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INSIDE:

PHOTO: COURTESY OF THE ALBERTA INSTITUTE FOR MACHINE INTELLIGENCE

Alberta cardiologists apply AI to diagnosis

Dr. Anmol Kapoor, a Calgary-based cardiologist, leads a team of 150 health professionals who not only care for patients in clinics but have also developed clinical products using AI. The team has created software that improves the results of nuclear medicine tests for heart patients, other software that enhances the analysis of Holter monitor results, and it recently created a point-of-care blood test for detecting heart disease. **SEE STORY ON PAGE 8.**

Quebec to invest nearly $1 billion in health IT

BY JERRY ZEIDENBERG

QUEBEC CITY – The Québec government has announced a plan to invest $951 million over three years to modernize the technological infrastructure of its hospitals. The goal is to improve communication among healthcare professionals through better electronic health records, enhanced security systems and more effective networks.

For some time, Québec health minister Christian Dubé has complained about the lack of interoperability of records in the healthcare system. He has also targeted the antiquated use of fax machines to transmit records and cited the need of patients to repeat their histories to providers wherever they go.

The new investment is designed to overhaul and update the technological architecture to minimize these problems.

"This technological modernization plan

> **A new, interoperable system for health records will be tested at two sites in Quebec, starting this year.**

for the health and social services system is a decisive step in our efforts to truly change our network in depth and improve the healthcare experience of Québecers in a lasting way," said Dubé in a news release.

At the end of 2022, an integrated system for sharing electronic records will be tested for a period of two years at two sites: the CIUSSS du Nord-de-l'Île-de-Montréal and the CIUSSS de la Mauricie-et-du-Centre-du-Québec.

As the systems are tested and fine-tuned, they will be rolled out to other regions across the province.

The government said the initial sites were chosen because of their expertise in electronic solutions.

The ultimate goal of the system is to allow healthcare professionals and patients to access all patient information in one place,

Quebec plans to invest nearly $1 billion in health IT over three years

with no more hunting for files from one repository to another. As well, it aims to reduce the use of paper in the healthcare system, especially the reliance on faxing.

According to an article in Le Journal de Québec, a government source said Québec wants to deploy its electronic health record gradually, in order "to avoid slippages".

Of course, Québec has attempted to computerize its hospitals and healthcare system since the late 1990s. Observers estimate that it has invested some $2 billion in the effort, much of which has come to naught. Many of the solutions have either performed poorly or have been rendered obsolete by technological innovations.

Some ambitious rollouts of technology have simply been abandoned.

In the latest modernization strategy, the $951 million investment includes $292.5 million for improving the telecommunications network of healthcare establishments. As part of building links among providers, the goal will be to strengthen computer security, consolidate data processing centres and shift to cloud computing.

Another $238 million will be set aside for projects aimed at getting rid of the faxes, paper folders and other paperwork that clutters hospital counters and complicates the work of administrators and clinicians.

The outdated nature of the information systems in hospitals and health centres came into full view at the start of the pandemic, in 2020, when Québec found itself unable to obtain an overview of the needs on the ground.

"The anachronistic use of faxes in hospitals has become a sad symbol of a delay in the development of information technologies. A major digital modernization project is necessary," Dubé said earlier this year.

A previous government made its own attempt to modernize with the announcement of the Dossier santé Québec (DSQ), the Digital Health Record.

However, this project has been criticized as taking too long to implement.

The task facing the government now is what to do with the DSQ. One solution is to connect hundreds of existing systems, no matter whether they are obsolete or leading-edge, to the DSQ.

This will potentially create an integrated system that provides healthcare professionals and patients with access to previously siloed records.

The Journal de Québec reports that "the project deployment strategy is still to be finalized," according to the director of communications for the office of the Minister of Health, Marjaurie Côté-Boileau. She

> **About $238 million will be invested in projects that eliminate the use of faxes, folders and other paperwork.**

added that, as of now, the DSQ has not been shelved.

The current government has also been working to improve the legal underpinnings needed to share medical information. Bill 19, which was tabled last December, is designed to facilitate the sharing of data with doctors, managers and patients.

As in other provinces, the COVID-19 pandemic exposed flaws in the healthcare information system. For its part, Québec could not find out how many workers were on duty or track early vaccinations.

The combination of investments in interoperable health records and changes to the legal structure governing the sharing of health information are designed to improve access to data.

When he announced Bill 19 late last year, Dubé said: "Yes, it's a colossal job, but a necessary one. The pandemic shed light on the weak points of our health system. Data problems were part of the equation. We don't want to re-live this. We want to ensure a fluid movement of information."

Québec now has 9,000 data platforms operating in 34 regional health and social service authorities scattered in 17 regions, Dubé said. The system is essentially hospital-focused, and in many instances, data is still stored in file folders.

When it comes to patient information, hospitals are reluctant to share it for privacy reasons, which Dubé said can make it hard even to get test results passed along the chain to medical personnel involved in a person's care.

Another example of the troubled system cited by the minister: While there are 8 million Québecers, there are 30 million hospital cards in circulation, with patients holding multiple cards for different hospitals.

The same patient may have records in multiple hospitals, but those records are stored in different formats that aren't interoperable. The new system, incorporating enhanced connectivity and cloud technology, will be designed to connect all the records.

For the past few years, a partnership between French-based Enovacom and Purkinje, of Montréal, has been working to connect the record systems used in Québec's hospitals.

Enovacom's country manager in Canada, Alain Larochelle, said that many centres have implemented interfaces or are in pre-production. Larochelle is confident that the Enovacom Integration Engine will continue to be a building block that's leveraged by the Québec government's new strategy.

However, Larochelle asserted that much more than hospital-generated data should be collected and linked. "Data can be generated by information systems, medical devices, and wearables that go beyond the hospital. First-line providers and community clinics also generate data, and the patient partner will be part of the ecosystem – not only as a consumer but also as a producer of data."
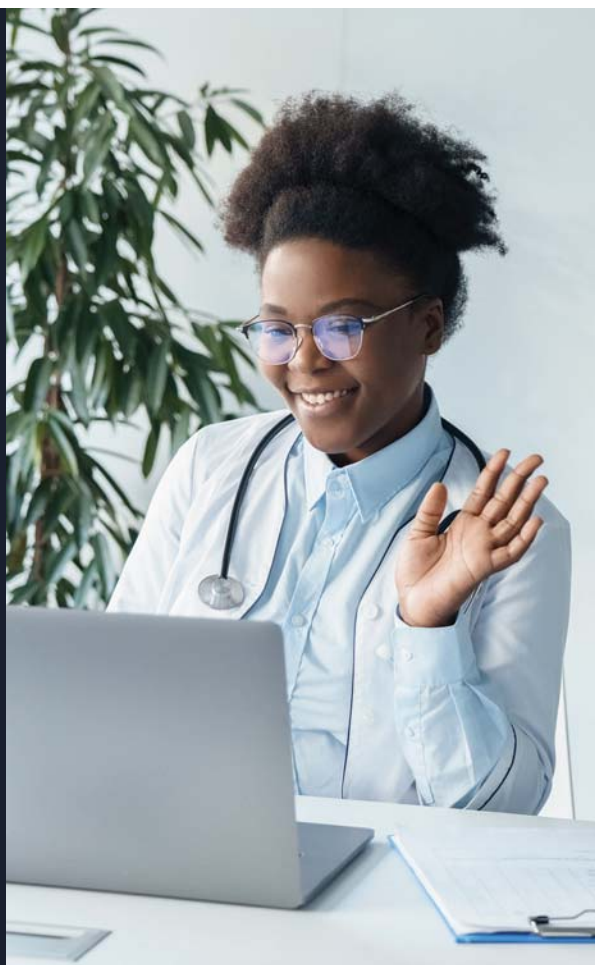
Larochelle noted that the new data will need to be hosted. For its part, Enovacom is proposing the Enovacom Data Repository, an FHIR compliant data repository that can meet the need of clinical operations.

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Seven Ontario organizations partner to launch region-wide EHR system

BY REJEAN BOURGAULT

More than 1.5 million Ontarians are getting better, safer and more efficient healthcare, thanks to the new Clinical Information System (CIS) launched by a partnership of seven acute care hospital organizations located in Ontario's Central East region.

It's one of the most wide-reaching electronic record systems – in terms of the number of patients served – yet to be deployed in the province.

Coming together amid the COVID-19 pandemic, the organizations – Campbellford Memorial Hospital, Haliburton Highlands Health Services, Lakeridge Health, Northumberland Hills Hospital, Peterborough Regional Health Centre, Ross Memorial Hospital and Scarborough Health Network – have taken huge strides to improve patient care at a moment in time when health is top of mind.

Since December 2021, the regional partnership has been using the Epic electronic health record system, enabling a patient's digital record to be made available across 14 hospital sites.

Prior to the launch, the partners were running independent systems. This meant hospitals in the region couldn't easily share patients' health information and sometimes the same tests had to be conducted over again. The difficulties and devastation of the pandemic illuminated the importance of having a shared CIS in place to ensure optimal care for patients across the Central East region.

The new regional CIS provides those patients with one digital record that can be shared across these seven organizations. There's quick access to a secure and easily navigated portal to view their health information, including test results and medications, leading to faster diagnoses and treatment plans.

"We wanted to reach that utopian state where when a patient arrives at any of our hospitals, we know everything about their relevant health history – so that they get the safest and highest quality of care," said Dr. Ilan Lenga, chief information officer and chief medical information officer at Lakeridge Health.

David Graham, Interim President & CEO at Scarborough Health Network, who is the current administrative lead for the Central East Regional Operations Team: "What we were attempting to accomplish with our new regional CIS was to have the enabling technologies required to bring state-of-the-art quality and safety tools to the bedside. We are already seeing that in practice since the rollout."

This upgrade required technology and data storage that respected Canadian privacy laws on personal health information, in addition to being able to expand and pivot when necessary, and sustain patients in the region for decades – all while being cost-effective.

The size, scale, and scope of the seven-organization member partnership was much greater than what any one hospital group had managed previously in Ontario. They felt Amazon Web Services (AWS) was particularly attractive as an infrastructure capable of hosting the new CIS, due to its time-tested ability to provide a high level of performance with large-scale projects.

The hospital organizations always had a regional vision for a hosted environment. They turned to AWS for secondary data storage and disaster recovery to find an innovative and secure solution that would allow the project to meet a 2021 calendar year go-live date. The hospitals collaborated with Epic, AWS and its implementation partner, Deloitte, to build, test, and deploy the new CIS.

"A hosted CIS was our end goal from the very beginning, but hosting that CIS became quite urgent," said Graham. "AWS's ability to move quickly to come up with a solution was a key enabler of us meeting our deadlines in the time we needed for implementation."

Andrew Kelly, chief digital officer for the Central East Regional Operations Team, who leads a team of approximately 120 in providing a centralized IT delivery service around the shared CIS to the seven organizations, noted: "Deloitte and AWS worked with us not only to design an innovative disaster recovery solution tailored to our specific needs, but also to deliver it in a remarkable few-months timeframe rather than the initial one-year timeline."

As Dai Mukherjee, partner at Deloitte Canada pointed out: "Their openness to rethinking its strategy for disaster recovery allowed them to not only meet its go-live date, but also helped advance its journey into the cloud."

The decision is already saving the regional partnership money – they estimate $10 million over 10 years due to eliminating the expense of setting up a secondary data centre. Because of AWS's on-demand service offerings, the group can scale parts of the infrastructure down to save costs during normal operations, when the disaster recovery system is not in active use.

"Hospitals need their CIS systems to be fast, reliable and secure," said Larry Sylvestre, healthcare lead, AWS Canada. "Migrating electronic health records to the cloud allows hospitals to leverage AWS's infrastructure to help minimize the risk of failure and the time to recover."

Graham says he's still impressed by how seven different organizations managed to so quickly tackle a very complex problem – and how successful it has been.

"There are people who don't believe healthcare can move quickly, and that it's unable to do so, and this project demonstrates that that's not the case – and through a pandemic! I am incredibly proud of our regional partnership and believe we are establishing ourselves as healthcare leaders in Ontario."

Rejean Bourgault is the country manager for AWS Canada.

Progress in e-mental health for patients will require clinician training

BY JERRY ZEIDENBERG

A national survey has found that Canadians dealing with mental health issues routinely use digital mental health supports – like apps and online programs – but only 29 percent are satisfied with them.

The survey, called *Canadian Perspectives of Digital Mental Health Supports: Findings from a National Survey Conducted During the COVID-19 Pandemic*, was carried out in 2021, with 1,003 participants across Canada. It was led by researchers at the Centre for Addictions and Mental Health (CAMH) in Toronto.

Dr. Nelson Shen, one of the researchers, moderated a discussion of the findings at the online e-Health 2022 conference in May.

The major concerns of patients and caregivers, noted Dr. Shen, were trust in the privacy and security of the applications (cited by 33 percent of the participants) and uncertainty about which digital tool to use (cited by another 33 percent.)

These factors are considered barriers to the further implementation of digital solutions in mental healthcare.

"There's a lack of public awareness of the tools that are available," said Dr. Shen, "and misconceptions about [the security] of mental health tools."

Among those who didn't use mental health tools, and completed the survey, the main reason for avoiding digital applications was the perceived lack of a human element. People naturally want a human connection when they're discussing their issues; however, experience has shown that when patients actually use solutions such as videoconferencing or texts, they find the human dimension is present.

Others who avoid digital solutions cited concerns about trust, with fears about hackers. They also had a low perception of the usefulness of apps or didn't know which ones to use.

Dr. Damian Jankowicz, vice president of information management and CIO at CAMH, was also a researcher involved in the study. He, too, was on the

> **Patients are unsure about which app to use, and they also worry about the security of digital solutions.**

e-Health session to discuss the findings of the report.

"People are very interested in mental health tools, but they often don't know what to use," he said. At the same time, they have a lot of trust in mental health professionals.

For this reason, said Dr. Jankowicz,

"it's the healthcare professionals who must convince people to use the tools."

To facilitate this, he added, "Our clinicians need to be trained in how to use and embed these digital tools … so that patients can use the tools in this brave new world."

Dr. Shen agreed, saying that digital options should be integrated in care pathways for patients.

Dr. Jankowicz noted that CAMH in Toronto and the Royal, in Ottawa, have begun to do this. "So, you can use these tools even before you see us. It's especially useful for low-intensity cases, and for recovery."

He asserted that digital tools will be key to helping overcome the iniquities in the healthcare system – such as access to healthcare professionals for patients in remote locations. By using digital solutions, patients have access to clinicians,

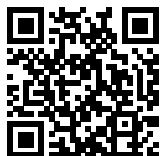# Point-of-care lab technology enables clinicians to speed-up bloodwork

BY NORM TOLLINSKY

A made-in-Canada lab technology – the epoc point-of-care blood analysis system – has been helping hospitals around the world care for patients on ventilators, many of whom needed special attention because of the COVID-19 pandemic.

And thanks to its small size and portability, the system is becoming increasingly popular with community physicians and paramedics too, who use it to conduct on-the-spot blood analysis of their patients.

Siemens Healthineers acquired the developer of the technology, Ottawa-based Epocal Inc., in 2017. In early 2021, Siemens announced an investment in the company, adding two new manufacturing lines and

> **The epoc point-of-care lab system is being used in hospitals, and also by paramedics in ambulances.**

an additional 24,000 square feet to meet increased demand for the point-of-care business across Canada and worldwide.

The Ottawa-based business unit now supplies the device and the test cards to more than 70 countries with the help of Siemens Healthineers' global sales and service teams.

"We saw a large and very rapid increase in demand that we were able to respond to, thanks to our team of passionate employees, significant investments during the pandemic and very stringent COVID protocols that allowed us to expand the site and increase output," said Mathias Ganzmann, general manager, Siemens Healthineers POC Ottawa.

The use of a mobile device for blood testing isn't surprising given the increasing use of mobile devices for banking, booking vacations and so many other applications, added Ganzmann. "When you're a physician caring for a patient in a life and death situation, you want to have the answer right away. You don't want to wait for hours or days for blood test results."

The epoc blood analysis system measures blood gases, metabolites and electrolytes, including oxygen and carbon dioxide, sodium, potassium, ionized calcium, chloride, glucose, lactate, blood urea nitrogen, creatinine and hematocrit with accuracy and actionable information that is equal to or better than traditional blood testing technologies, said Vargha Talebi, Siemens Healthineers' director, Assay Systems R&D.

Aside from hospital ICUs, the epoc blood analysis system is popular with both land-based and air ambulance paramedic services. The Sudbury Paramedic Service, for example, has four devices that are used to provide early intervention home care for older adults at risk of hospital readmission for complications related to Chronic Obstructive Pulmonary Disease (COPD) and heart failure.

Sudbury's Community Paramedicine Program began in 2015 with two paramedics and now includes 20 to 24 paramedics staffing a Care Transition Program for older adults released from acute care, a High-Intensity Needs Program for the most critical patients requiring near daily interventions, and a Community Paramedicine Long-Term Care Program caring for patients on a waiting list for congregant care and at risk of Emergency Rooms (ER) visits or hospital admission.

According to Sudbury advanced care paramedic Marc Ungar, the epoc blood analysis system is used on average once daily during scheduled and just-in-time
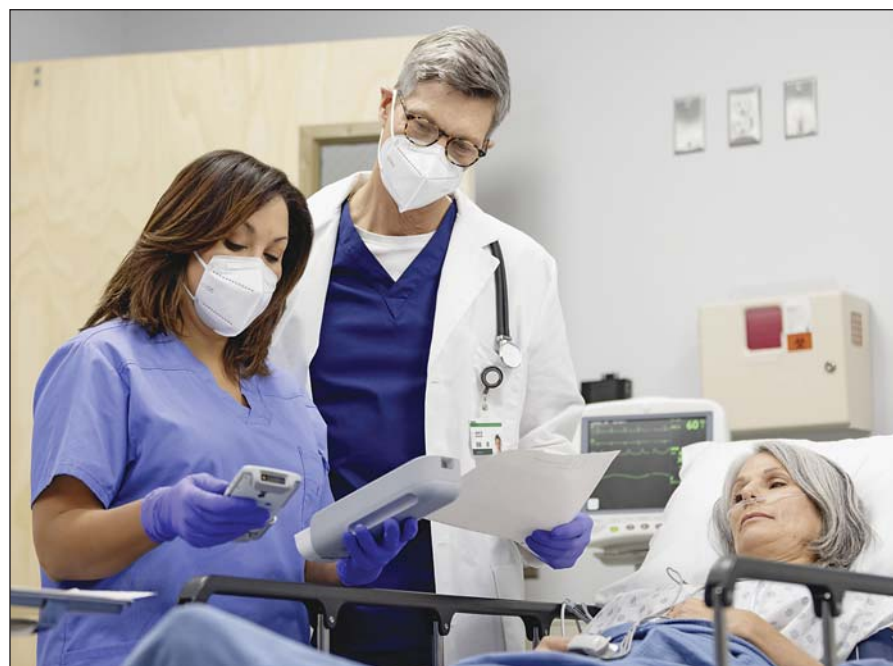
calls to monitor and stabilize patients, avoiding 911 calls, ER visits and hospital admissions.

In the absence of point-of-care testing, said Ungar, a physician would have to requisition a blood test at a community lab, resulting in a delay of up to two weeks and a requirement for the patient to leave home or pay the community lab for a blood draw at home.

The epoc blood analysis system is also ideal for physician offices and clinics in remote communities unable to wait days for blood test results from centralized labs.

"The device can work with arterial blood, venous blood or capillary blood," said Talebi. "For arterial or venous blood, it's a standard blood draw that is taken, and for capillary blood, it's a finger lance. The blood is collected in a sample collection device – a syringe or a capillary tube – and injected into a credit card size test card containing a smart sensor and assay panel with all of the micro fluidics required for the actual panel workup.

"The sample travels through the micro fluidics channels across our assay panel, which is inserted into the hand-held device, and in two or three minutes, you have your results on the device's mobile high-definition display."

In addition to the advantage of providing test results in minutes, the system requires a very small sample draw of less than 0.1 ml of blood, said Talebi.

The test cards can be stored at room temperature and are bar-coded with a lot number and expiration date for quality assurance, preventing use of an expired test card.

The slim, lightweight design of the hand-held device includes a Vibrant HD Touch Screen – HD that can be used with gloved fingers and features a large on-screen keyboard. Both audio and visual prompts guide users during the test process, informing them, for example, when to inject the sample and insert the test card into the device.

The colour-coded results on the display tell the user at a glance if a result is normal, outside the reference range, or critical.

The wireless, battery-operated device is ruggedized for use in land-based and air

ambulance settings, and both stores data internally and transmits results to hospital information systems.

One of Siemens Healthineers' most mature markets based on installed base and market penetration is the U.S., but Ganzmann projects continued acceptance of the epoc blood analysis system globally, noting that like any new technology, "You first

Mathis Ganzmann, GM, Siemens Healthineers POC

have to build trust. You have to be at the customer site to explain your technology and let people experience it. Then you need some word-of-mouth communication. That's where we are right now in Canada."

Siemens Healthineers is continuing to invest in its epoc blood analysis system. "We have a very active research and development department here in Ottawa and we are actively working on the next generation of our product," said Talebi. "I can't say too much about it for obvious reasons, but we are adding functionality that will see our epoc system grow to include other medical applications such as kidney disease, heart failure, diabetes, hemorrhage, chemical poisoning, shock and sepsis, among others."

According to Ganzmann, point-of-care blood testing in no way represents a threat to centralized labs, which have more testing capabilities. "Point-of-care blood testing is more of a complementary solution," he notes.

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e-mental health

wherever they may be, day or night.

Maureen Abbott, a manager with the Mental Health Commission of Canada, observed during the e-Health 2022 session that her organization has released several reports and studies recently that are focused on digital tools for mental healthcare.

It has also created modules for healthcare professionals and administrators, showing them how to integrate mental health tools into their services.

According to the MHCC's website, the modules enable mental health professionals to acquire the skills needed to integrate digital tools into their services. The modules include:
• Module 1: Exploring the world of e-mental health
• Module 2: Roadmap for launching e-mental health
• Module 3: Building your digital skill set
• Module 4: Engaging clients in e-mental health

She said that 650 healthcare professionals have already worked in one or

more of the available modules. Access to the modules is available at: mentalhealthcommission.ca/e-mental-health-implementation-e-modules/

Mental health tools are becoming increasingly important, she said, as they provide access to care for people who might otherwise not receive it. "We're hearing that e-mental health

> **Modules created by MHCC show healthcare professionals how to deploy digital mental health apps.**

services literally saved their lives, through 24/7 access. We're hearing that people like these services because they feel more anonymous, with no judgement." She said these services have been especially effective for patients with suicidal ideation.

As Dr. Jankowicz observed: "Our patients really want digital mental health tools. They're telling us every day and they're asking us to prescribe something for them. Clinicians want it too. It's just a matter of moving it forward."

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Calgary company aims to improve cardiology outcomes by using AI

BY JERRY ZEIDENBERG

Montreal, Toronto and Edmonton are known as Canada's powerhouse centres for the development of artificial intelligence and machine learning – the federal government even designated them as such in its AI strategy. But a Calgary company is putting its city on the map, too, with advanced AI projects for cardiology.

Dr. Anmol Kapoor, a Calgary-based cardiologist, launched CardiAI in 2018 to develop AI solutions for heart-related problems. The company has a deep pool of expertise – it employs 150 people who not only devise new technologies but also operate cardio clinics across the province. They include cardiologists, technologists, and software engineers.

On one front, CardiAI is developing an AI system to improve nuclear medicine imaging – one of the main diagnostic tests used for heart patients to evaluate cardiac function.

"The way nuclear imaging is done hasn't changed much in decades," said Dr. Kapoor.

In many cases, physicians not only look at the images generated by the nuclear med scanner, but they also consider the results of cardiac stress tests, as well as physiological indicators, like heart rates and blood pressure. Normally, when making an assessment using nuclear medicine scans and other data, cardiologists are right in their assessments about 85 percent of the time.

For their part, the team at CardiAI is pulling together all of the data and looking for patterns using machine learning (ML), as an enhanced way of spotting potential problems for cardiologists.

"Even if we improve the results by 5%, it's a huge leap," said Dr. Kapoor.

He said a small pilot project was suc-

cessful, and the company is now organizing a larger trial. The goal will be to eventually gain U.S. FDA approval, as well as authorization from Health Canada.

In another area, CardiAI is working to apply AI to the results of Holter monitors, the devices that heart patients often wear to collect data for 24 to 48 hours or more. Using the data, physicians can detect problems like arrythmias.

Dr. Kapoor was spurred to investigate this problem by a patient who was experiencing heart failure, and was very frail, but had to continuously go to doctors' offices and labs for tests and consultations. It was extremely difficult for the patient, who found the constant appointments to be exhausting.

Despite the medical attention, the patient died. Dr. Kapoor realized there was a better way to treat HF patients such as this one; instead of requiring them to go to medical offices and labs, a Holter monitor, and other technologies, could be used in the homes of patients and analyzed with the help of AI software.

With AI applied to the data that's collected, problems could be quickly flagged, and clinicians could be alerted.

This is one of the systems that CardiAI is working on right now.

Dr. Kapoor noted that Holter monitors generate hours of data, which must be cleaned by technicians and then analyzed by cardiologists – a lengthy and laborious process. Using AI, however, the tasks can potentially become fast and easy.

The goal, of course, is to train the AI system to recognize problems in the data as well as a cardiologist would. To this end, CardiAI has been building its own repository of data, from which the system learns to spot possible problems.

Dr. Kapoor said the solution has been pi-

Dr. Anmol Kapoor launched CardiAI in 2018

lot tested on over 500 patients, with data in each case collected over a five-day period. "It's a huge amount of data, about 500,000 heart beats per patient," he asserted.

The company believes it will have a model that performs with a high rate of success ready soon and hopes to run a larger clinical trial this year. Again, it will be seeking approvals from both the FDA and Health Canada.

CardiAI is also devising a point-of-care blood testing kit that can be used by patients at home to detect heart and kidney problems. This technology, too, will help patients by allowing them to stay in the comfort of their homes while giving them access to clinical tests.

The kit enables patients to perform a natriuretic peptide test – sometimes called a BNP or NT-proBNP test – wherever they might be. High levels of these substances in the blood can indicate the heart isn't functioning properly. However, natriuretic

peptide tests normally require the patient to go to a medical lab.

"Patients shouldn't have to go to a lab for a blood test," said Dr. Kapoor. "Using this system, we can make a diagnosis from a finger-prick."

He added, "I want to disrupt how laboratory work is done."

Again, AI will be used to analyze the results of some of this testing.

Overall, Dr. Kapoor said that new technologies are changing the nature of healthcare and how it is delivered. Just as Fitbits and Apple watches are putting more information into the hands of patients and enabling them to monitor their health on their own, Dr. Kapoor intends to create additional technologies and tests that make life easier for patients.

"We're moving the door from the ER to the patient's bedroom," he said.

While the company has a good deal of clinical expertise, it has also benefited from a relationship with Edmonton-based Alberta Machine Intelligence Institute (AMII), an AI lab that provides assistance to Alberta companies. CardiAI also gained support from the Prairies Canada Regional Innovation Ecosystem program and works with the federal MITACS program.

Not only is CardiAI targeting the U.S. and Canadian markets, but it's also intending to commercialize its technologies and sell them around the world. Dr. Kapoor realizes that can be a challenge. "It's one thing to develop a technology, it's another to scale it up," he said. "Once they reach the commercialization stage, most companies falter."

However, CardiAI already has international connections and operations, such as running clinical trials in other countries. "We have more experience in international operations than most companies do," he said.

Technology must be simple to use if we want to solve complex problems

BY RIKKI JENNINGS

As we enter our third year of the global pandemic, healthcare organizations are evaluating vulnerabilities and identifying opportunities to improve upon nearly every aspect of current business and care models.

For example, the shortage of nurses has forced conversations about how to more effectively attract and train new talent without compromising safety or integrity.

There are also efforts to automate workflows to augment the workforce, much like what we're seeing in manufacturing, warehousing, and retail environments.

In addition, hospital administrators and clinicians – who typically remain focused on what's happening within their four walls – are now actively engaged in supply chain management discussions. The shipping capacity and speed of medical supplies and equipment directly impacts their operational capacity and speed.

It has been remarkable to see the level

of collaboration occurring across the healthcare community, extending from production facilities to retail pharmacies, and hospitals to long-term care facilities. Everyone is trying to figure out how to do more with less and, more importantly, how we can progress healthcare to a point where we aren't having to barter and beg for people, supplies, space, or equipment.

Transformation: This creativity, though borne out of necessity, is giving credence to a long-standing belief that healthcare must transform.

In a recent global study conducted by Zebra, hospital decision-makers and clinicians agreed that technology can be transformative to healthcare over the next five years. Care models can become more predictive, workflows can become more automated, and patients can enjoy more personalized and elevated experiences that help to speed recovery and reduce return visits. We've heard stories of rapid innovation in the face of adversity and become hopeful that hospitals, pharmacies, imaging centers, and medical device factories have become

truly "intelligent enterprises."

A second global study of the pharmaceutical supply chain, conducted in 2021, provided further reassurance that end-to-end technology investments are being made to increase operational transparency, accountability, efficiency,

Rikki Jennings

and speed to address drug quality, safety, and availability concerns. **Cloud solutions:** The move to smarter, more connected healthcare systems and supply chains could be mired in complexity – and our journey to a sustainable digital health system could be completely derailed – without a commitment to simplicity.

It's important to choose hardware and software platforms that can be implemented, managed, secured, accessed, and/or scaled remotely.

By shifting to a cloud-based ecosystem, we make it easy to keep people and information systems online and in sync, no matter where they are physically or virtually located. It also becomes simple to adapt both standalone and interconnected technology platforms to accommodate evolving workflows.

We no longer need to physically rip and replace every time we want to add new features or functionality. Simple software updates pushed over the air – or by remote IT managers – can get the job done.

Perhaps that's why we're seeing more hospital decision-makers deploy enterprise-grade mobile solutions than they did five years ago. They're thinking about what it will take to innovate in an agile manner over the next five years as real-time locationing, workflow automation, and predictive analytics tools are introduced to utilize data on hand to make better decisions.

Justifying investments: Hospital and pharmaceutical supply chain leaders may have big technology spending plans for

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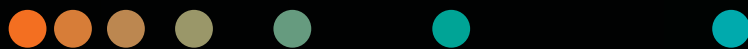
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DCA Vantage Analyzer: streamlines and simplifies diabetes patient testing and meets lab-quality standards at the point-of-care setting.
• HbA1c
• Urine ACR
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• Single-use, self-calibrated card
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AI and entrepreneurialism are the keys to delivering top-notch care

BY JERRY ZEIDENBERG

The Mayo Clinic consistently scores as the top hospital worldwide in surveys conducted by both U.S. News & World Report and Newsweek magazines. So, it would be interesting and instructive to find out how the hospital plans to stay a global leader in the delivery of medical care.

The Mayo Clinic's president and CEO addressed this very topic during the recent HIMSS conference, held in Orlando, Fla., in March. Importantly, informatics and artificial intelligence are key drivers of the hospital's strategy.

"Our top priority is to lead patient-centred care in the digital age," said Dr. Gianrico Farrugia, the Mayo Clinic's chief. "And to do that, we must first transform ourselves."

That transformation, he continued, will hinge on the deployment of "multi-modal data, AI algorithms and privacy architecture." These technologies, he said, will be used to "deliver better care and new cures to patients."

Not only is the Mayo Clinic focusing on the development of technological solutions, but it's also reaching out to partners, launching companies and investing in technological start-ups.

As one example, Dr. Farrugia commented on a pathology project. "We're currently working with our strategic partner, Google, and many others, to digitize Mayo's entire tissue pathology library."

As part of the project, the partners are scanning the more than 2 million pathology slides that are collected each year. As well, the team is creating a microscope web app for online viewing of the samples.

Together, the digital solutions will make current and historical images immediately available to pathologists, allowing them to perform their work faster and more easily than before, and from any location.

Dr. Farrugia says that AI and informatics are key parts of the Mayo Clinic's strategy to provide the best care.

Dr. Farrugia said that AI is being applied to pathology so that simpler and more repetitive tasks, such as counting cells, are automated. "That lets pathologists leverage their expertise to make the diagnosis," he commented.

For its part, the Mayo Clinic employs 73,000 staff and sees 1.3 million patients a year. In addition to its main site in Rochester, Minn., it has several other facilities in the United States and around the world and treats patients from 130 different countries.

It has developed a huge database of clinical information from which it can draw information and produce new solutions.

It houses nearly 10 million electronic patient records, along with 520 million clinical notes and 7 billion records of vital signs. The system also stores 437 million ICD coded diagnoses and 4.9 million radiology and dermatology images.

"Our platform consists of one of the largest bodies of longitudinal data in the world," said Dr. Farrugia.

A good deal of work is being done on compiling data from disparate sources – an interoperability problem that has plagued healthcare providers for decades. Mayo is gathering data from different applications, such as the electronic health records and radiology images, as well as primary care charts and wearable devices.

"This is a critical function, as data streams continue to increase," said Dr. Farrugia. Not only must the various forms of data be gathered together, but they must also be validated, to ensure data quality and that the information all works together. To smooth the entry of myriad forms of medical device information into the hospital's data repository, in 2021 Mayo launched a new company called Lucem Health.

As the hospital announced at the time, "Lucem Health Inc. [will] provide the overall platform for connecting remote patient telemetry devices with AI-enabled algorithms … and for integrating diagnostic insights generated by these algorithms into clinical workflows.

On another front, Mayo is producing new AI solutions to combat heart disease – one of the top killers of Americans and people worldwide. Dr. Farrugia explained that Mayo's cardiologists were among its first physicians to innovate using AI algorithms.

He said the cardiologists drew upon the seven million ECG records in the hospital's database to create an algorithm that can spot problematic ejection fraction results. (Ejection fraction is a commonly used metric to identify heart failure; it measures the effectiveness of the heart at pumping blood. If one's ejection fraction falls below 55%, it's a danger sign and means the heart isn't pumping as well as it should.)

In developing their algorithm, the Mayo clinicians found that they could identify problems years before patients would normally receive testing and years before the onset of symptoms.

The algorithm was subsequently tested on 22,000 Mayo patients to validate the findings. It went through another round of testing with 44,000 Mayo patients, and 53,000 independent patients.

The algorithm has been shown to be effective. For this reason, it's being incorporated as an ECG screening tool in Mayo's own electronic health record. Moreover, it will be offered to other organizations.

"We want to be able to provide these algorithms to all who want them in 2022," said Dr. Farrugia.

The entrepreneurial Mayo Clinic in 2021 formed another company, Anumana Inc., which will focus initially on designing state-of-the-art neural network algorithms based on billions of relevant pieces of heart health data in Mayo Clinic's Clinical Data Analytics Platform, including raw electrocardiogram (ECG) signals.

Introducing a new era in healthcare with Altera Digital Health

BY JOHN LEE-BARTLETT

When you imagine the future of healthcare, what does it look like? What technologies will be used by providers, and what will the impact be on clinicians, patients, and communities?

Altera Digital Health is elevating the practice of healthcare IT today so our clients can deliver healthier tomorrows. Our company name may be new, but we are far from new to the delivery of care. In fact, our solutions assist over 40 percent of the Canadian population.

Constellation Software Inc. (CSI) subsidiary N. Harris Computer Corporation (Harris) has acquired the Allscripts Hospitals and Large Physician Practices business segment, which includes the Sunrise and dbMotion solutions. Now rebranded as Altera, we will continue bringing innovation and expertise to healthcare organizations across Canada and the globe.

Here is what healthcare leaders in Canada need to know about this exciting time and what this moment means for your organization.

Rooted in Canada, trusted worldwide: CSI, based in Toronto, is a leading provider of software and services to public and private vertical markets. Ottawa-based Harris, one of CSI's six operating groups, provides software solutions that empower people who serve their communities – those in utilities, local government, schools, public safety and healthcare.

If you don't know Harris, you very well may have encountered one of its businesses or products. With more than 100,000 customers, 6,000 employees, 170 acquisitions, 25 verticals and 200 offices, Harris is a leading enabler of essential services, safety and care. The organization has a presence in nearly every continent, and that footprint is growing in size and scope. Harris has an exceptional track record for success, and it has never sold a business it has acquired. This foundation provides Altera and our valuable clients the high-quality management and long-term financial stability necessary for ongoing support, services, growth, innovation and the continuation of our solutions for many years to come.

What's in a name? Altera is helmed by president Marcus Perez, a Harris veteran and seasoned technology leader, as well as several senior executives formerly at Allscripts. As our leadership team reflected on the kind of organization we wanted to build, an obvious theme emerged from its discussions. The biggest market need in healthcare is the need for change.

Spending at current levels is unsustainable. Patient wait times are unacceptably high. Personnel shortages threaten the safety and wellbeing of patients and clinicians. The technology meant to aid caregivers impedes their work more often than not. Then factor in the ongoing global pandemic. It is time to do things differently.

This recognition inspired the naming of our company. "Alt" denotes height and "era" signifies a distinct period of time. As any changemaker knows, you do not go higher or farther by going alone. The loyal clients that have invested in our solutions and have trusted

John Lee-Bartlett

Mobile and portable imaging offer lower costs and faster access to DI

CADTH recently produced a report on the use of mobile CT and MR imaging in Canada, in which equipment is housed in a van or trailer that can be deployed to multiple sites. CADTH also issued a study on portable MR, in which the unit can be moved around a facility instead of being fixed in a special room.

CADTH, based in Ottawa, is an agency that specializes in evidence-based research on drug and information technology. Its work helps healthcare executives and managers make better decisions about the deployment of technologies.

The report on mobile systems, titled *Mobile Imaging: The Benefits and Challenges*, was created in response to queries from healthcare professionals, an indication that the topic is on the minds of executives and managers. "Requests came in for more information about mobile imaging," said Andra Morrison, the program development officer at CADTH who authored the studies.

While there is currently limited use of mobile and portable imaging in Canada, interest is rising because of the potential benefits. The scanners can be up and running relatively quickly and generally cost less than traditional fixed systems.

As well, they can be shared among smaller communities with lower exam volumes, making local diagnostic imaging available and convenient for patients. In many instances, the availability of mobile units means that patients don't have to be sent to larger centres for imaging. "Transporting patients can be brutally expensive," said Morrison.

Moreover, because of the COVID lockdowns across the country, waitlists for diagnostic imaging exams have soared, with waits for MRs, CTs and other exams becoming longer than ever. "Prior to COVID, most provinces were already beyond the recommended waits for imaging exams," said Morrison. Now, some experts are saying it could take over five years to clear these backlogs.

The government of Canada in the most recent federal budget allotted $2 billion to help reduce wait lists for surgical procedures and diagnostic imaging exams.

Interest is growing in mobile imaging, with MRI and CT suites contained inside trucks and vans.

Some of the money will be used to acquire new equipment, including mobile and portable scanners.

Computed tomography: Currently, there are just two publicly funded mobile CT units in Canada, both in Quebec; one unit is in Montreal and the other is in Quebec City. These are fixed mobile units. In addition, while not reported as part of the CMII mobile inventory, Canada's Department of National Defence installed a "deployable CT," which operates as a fixed CT unit, at the Canadian Forces Base Halifax in Nova Scotia, in October of 2020.

As well, there is a mobile stroke unit in Alberta that includes a portable CT unit, also not reported as part of the inventory.

Unlike general mobile imaging equipment, which is technically identical to conventional imaging equipment and provides the same imaging capabilities, the CT used in the mobile stroke unit produces a lower-quality image compared to conventional CT.

Magnetic resonance imaging: There are seven mobile MRI units across Canada that serve at least 20 sites. Two of these are reported as fixed units. There are two mobile MRI units in British Columbia, three in Quebec, and one each in Alberta and New Brunswick. A mobile MRI unit that visits Lloydminster – a city jointly in Alberta and Saskatchewan – is part of a con-

tract between the Saskatchewan Health Authority, Alberta Health Services, and Lloydminster Medical Imaging.

There are two broad categories of mobile imaging: provisional and mobile. Mobile imaging units can be shared between several sites with geographic proximity. Provisional mobile imaging is used by hospitals as an interim solution when equipment is out of service. Often, these hospitals already provide these services but are using provisional mobile imaging to maintain their current service volume until the temporary disruption ends.

Occasionally, provisional mobile units are fixed to a single hospital, where they operate as permanent units. This usually happens when the configurations of a healthcare facility cannot easily accommodate the unique requirements of imaging equipment. In some instances, provisional mobile imaging is used to provide additional capacity when there is a backlog or

when demand for imaging services exceeds accepted wait times.

There are numerous advantages to mobile imaging, many of which focus on how they can be quickly deployed where and when they are most needed. Some common benefits are outlined here.

• Access: Mobile imaging provides a means of reducing disparities and inequalities in the delivery of healthcare by providing a resource to vulnerable populations that will not typically visit a healthcare centre, yet often carry the greatest burden of disease. Mobile lung cancer and mammography screening programs, as well as mobile health clinics more generally, have reported success in increasing participation in healthcare to underserved, geographically isolated or undereducated populations.

• Health outcomes: Mobile imaging may facilitate better health outcomes and contribute to value-based healthcare by diagnosing disease early, which often leads to more accurate patient management, faster patient recovery, and reduced length of hospital stay.

• Convenience: Mobile imaging provides convenience to patients by removing travel obstacles associated with journeying long distances from rural and remote locations to imaging facilities in urban centres.

• Out-of-pocket costs: Populations in rural and remote communities acquire out-of-pocket travel expenses for diagnostic imaging services delivered in distant locations.

• Health system cost: Healthcare facilities that do not have a large enough volume of imaging exams to justify the cost of an in-house imaging modality are still able to provide patient access to advanced imaging equipment by sharing the cost among two or more participating hospitals.

• Space and building constraints: Mobile imaging allows hospitals to provide advanced imaging services when they may not have the physical space to install a unit, or when they prefer to avoid costly building reconfigurations, by using fixed mobile units located in parking areas or laneways.

• Wait list reduction: Mobile imaging

St. Michael's Hospital takes delivery of portable MRI on wheels

TORONTO – UpCare Partners & Associates is pleased to report the successful installation of the first Canadian clinical portable MRI at St. Michael's Hospital. The company deploys innovative medical imaging technologies in partnership with suppliers from Canada and abroad.

In this instance, UpCare worked with Hyperfine, of Guilford, Conn., to introduce their MRI-on-wheels, called the Swoop, to clinicians at St. Michael's.

The Swoop is an Ultra Low Field pMRI System, with an electromagnetic field strength of 0.064 T. The unit is self-shielded and can be wheeled safely to the patient's bedside, enabling highly acces-

sible neuroimaging examination of adult and pediatric populations.

Hyperfine's advanced image reconstruction provides foundational enabling technology using proprietary deep-learning algorithms. Swoop AI-enabled technology automatically maps and corrects electromagnetic interference within the imaging environment.

"Swoop provides the ability to directly image the patient at the point-of-care, wherever that may be, by providing conventional non-contrast MR

imaging which is within the realm of high-field MRI. Its goal is not to replace conventional MRI in these instances, but rather to enable clinicians to obtain answers to specific clinical questions in a safe and efficacious manner," said Dr. Edmond Knopp, neuroradiologist and senior medical director at Hyperfine.

Dr. Knopp added, "A value-added benefit is the ability to alleviate bottlenecks on hospital systems' conventional scanners, by scan-

ning unstable ICU patients in the ICU."

"Several Swoop systems are now deployed in Canada and are being used in various settings and patient populations from neuro-ICU, emergency trauma, neurosurgery clinic, as well as multiple sclerosis patients. Its use in stroke units will soon be assessed," said Olivier Poitier, co-founder and CEO of UpCare Partners. "This technology is a true paradigm shift. We are amazed by the positive response from the Canadian Healthcare System. Leaders in the field are ready to challenge the way things have always been done and bring relief to a stretched-out system," added Benoit Sai, co-founder and CCO of UpCare Partners.
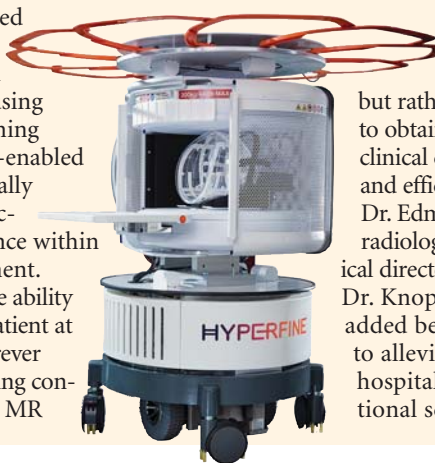
Integration of XERO® with Teams enables clinicians and specialists to share images

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.

AGFA HealthCare

enterpriseimaging@agfa.com

Schools modernize the teaching of anatomy using extended reality

BY JERRY ZEIDENBERG

Case Western Reserve Medical School, in Cleveland, Ohio, is bringing the teaching of anatomy into the 21st century with a curriculum that uses headsets and extended reality (XR) software as a major component of the learning experience. While anatomy has traditionally been taught through dissections of cadavers and lectures, Case Western Reserve has reduced the cadaveric dissection component to a two-week boot camp, followed by work in a new "Virtual Dissection Lab."

Anatomy students also work with radiological images to learn about biological structures, disease and causes of illness and death, with a special emphasis on physical exams using ultrasound.

The Virtual Dissection Lab makes use of Microsoft's HoloLens headset coupled with software that Case Western Reserve has developed on its own, called HoloAnatomy.

To this end, an in-house team developed models of a holographic male and female with enough detail for medical students. In 2020, when the COVID pandemic struck in full force, many Case Western Reserve students were able to make use of the software remotely and to continue learning anatomy with their professors and classmates while connected over a network.

For its part, Case Western Reserve Medical School has a unique relationship with Microsoft, and with the Cleveland Clinic, where its new medical school is located.

"Case Western Reserve School of Medicine moved to a new campus, and as plans for the new building got underway, we were informed that there were to be no wet labs," said Dr. Susanne Wish-Baratz, director of the anatomy program at the medical school. "We found this to be quite distressing, as cadaveric anatomy has always been the cornerstone of dissections for generations. But then we started looking at this as an opportunity instead of a threat."

Dr. Wish-Baratz made her remarks while participating in a HoloLens webinar, held in April, about augmented reality applications in healthcare. The event was sponsored by the VR/AR Association (VRARA).

She noted that Case Western Reserve developed its HoloAnatomy software after consulting with physicians across the medical school. That was to ensure the software

GigXR's extended reality system is being used for anatomy education at many leading medical schools.

incorporated "all that a medical student needs to know."

The software is performing very well. As Dr. Wish-Baratz said, an initial study of students showed that HoloAnatomy reduces the time needed for learning, and that when it comes to retention of knowledge, the augmented reality system "performed as well as or better than students who did cadaveric dissections alone."

"Those who did both [cadaveric dissections and augmented reality education using HoloAnatomy] outperformed their peers."

Dr. Wish-Baratz said that dissections using cadavers are still important, and the medical school hasn't completely eliminated them. They serve as a rite of passage for doctors, and they are often a student's first encounter with a dead body.

They also demonstrate the wide range of variations in the human body. "Just as we look different outside, we also look different inside," she observed.

For these reasons, Case Western Reserve is maintaining a two-week boot camp in cadaveric dissection at its older site. Students then migrate to the new campus, where they continue their anatomy studies using mixed reality technology.

Dr. Wish-Barantz asserted that by using

3D holography and augmented reality, "You can see structures that you couldn't see in a cadaver, such as the ductal system and the lymph nodes."

Case Western Reserve has also developed software for teaching neuro anatomy using augmented reality. "Much of it can't be demonstrated using cadavers," said Dr. Wish-Baratz.

Using the HoloLens and HoloAnatomy, students work in small groups. They are guided by recorded lectures that prompt them to investigate specific anatomical areas and structures, and they work with each other interactively to ask questions and obtain answers.

She added, "It's a whole new modality, and we're learning how to teach with it from our students."

Moreover, she said, "It's also useful for nurses, physiotherapists, doctors for continuing education, physician assistants and many others."

Indeed, when it comes to nursing, Case Western Reserve's HoloAnatomy has been adopted by the Finger Lakes Community College in Canandaigua, N.Y. The college became a Microsoft HoloLens partner in 2018 and started using the HoloAnatomy software platform shortly afterwards. So far, the system has been a success.

"Early results are promising," said Christine Parker, an associate professor at the college. "Students performed higher using the HoloLens" than those without it.

In future, Finger Lakes Community College plans to expand its use of augmented reality systems and plans to collaborate further with Case Western Reserve.

David King Lassman, CEO of GigXR, developer of a development and distribution platform for augmented reality, noted that traditional, cadaveric dissection is simply not a practical option for all schools. "It requires bringing students on campus," as opposed to virtual solutions, which can be used anywhere, anytime.

As well, cadavers – and manikins, too – are expensive and require a great deal of support personnel and equipment.

Lassman pointed out the inherent bias in manikins. "Most are white, 30-year-old

Caucasians. In many parts of the world, most people don't look like that."

By contrast, augmented reality "bodies" can be created for a variety of ethnic types and age groups. As well, when learning, students can repeat the lessons over and over until they are comfortable with their understanding. "You can fail in a safe environment," said Lassman.

GigXR has been developing a medical system for augmented reality for three years and has partnered with many leading medical schools. Using this ecosystem, partners are able to draw on components developed at another organization for use in their own application. "Barnes Jewish Hospital may say, I want to teach cardiovascular medicine in the way that Stanford does," commented Lassman. As such, they're able to make use of the software developed at Stanford.

For its part, the University of Michigan's medical school, Michigan Med, has become one of the leading centres in the United States for the development of XR-based medical and nursing education. It was recently awarded a first-of-its-kind grant by the National Science Foundation, in coordination with the University of Maryland and Maryland Shock and Trauma, to develop mixed-reality applications for medicine.

Michigan Med has already delved deeply into extended reality applications. For ex-

> **Deploying extended reality, students can visualize much more than can be seen when using cadavers.**

ample, it has held three mixed reality international grand rounds, inspired in part by a similar program at Imperial College in London, UK. During each of the mixed reality rounds at Michigan Med, between 150 and 200 physicians and learners tuned in as a doctor wearing a HoloLens headset examined patients on the hospital floor.

He was able to chat with the patient and simultaneously bring up labs and diagnostic images for viewers to see on their computer screens; moreover, the international participants were able to speak with the doctor and patient in real-time.

Not only does this enable learners to interact with various kinds of patients, but it also gets them into patient rooms during times of limited access, such as during the COVID-19 lockdown. Moreover, patients are often more comfortable with just a few clinicians in the room, instead of a crowd of students and nurses.

Dr. Taylor Kantor, a cardiac and thoracic surgeon and surgical innovation fellow at Michigan Med, said a recent survey showed that 99.5% of learners felt that XR technology improved comprehension of different medical procedures.

Dr. Kantor said Michigan Med has been actively creating mixed-reality applications for student education, in which virtual overlays appear over a medical manikin. This is accomplished by wearing a HoloLens or other viewer, which enables the student to observe various medical problems and to develop expertise in diagnosis.
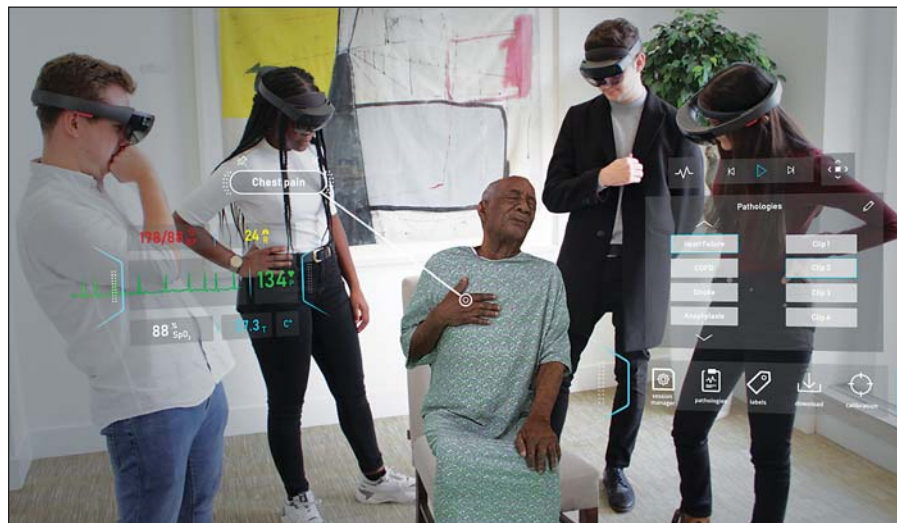
Using virtual reality, medical students can learn on their own or in groups, solving a variety of problems.

Oak Valley Health's new interventional suite eases clinician access to patient

BY NORM TOLLINSKY

Oak Valley Health, formerly Markham Stouffville Hospital, is the first Canadian healthcare institution to acquire and deploy GE Healthcare's Allia IGS 7 image guidance system for interventional radiology. The state-of-the-art technology is the result of a multi-year collaboration with interventionists and surgeons to enhance their user experience, improve workflow efficiency and increase the adoption of advanced image guidance technologies.

The system consists of a laser guided floating robotic gantry that can be moved around the room at the press of a button and repositioned for optimum access to the patient. Previous systems, explained Oak Valley interventional radiologist Dr. Mitesh Mehta, "were either fixed on the floor or to the ceiling and were stationary, so you would have to work around it. It was challenging, I must say."

Moving from one side of the patient to the other during a procedure was difficult because the C-arm was in the way. "What we would have to do in the middle of the procedure in the sterile field was to take the patient and flip them around," said Dr. Mehta. "Imagine trying to do this when you have catheters in very delicate arteries or veins. We were concerned that something could go wrong, and it was uncomfortable for the patient, but now, if we're working on the right side and we want to move to the left, we just use the touchscreen, and the entire gantry moves to the other side. The difference is amazing. It's revolutionary."

The wide bore offset C-arm spins around the patient with ease, avoiding the risk of collision with the procedure table or the patient, a risk that was especially pronounced with larger patients in the past.

The Allia IGS 7 can be used for a variety of minimally invasive procedures, including angiograms and angioplasties, aneurysm repairs and embolizations.

"In the old days, we used to operate for

Oak Valley Health's interventional suite makes use of AI to determine the right image and correct dose.

a lot of these procedures, but now, using minimally invasive techniques, a patient can go home in a few hours on the same day," said Dr. Mehta.

The Allia IGS 7 is equipped with GE Healthcare's AI-powered AutoRight technology that automatically optimizes acquisition parameters, radiation exposure, image processing and display, ensuring "the right image at the right dose at the right time," noted Arlene Desousa, GE Healthcare business modality leader. "This is something we are first to market with."

"Dose optimization is complex because there are many adjustments we need to make during a procedure," explained Dr. Mehta. "As we progress from the abdomen and the pelvis to the leg, we have to adjust the radiation dose each step of the way to make sure we don't over-radiate the patient. With the Allia IGS 7, it's fully automated for radiation dose and image optimization. It knows the thickness of bone and fat and the amount of radiation required as you're performing the procedure. It allows for more accuracy. It reduces human errors and decreases radiation dose."

The Allia IGS 7 was designed to be used by a wide range of specialists, including interventional radiologists, vascular surgeons and neuro-interventionalists, each of whom uses different tools, so GE Healthcare designed the touch panel in a way it could be personalized for each user.

"As soon as the physician walks into the room, it becomes their room," said Desousa. "It can be personalized at the click of a button, so the tools you use are at your fingertips. There's the needle ASSIST, the vessel ASSIST, the embol ASSIST, for example. All of these advanced technologies are designed for a specific user to help guide them through the procedure."

"The touch panel is a wonderful thing," added Dr. Mehta. "It's like a tablet. When you come in for your procedure, it looks the way you want it to look. It's your home page. I know where everything is. I don't have to rely on someone else's configuration. I know how to get that injection sequence back. I know how to manipulate the contrast. The customization is a real improvement."

According to Dr. Mehta, the Allia IGS 7 will allow Oak Valley Health to double the

volume of patients going through its newly constructed 2,465 sq. ft. interventional radiology suite. "It will also allow us to offload some of the work we do in CT because we can do it quicker, more ergonomically and with less radiation in our IR suite."

Using Allia IGS 7's Advanced Workstation, clinicians are able to use an image that has already been acquired to simulate a procedure. "For example, when the physician is performing a liver embolization," said Desousa. "Using the Advanced Workstation, you can look at the liver and all of the vessels feeding a tumor. You can simulate an injection point, highlighting and extracting those vessels, so you know in advance what you need to target."

"It gives us the ability to do a dry run of a complicated procedure," said Dr. Mehta. "We can practice it before the patient comes in and think about any possible complications or difficulties that we could encounter."

As part of the IR suite redevelopment, an ultraviolet light sterilization system was installed within the ductwork, in addition to the already stringent air filtration systems found in modern hospitals. Also a first in Ontario is the use of a UV Room Disinfector, mounted at ceiling level, using smart sensors to disinfect the room after every use. The disinfector in combination with effective cleaning protocols reduces the spread of hospital acquired infections while conducting invasive procedures.

"The backlog in non-urgent patient care, combined with today's growing disease burden, demands new solutions to help clinicians manage today's evolving needs," said Heather Chalmers, president and CEO, GE Canada. "Powered by GE Healthcare's Edison intelligence platform, the Allia imaging system offers the first AI-driven imaging chain that may reduce radiation dose and contrast for interventional procedures. Ultimately, this will enable the team at Oak Valley Health to increase patient access and surgical capacity for the York, Durham regions."

Designing the advanced medical device reprocessing department

When the Medical Device Reprocessing Department (MDRD) at Toronto's Mount Sinai Hospital began its redevelopment in 2018, it did so with a vision of being the leading Reprocessing Centre of Excellence in Canada.

Decentralized over two separate floors, the department faced outdated design, aging infrastructure and redundancy. The opening of the Hospital's new Surgical Services Floor also meant that a drastic increase in MDRD services was anticipated in the near future. Packaging and processing more than three million pieces of surgical equipment annually, the MDRD was in need of a modern, new space.

Today, the department's vision is a reality.

The expanded MDRD now offers a full suite of in-house sterilization ser-

vices for the first time and can accommodate an increased volume of sterilizations and faster turnaround times. The department features the latest reprocessing and tracking technology and state-of-the-art equipment and leverages unique innovations to improve patient safety and efficiencies. Additionally, a new dedicated elevator between MDRD and the Surgical Services Floor ensures surgical teams have the tools they need to perform life-saving operations.

"Providing sterile medical supplies is critical for providing safe patient care and for hospital operations," says Garry Bassi, director, Medical Device Reprocessing and Support Services. "Collaboratively working with Redevelopment, Operational Readiness and key stakeholders allowed us to achieve a department that exceeds safety standards."

A Decontamination Area features

large, custom-made sinks that are height-adjustable, with drain valves that can be easily removed for daily disinfection. Dosing pumps automatically release calibrated amounts of detergent and enzymatic, while air and water guns

> **Mount Sinai Hospital uses special technology to disinfect robotic surgery instruments, a challenging task.**

can be taken apart and put though an autoclave to destroy biofilm.

Workstation technology enables trays to be scanned to bring up washing instructions, while a lighter-coloured floor allows for greater visibility in case surgical instruments drop to the floor. Four new cube washers – thermal disinfectors

– ensure current demands are met and anticipate future growth needs, while two large Steris case cart washers wash two case carts at a time.

Mount Sinai Hospital's MDRD is one of the first in Canada with the Steris Innowave Pro Ultrasonic, a specialized washer that disinfects robotics surgery instruments. Using cavitation energy to form bubbles which implode onto the instruments to dislodge debris, the washer can access device crevices a technician's brush cannot.

Another unique feature, the Reverse Osmosis Water System, generates pathogen-free water. This is one of the highest standards in medical device reprocessing. In the Prep and Pack Zone surgical instrument trays are scanned by barcode, informing technicians how the trays are to be assembled based on surgeon preference.

How can we produce the data that supports clinical quality improvement?

Clinical data abstraction, using automated tools, is a great way to determine evidence and create best practices.

BY DR. SUNNY MALHOTRA

Currently, 1.3 million Canadians are diagnosed with heart disease and 600,000 live with heart failure. About 750,000 Canadians are living with the effects of stroke, and 800,000 have peripheral vascular disease. Healthcare systems and clinics in Ontario see thousands of patients annually, and countless physicians and nurses dedicate themselves to providing and documenting the care of these patients.

Corhealth Ontario, developed in 2017 from the merging of the Cardiac Care Network and the Ontario Stroke Network, aims to provide leadership to improve cardiac, stroke, and vascular care for patients in Ontario through evidence-driven practices such as clinical abstraction.

Clinical data abstraction is the process of extracting information from medical records to identify patient data that is used for clinical research, essentially turning unstructured data into structured data that is actionable by identifying disease trends, improving the quality and safety of patient care, and increasing efficiency of healthcare systems.

Corhealth uses data and evidence from clinical abstraction to improve the quality, efficiency, accessibility, and equity of cardiac, stroke, and vascular services for patients. Patient information about common risk factors contributing to heart disease and stroke, including smoking, physical inactivity, poor diet, high blood pressure, etc., is collected through data abstraction and used to assess disease states and overall patient outcomes.

The corresponding data is implemented in a strategic plan that includes informed planning, access and resource allocation, and measuring and reporting quality and patient outcomes.

The goals include building clinical leadership, integrating care across disease states and systems of care,

> **Data is implemented in a strategic plan that includes informed planning, access and resource allocation, measuring and reporting quality and patient outcomes.**

and involving healthcare partners to increase efficiency and improve cardiac, stroke, and vascular healthcare.

Furthermore, data abstraction and clinical registries can also be used by healthcare organizations to measure their performance against other organizations, surveil disease trends, and determine healthcare costs.

However, the sheer volume of patients alone and corresponding patient data that gets produced makes it challenging for healthcare systems to manually abstract clinical data to be able to measure performance, improve quality and equity of care, and increase the efficiency of their organizations.

The process of data abstraction is typically performed by a team of healthcare professionals who manually collect relevant data from medical records that are accurate for clinical registries that can be used in implementing healthcare advancements.

However, the COVID pandemic has complicated this process of data abstraction as physicians and nurses are pulled from these duties to assist in frontline patient care, thus delaying a hospital's
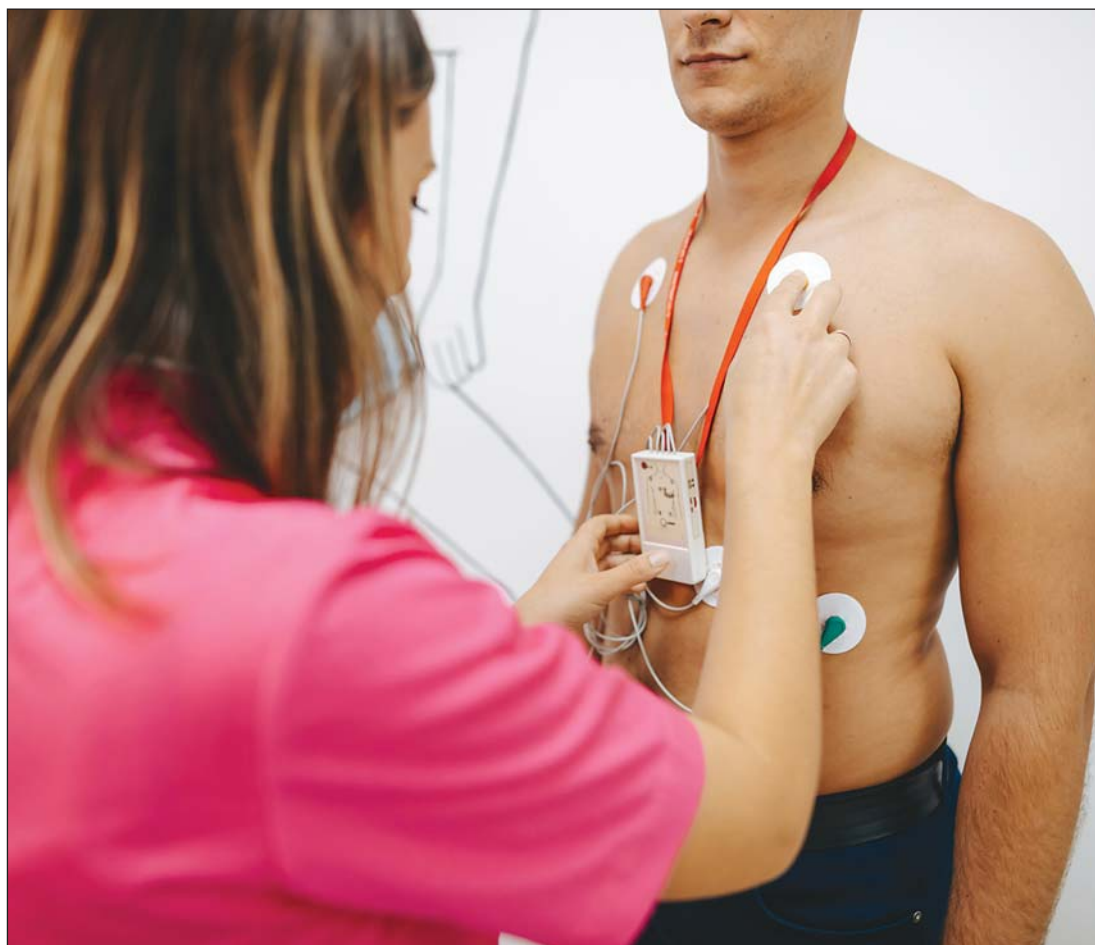
ability to correct quality problems and successfully impact quality improvements and efficiency.

Facing these challenges at our company, Cardiac Registry Support, we had to offer tools to effectively reduce the burden on healthcare facilities and enhance the reporting process for quality improvements. I hope that others can learn from this as we published our quality improvement findings.

The first step was creating an audit tool that data abstractors can use to assess the quality of abstraction performed by health system abstractors to ensure accuracy and high inter-rater reliability.

The tool confers a high degree of data quality through continuous auditing, feedback loops, and tight processes to resolve missing data to achieve near real-time abstraction, thereby creating more effective and efficient data abstraction.

It can be used across 13 cardiac registries, including ACC/NCDR, chest pain MI, PCI, TVT, LAAO, ICD, A-fib, STS registries, VQI, Get with the Guidelines registries, and UNOS Heart and Lung transplant registries.

Another tool created by Cardiac Registry Support is robotic process automation on the UiPath platform to provide automation solutions for data abstraction from medical records into data registry fields.

Dr Sunny Vikrum Malhotra is a US trained sports cardiologist working in New York. He is the CEO of Cardiac Registry Support. www.cardiacregistrysupport.com. Twitter: @drsunnymalhotra
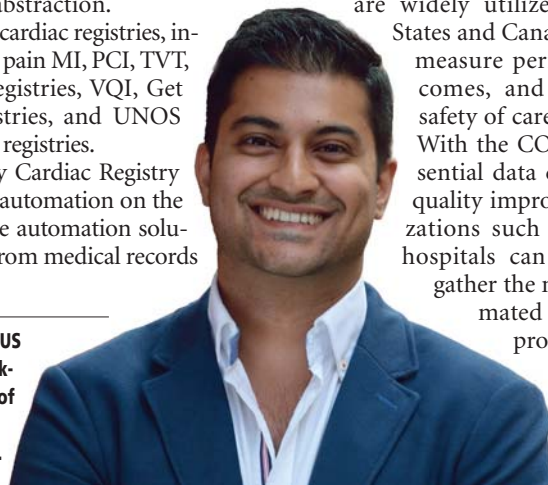
This software robot uses Optical Character Recognition to read electronic medical records and can be trained to audit data and enter that data into the appropriate data registry fields.

By using automated data abstraction, healthcare systems and clinicians can focus on utilizing the data from registries to perform quality improvement projects and improve patient care and outcomes.

Hospitals save on costs and resources that would otherwise be allotted to abstracting and efficiently generating more accurate data. Nursing staff have been reallocated due to HR bandwidth obstacles to clinical care or have divided their responsibilities to their departments because of these mandated quality measures.

Clinical data abstraction and clinical registries are widely utilized throughout the United States and Canada to maintain data quality, measure performance and patient outcomes, and improve the quality and safety of care.

With the COVID pandemic delaying essential data collection for health system quality improvements, healthcare organizations such as Corhealth Ontario and hospitals can effectively and efficiently gather the necessary data through automated abstraction and audit tools provided by companies to correct and successfully impact quality improvement, measure performance, and provide improved patient care and outcomes.

Modernizing Canada's organ donation and transplantation system

BY BARRY BURK

Close to 2,800 solid organ transplants were performed in Canada in 2021, yet 250 Canadians died while waiting for a transplant. How can we improve both of those numbers?

It will require a concerted and collaborative effort in three key areas:

• raising awareness about the importance of organ donation, as several organizations do every April during National Organ and Tissue Donation Awareness Week;

• expanding innovative approaches such as regional and national coordination, live donation and paired donation exchange programs, or perhaps even a presumed consent (opt-in) model that Nova Scotia and several countries are already using;

• and modernizing Canada's organ donation and transplantation system.

In this article, I'll focus on the third area. You may be surprised to learn that in many parts of Canada, organ donation and transplantation still relies on old technologies such as phone, fax, email, and paper charts to communicate among interdependent organizations and clinicians.

Barry Burk

That's why implementation of a pan-Canadian information system for tracking donation and transplant activities was deemed essential by the Organ Donation and Transplantation Collaborative (ODTC), a collaboration between federal, provincial and territorial governments and Canadian Blood Services.

The ODTC identified two challenges that need to be addressed: the standardization of data across Canada to ensure that consistent, high quality and timely data is available for analysis and system performance reporting; and solution interoperability to ensure that record-level data can be securely and privately transmitted among organ donation and transplantation (ODT) operators, and from these operators to the Canadian Institute for Health Information (CIHI) for analysis and reporting.

For the past three years, Canada Health Infoway (Infoway) has been co-leading an initiative with CIHI to address these challenges and modernize Canada's ODT data and system performance reporting capabilities.

Dr. Joseph Kim, director of the Kidney Transplant Program at Toronto General Hospital and chair of the ODTC Data System Working Group, says this work will be of tremendous value.

"Working in close collaboration with federal, provincial and territorial agencies, this initiative will improve the consistency and quality of ODT data across Canada and will expand its use for decision-making. The new data and reporting systems will enable improvements in the supply of solid organs, access to transplantation services, and health outcomes for transplant patients and living donors."

Infoway is leading the procurement of a deceased donation management solution that has involved seven provinces: Alberta, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. The outcome will be a common solution that all organ donation organizations can use to manage their referral cases.

With much of the planning completed to tackle system-wide challenges in data standardization, solution interoperability and performance measurement and reporting, the ODT community in Canada can now focus on implementing new technological capabilities to enable improved service to patients, caregivers and families and health system decision-makers.

Barry Burk is Executive Vice President, Virtual Care Programs at Canada Health Infoway.

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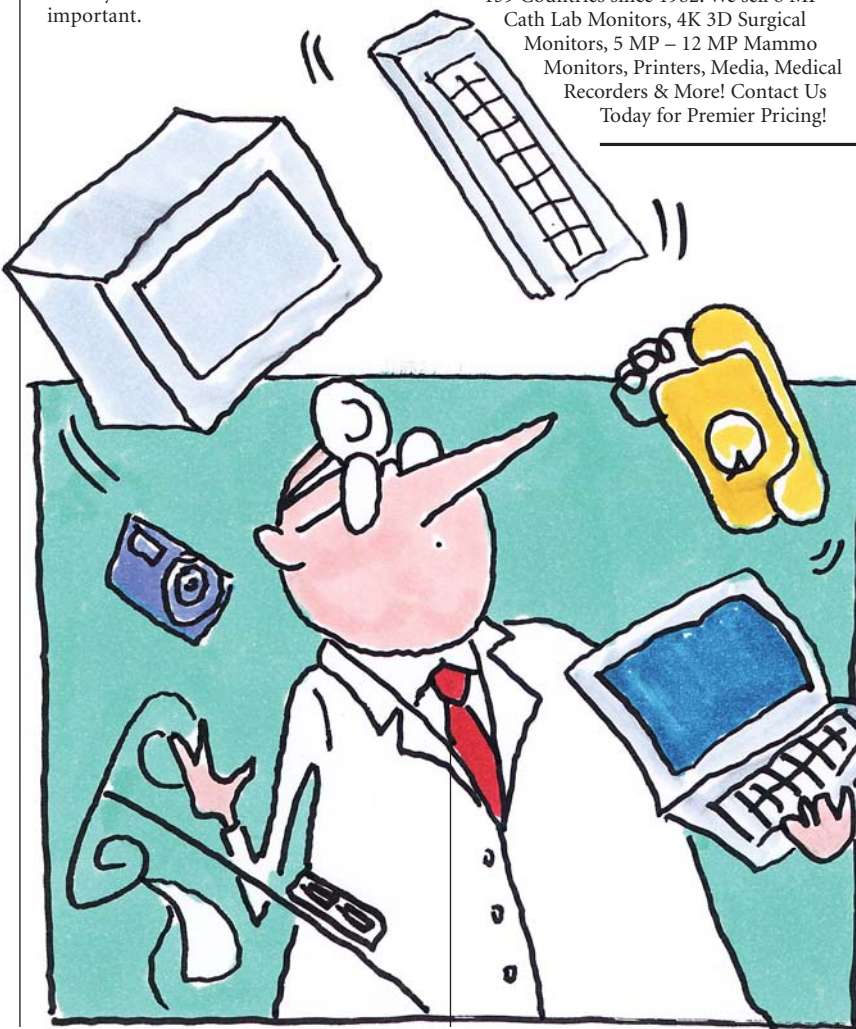
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Technology must be simple to solve complex problems

2022 and beyond. But if the resource burden outweighs the benefits to staff or patients, there will be reluctance to follow through.

Fortunately, everything from mobile computers, barcode scanners and printers to RFID, machine vision, analytics and robotics automation systems are now being designed – or redesigned – with simplicity at the forefront.

For example, RFID sleds can be attached as accessories to mobile computers so that staff can instantly read thousands of RFID tags within a predefined range. There's even off-the-shelf software and read-to-cloud RFID application interfaces that allow RFID to be deployed as a solution in hospitals, drug stores and pharmacies without any on-premise infrastructure needed.

Diversity, inclusion and recruitment: Technically, someone who has never worked in manufacturing could successfully conduct quality control inspections their first day on the job because machine vision systems automate the decision process. By removing human subjectivity from the equation, specialized skill sets and perfect eyesight are no longer re-

> **Clinicians are more apt to use new technologies that improve processes when they feel familiar.**

quirements for the job. This expands the labour pool, improving recruitment success, while increasing workers' success, aiding in retention.

Likewise, clinicians are more apt to adopt new technology solutions that can lighten their workload when they feel fa-miliar or easy to use. If the user interface on an enterprise mobile computer looks like the one on their personal smartphones, they won't get as frustrated by having to learn new software.

And they'll appreciate the prescriptive nature of certain apps or the simplicity of single-button task actions, such as positive patient identification. When clinicians feel their jobs are easy, they'll be more likely to get on board – and they'll be less likely to leave.

Integrating modern tools into legacy healthcare systems may seem like a challenge. But it will significantly simplify healthcare management and improve access to the quality jobs, supplies, and medical care needed to benefit the well-being of staff, patients, and society.

Rikki Jennings, BSN, RN, CPN, is chief nursing informatics officer with Zebra Technologies.

Portable imaging offers lower costs and faster access

can assist overburdened, in-house imaging departments to help reduce wait lists in a way that can accommodate different levels of volume demand and scheduling requirements – from a few hours per day to an entire week and in a diverse range of locations.

Portable MRI: On a related front, under the direction of Andra Morrison, CADTH also produced a study on portable MRI scanners (pMRI) called *Portable MRI for Use at the Bedside.* With innovations in MRI focused on advancements in low-magnetic-field technology, MRI has been miniaturized and brought to the point of care. (A different form factor than mobile MRI, which is enclosed in a van or truck.)

A portable MRI unit can be wheeled to the bedside, allowing the acquisition of clinically meaningful examinations that enable physicians to diagnose and moni-tor patients even in the presence of ferromagnetic equipment.

The device is not intended to replace conventional MRI; rather, pMRI can be used to provide enough information to inform immediate clinical management of patients for some clinical indications. It is currently used clinically for brain imaging,

> **A portable MRI can be wheeled to the patient bedside, allowing quick imaging of the brain.**

although future possible clinical applications for pMRI could be much broader.

Portable MRI has the potential to improve patient outcomes by providing useful imaging that is quick, safe, accessible, and cost-effective. It may be used in a variety of unconventional settings, which may help reduce health inequities. As well, pMRI may help reduce wait lists in overburdened imaging departments by maximizing the use of conventional MRI for the clinical indications for which it is most needed.

At least four pMRI systems have already been distributed to hospitals across Canada to investigate possible uses in research and clinical settings. This includes the Djavad Mowafaghian Centre for Brain Health at the University of British Columbia where pMRI is being investigated for its use in imaging multiple sclerosis.

A two-year pilot program in Northern Ontario at the Weeneebayko General Hospital in Moose Factory is investigating pMRI primarily for brain imaging, particularly for the assessment of stroke and infection and monitoring of neurological diseases and injury. Usually, patients in this region travel to Kingston for non-emergent exams at a cost of $600,000 annually to the healthcare system.

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> **Altera is bringing electronic health record systems into the cloud through a partnership with Microsoft.**

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John Lee-Bartlett is VP, International Solutions Management & Managing Director Canada and Americas (non-US), Altera Digital Health.

Revolution™ Ascend
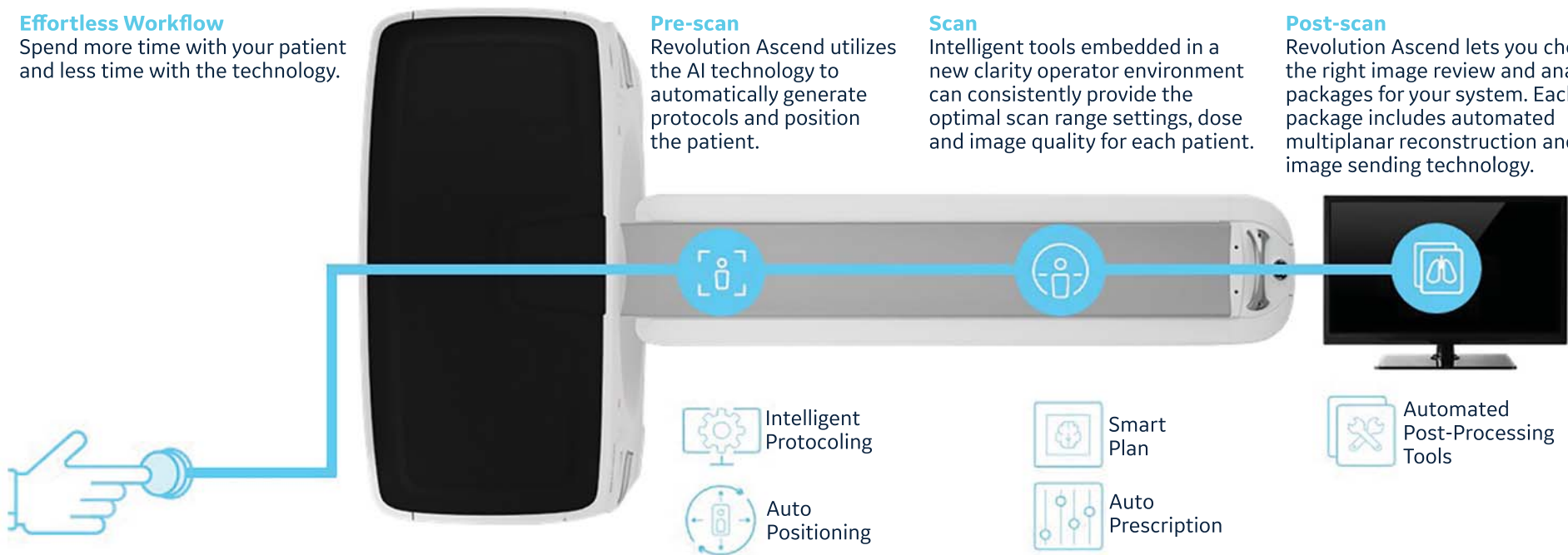## with Effortless Workflow.

Revolution Ascend uses an AI-based workflow solution, a smart user interface, cutting-edge technology, and access to Smart Subscription to substantially simplify, streamline, and automate the entire CT experience from both inside and outside the scan room.

Effortless Workflow. CT departments throughout Canada face operational challenges that require a completely new approach to performance imaging. In order to manage an increasing procedure volume, you need accurate results faster than ever before. With Effortless Workflow, we provide an innovative CT experience using AI technology to streamline the entire CT process.

TrueFidelity CT images. Deep Learning Image Reconstruction (DLIR) promises unparalleled benefits for patients, along with the radiologists and technologists dedicated to their care. Achieve never-before-possible clarity at low dose.

Revolutionizing CT from referral to report

Effortless Workflow
Spend more time with your patient and less time with the technology.

Pre-scan
Revolution Ascend utilizes the AI technology to automatically generate protocols and position the patient.

Scan
Intelligent tools embedded in a new clarity operator environment can consistently provide the optimal scan range settings, dose and image quality for each patient.

Post-scan
Revolution Ascend lets you choose the right image review and analysis packages for your system. Each package includes automated multiplanar reconstruction and image sending technology.

Intelligent Protocoling

Auto Positioning

Smart Plan

Auto Prescription

Clarity Operator Environment

Automated Post-Processing Tools

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