutions before RFP requirements are defined, allowing a design approach that focuses on identifying key solution attributes – new or existing – that best meet their needs.
 • Innovation and development partnerships that facilitate deeper collaborations between MedTech and provider organizations, who work together to develop net-new, novel solutions – resulting in new, beneficial technologies.

Success story: The feasibility and value potential of innovative procurement was demonstrated at Southlake Regional Health Centre, which leveraged this approach for procuring updated cardiovascular technologies.

Their first step was defining value-based objectives that focused on quality performance improvement, rather than price alone. Next, they engaged in competitive dialog with potential vendors to identify opportunities to re-design workflows and implement novel solutions that were focused on achieving those goals.

This effort led to measurable clinical quality improvements, and financial savings of $165,000 in the first year.

Learn more: In this 10-session course, participants will learn about the procurement framework and regulations, both in Canada and key international markets, various procurement models and strategies for stakeholder engagement, and frameworks for executing successful procurement and

> **Navigating healthcare procurement, a 10-session course, will be offered online starting April 27.**

change management processes. Special attention will be on the role of value-based, or 'innovation procurement' as an agile model for adopting, or participating in the design of, new and innovative healthcare solutions.

Navigating healthcare procurement will be offered online starting April 27, 2021. For more information and to register, please visit: www.nihi.ca.

Laurie Lafleur is a director at Waterloo MedTech, a professor of Health Information Science, and Health IT consultant. Shirley Fenton is the vice-president of the National Institutes of Health Informatics and a co-founder of Waterloo MedTech.

Nurses using virtual tools to keep skills sharp

174,000 times. She says the faculty has plans to develop at least three more games over the next year and a half.

Gearing up for virtual care: On top of using innovative technologies to train future health care providers, colleges and universities are also ensuring graduates are ready for a new era of digital healthcare.

Natalie Crown, acting director of the Doctor of Pharmacy program at the University of Toronto's Leslie Dan Faculty of Pharmacy, says pharmacy students are being trained on how to navigate an elec-

tronic health record and conduct virtual medication reviews with patients.

"Our students now take a health informatics course that's designed to prepare them for the skills they need to operate in the digital age," she says. "We've also brought in more e-health through our series of health system courses." In fact, U of T's pharmacy faculty helped lead a national initiative to develop an e-resource related to topics in digital health informatics for pharmacy students across Canada.

Rosalind Stefanac is a freelance writer specializing on healthcare topics.

Guardian Radiology

of diagnostics at Nuance Communications. "You need platforms with real-time intelligence, decision support, and automation that are capable of balancing efficiency with effectiveness – all while connecting people and applications. That's what PowerScribe One is becoming for Guardian Radiology."

For Guardian Radiology, patients are at the centre of their philosophy, and so, increasing access to imaging services, decreasing wait-times, and building a flexible practice are paramount.

"When radiologists can collaborate and communicate in real-time while amplifying their potential with the power of AI, we can create the care pathways that are essential to quality patient outcomes," Hebb noted. He explained

that this doesn't just mean taking waste out of the workflow to create efficiencies, but it also means connecting all stakeholders in ways that eliminate re-work – whether that means revising reports, managing denied claims, or even re-imaging patients.

That viewpoint is part of what contributed to Guardian Radiology's selection of PowerConnect Communicator. If a radiologist wants to consult with a colleague, this solution enables them to collaborate in real-time and within the normal radiology workflow.

"In-context messaging allows the consulting radiologist to launch the study, view the specific image in question, and respond right within the integrated chat window. It's not only more convenient, but helps to better manage disruptions, which can really weigh you down in the day-to-day," said Dr. Young.

In addition to PowerScribe One and

PowerConnect Communicator, radiologists at Guardian Radiology will soon take advantage of Nuance's workflow orchestration solution. PowerScribe Workflow Orchestration applies artificial intelligence to automatically distribute exams to the right clinical resource at the right time.

Once fully implemented, the team at Guardian Radiology will be able to focus

> **If an emergent case arises, the solution will automatically match the case with the appropriate radiologist.**

on reading images, rather than managing their worklists. If an emergent case arises, the solution will automatically match the case with the appropriate radiologist, and dynamically adjust their worklist.

"The less time we can spend manag-

ing workloads, assigning and prioritizing cases, and making sure things get communicated correctly, the better," said Dr. Young.

Further, PowerScribe Workflow Orchestration fully optimizes integration with Guardian Radiology's RIS/PACS environments for a more streamlined, comprehensive and synchronized experience for the radiologist.

With critical patient information at their fingertips and robust interruption workflow, radiologists can work seamlessly between multiple exams, and all apps on the desktop will remain in sync, so there's no risk of dictating on the wrong exam.

"At the end of the day, the combination of Nuance solutions will allow for the real-time intelligence and collaboration we need to position our practice for growth and expansion well into the future," explained Dr. Young.

THE ANSWERS WE NEED ARE EVERYWHERE. JUST ASK THE DATA.

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