CANADIAN
Healthcare Technology

INSIDE:

PHOTO: BC MINISTRY OF HEALTH

BC announces plan to strengthen healthcare HR

British Columbia is launching a program of investments to shore up the province's healthcare workforce. The strategy, said Health Minister Adrian Dix, (pictured) includes training more doctors, nurses and health sciences professionals, and supports the creation of a new medical school in Surrey. As well, the province is expanding the services that can be provided by pharmacists and paramedics. **SEE STORY ON PAGE 12.**

Healthcare supply chain needs a re-think, observers say

BY JERRY ZEIDENBERG

Product shortages and disruptions during the COVID pandemic have highlighted the dire need for Canada's healthcare system to collaborate more effectively when it comes to procurement and the supply chain. What's required is a task force consisting of private-sector suppliers, hospitals and other providers, and governments to share information and smooth the flow of shipments when supply disruptions occur.

Moreover, healthcare providers need to invest much more in informatics and data analytics to be able to track supplies across provinces and to predict the availability of products on a local and worldwide scale.

These were two of the key recommenda-

tions of high-level healthcare executives at a recent conference on the state of the supply chain in healthcare, given by Supply Chain Management Association Ontario (SCMAO) in September.

"Data is key, but it will only be useful if we

> **A taskforce for the healthcare supply chain, to share information, is recommended by stakeholders.**

can share the data as a country," said Kendra Frey, VP of Materials Management at Health-Pro Canada. "If healthcare providers only work with their own suppliers, we'll be spinning our wheels."

Frey said a committee or task force made

up of stakeholders across the board is needed to coordinate demand and supply throughout the healthcare system.

And to do this effectively, data sharing and trust will be needed among the players. "We know it's not going to work without sharing the information that we have." She said that by collaborating with each other, healthcare providers and product suppliers can demonstrate what's available and when shortages occur, they can discuss what substitutions can be made.

She noted that at the start of the pandemic, a task force of this kind was organized for the drug industry by Health Canada, with great success. This could serve as a model for the healthcare-product sup-

Canada's healthcare supply chain in need of a re-think, observers say

ply chain, she said. Everything from diagnostic imaging to personal protective equipment (PPE) would be included.

Frey asserted that national planning of this sort would help with stockpiles, too, so that shortages would be reduced the next time a pandemic occurs.

However, she said that governments and the public should be ready and willing to accept that there will be waste – products expire over time and new stock must be purchased and stockpiled.

Greg Chow, VP of Finance at Women's College Hospital, in Toronto, observed that shortages and disruptions in the healthcare system are far from over. He said hospitals continue to operate at over-capacity and are severely rattled when they can't get the products they need.

(At Women's College) "we're running at a level where there isn't any excess capacity," he said. "It's going to be difficult to address a further spike in demand."

He noted the hospital has already been adversely affected by recent shortages of contrast media for diagnostic imaging exams and by difficulties in obtaining epidural catheters and tubing for pain management.

What would happen, he asked, if the hospital needed to flex up to 120 percent of capacity? It might face shortages in other areas, as well.

Scott MacNair, EVP of Business Operations at the Provincial Health Services Authority in British Columbia, noted that the hospital supply chain in BC is much more centralized than in other provinces like Ontario. Nevertheless, BC has been experiencing its share of problems.

MacNair said that before the pandemic, "we'd deal with 100 (supply chain) disruptions a month. In the last 18 months, that's climbed to 250 a month."

What really needs upgrading in BC is the informatics infrastructure, he said, as the lack of good computer software is impeding the collection, analysis and sharing of data.

Some parts of the supply chain system in BC are still working on Excel spreadsheets, he said. "We shouldn't be doing that," he asserted. "We're very archaic."

He observed that Alberta has invested in analytics "and has done a fabulous job on tracking and tracing inventory."

Mark Walton, SVP with Ontario Health, agreed that "we have poor supply-chain data," especially in areas like DI and surgery that are flashpoints for the public.

Moreover, he said that additional pressure on the system is coming. "There's la-

> **Hospital supply chains have been crafted to run as "lean" as possible. But that causes huge problems when a crisis occurs.**

tent illness (in the public) that's out there and hasn't yet been diagnosed. We expect to see a huge bolus coming."

This will put tremendous strain on healthcare providers and may also use up the available supplies of medical products.

Walton said Ontario hospitals have already been running at 110 percent to 120 percent of their surgical volumes. Awareness of supply chain issues has grown enormously during the pandemic, he said, with a greater sensitivity to international issues.

"We've become acutely aware of our vulnerabilities. We've come to see that a change in China will have an impact on Canada."

"We have to gain a better understanding of who our external suppliers are," he said.

Walton agreed with his colleagues on the panel that the healthcare system suffers from a shortage of data about supply chain issues, and that more work should be put into building the relationships and resources needed to obtain and analyze critical information.

"We really don't have baseline data, and there's no single source of truth," he said. "Finding the data can be a challenge in itself."

Walton said the capacity for hospitals to collaborate with each other was proven during the early days of the pandemic, when they shared information and transferred patients to each other's facilities – even out of province.

Sharing data among private-sector suppliers, and with hospitals and governments, may be more difficult, he said, as private companies have little incentive to do this and may fear they have much to lose. "They're reluctant to share information about their volumes and prices," said Walton.

That and more may need to be done, however, to avert another supply chain crisis if and when another pandemic strikes.

"We need to make sure this isn't another SARS that comes and goes, where we don't learn anything from it," said Walton.

The panellists agreed that shortages also extend to human resources, and that a centralized task force could help alleviate these scarcities.

Greg Chow, of Women's College Hospital, said that when it comes to human resources, "there's cannibalization going on," explaining that to fill gaps, providers are often poaching nurses and other staff members from each other – leaving new gaps in the system.

"If we all collaborated, we could (jointly, and more powerfully) create asks for government and policy makers," said Chow. He said the system needs more education programs and the fast-tracking of foreign credentials to fill HR vacancies – a nagging problem in the healthcare sector.

Session moderator Angela Ma, Health Partner with PwC Canada, noted that hospital supply chains, traditionally have been crafted to run as "lean" as possible. However, when a crisis like a pandemic occurs, they're unable to accommodate the surge in demand for medical products. How could they be made more effective, she asked.

Chow answered that there must be a rethinking of this approach. To plan for the future, governments and policy makers must realize that "challenges will cost", he said.

"We'll need to have 'risk premium' to invest in ourselves," said Chow.

CANON

CANON MEDICAL

Introducing **Auto Scan Assist for MRI**

powered by **Altivity**

W-SpineLine+

LiverLine+ and SURE**VOI Liver**

ProstateLine+

NeuroLine+

CardioLine+ and SURE**VOI Cardiac**

SpineLine+

KneeLine+ and SURE**VOI Knee**

*Internal data results of image selection, plan setting steps and time savings.

Standardize and Simplify Your MRI Workflow

Powered by Altivity, Auto Scan Assist reduces operator burden and MRI set-up steps by up to 80%.* Take away the variability and standardize your workflow with automated slice alignment for a range of anatomical examinations. With enhanced procedural efficiency, Auto Scan Assist reduces overall examination times to improve patient comfort.

Click here to learn more >>

Up to
80%
Reduce Burden on the operator

Up to
80%
Reduction of operation steps

Up to
75%
Reduction of Operation time

Made For life

RACE streamlines patient journey through improved communication

BY MIRANDA DEFER

The RACEApp+, which was created in 2015, underwent significant updates in 2022. Managed provincially by Providence Health Care, and with more than 85,000 calls to date, RACE streamlines the patient journey through improved communication between family doctors, nurse practitioners and specialists. Committed to keeping up with the telephone advice needs of primary care providers, RACE will continue to add specialty services based on feedback from primary care.

This summer, RACEApp+ rolled out a number of improvements in keeping with the program's commitment to improving the quality of patient care. Upgrades include:
• The ability to connect to local specialists when available (if they're not available, you can still easily connect with a specialist in another region).
• Accessibility and ease-of-use upgrades, including consistent formatting for patient demographics, and badge notifications to indicate new requests.
• The ability to facilitate an integrated provincial service.
• Two-factor authentication for improved security and ease-of-use for providers.

The updates will make RACEApp+ easier to use, improving the sharing of patient information between specialists, family physicians and nurse practitioners, while creating a better app experience.

"I find it to be very user-friendly, and a great way to gather the patient data in a confidential but efficient manner," said Dr. Nawaaz Nathoo, a Vancouver-based ophthalmologist and frequent RACEApp+ user.

The Rapid Access to Consultative Expertise (RACE) advice line was launched by Providence Health Care in June 2010. The RACE model allows physicians, medical residents, nurse practitioners and midwives to go to one online application, the RACEApp+, or call one number and speak directly to specialists. A collegial and educational interaction is encouraged when the specialist answers the call. The service provides an opportunity for in-time learning, often when the patient is still in the primary care office.

Dr. Yazdan Mirzanejad, a Surrey-based infectious disease specialist with over 25 years of experience, frequently uses RACE and rotates along with his colleagues in providing consultative expertise to other physicians.

"My availability to my medical community practitioners and their patients is clearly owed to RACE … who work to fill the existing gaps for timely access to expert advice," commented Dr. Mirzanejad.

RACE was launched with five specialty services. And, as of 2022, there are 80+ services available, with plans to increase the specialty service offerings. Family physicians and specialists are remunerated for telephone interaction. RACE is funded in part by the Shared Care Committee, a joint collaborative committee representing a partnership between Doctors of BC and the BC government. The service currently has over 1,500 calls per month, and services more than 4,300 primary care providers and 800 specialists.

The RACEApp+ allows users to easily request the specialty of their choice in one easy step – no more listening to the list of specialties on the telephone and writing down billing information.

It allows physicians to pre-enter patient demographics while requesting advice, ensuring the phone conversation is focused solely on the patient. Specialists can make a note and choose how they would like to be notified of requests either by phone, text, email or pager. Although the request is placed through the app, the interaction is still voice-to-voice when the specialist returns the telephone call. The app is accessi-

EDI spots pricing anomalies in Ontario's healthcare supply chain

BY TIM WILSON

As orders for medical equipment flow through Electronic Data Interchange (EDI) systems, giving a view of the purchasing patterns of hospitals across the country, it's become apparent that different facilities are paying a wide range of prices for the same goods. Those disparities are especially noticeable in Ontario.

"We have identified hundreds of medical products in Ontario with significant price differentials," says Dave Ralph, president and CEO of Commport Communications International, an e-commerce provider in Toronto. "Sometimes the difference is small, but the ordered quantities are large, or very large."

Commport acquired its EDI business from Telus in 2012. It now serves over 700 hospitals in British Columbia, Manitoba, Ontario, New Brunswick and Newfoundland, with between 800 and 850 healthcare vendors as customers.

"In Ontario, as we grew the database, we recognized that these pricing irregularities were rampant. We don't see problems to this extent in the other provinces where we operate."

Back in November, 2020, Ontario announced that it was launching a new agency, Supply Ontario, to centralize government procurement. The idea was to enable a whole-of-government approach to purchasing goods and services. One specific goal was to save taxpayers money by "delivering the best value by sourcing high-quality goods at scale to serve the public interest in a financially responsible way."

However, the process to bring about transformative change in the medical supply chain in Ontario has been slow.

"I thought with Supply Ontario we would see a single price for a product across the province, but that hasn't happened," says Ralph. "The potential savings are staggering. It would be possible to go to the Commport database, find the lowest price, and to tell vendors that we will buy province-wide at that price."

Ralph has presented to the Deputy Minister of Health in the former Liberal government, and twice to the Ministry of Health in the present Conservative government. However, he has not presented to Supply Ontario.

When contacted by Canadian Healthcare Technology, Supply Ontario was unable to reference any specific initiatives to address price harmonization – or even to acknowledge pricing inconsistencies – other than to say it is "currently focused on building up its operational capacity to drive its mandate to leverage Ontario's buying power."

With EDI, it is possible to have a system in which pricing is consistent, even when there is diverse geography and differing volume requirements.

"In British Columbia, when a contract is signed with a vendor, there is one price for all hospitals and health authorities," says Kanwar Hayer, provincial manager with the Health Services Authority of BC. "It is all done under one umbrella. It doesn't matter if the hospital is in Kelowna or Vancouver – it's the same price for the same item across the province."

This is not the case in Ontario, where the system is more fragmented. For example, two purchasing organizations, Plexxus and Mohawk Medbuy Corporation (MMC), which collaborate for joint strategic sourcing initiatives, represent over 60 percent of healthcare spend in Ontario hospitals. Plexxus was unable to

> **"We have identified hundreds of medical products in Ontario with significant price differentials," says Dave Ralph.**

confirm that, based on its own data, pricing anomalies are a problem in Ontario.

However, using only the data available to Commport, it is possible to see many areas where significant savings could come into play.

"I can see where a vendor will sell a gown to one hospital for $14, and then to another for $8," says Ralph. "This is repeated across the province, with almost every hospital paying a different price. And it is not all about geography or volume – sometimes a smaller rural hospital is getting a better price than a major hospital in a big city. We have some hospitals in Ontario that are only 25 miles apart, but with a big pricing differential."

Though purchasing methods can differ depending on the type of product – basic PPE, for example, will not be bid on in the same way as a pacemaker – once a price is established, there is no reason it cannot be consistent.

"There is an opportunity to save hundreds of millions of dollars," says Ralph. "Even if you used this data to set a baseline catalogue price, I estimate that you could immediately save $32 million."

British Columbia is already a fine example where a single price model is succeeding.

"In BC, we consider ourselves to be a leader in terms of how we approach supply chain in Healthcare," says Hayer of BC's Health Services Authority. "Our executives have made presentations to many jurisdictions explaining how we approach purchasing, contracts, warehousing and logistics, and how it can scale."

Given that Commport's clients are the vendors themselves, it might seem odd that Ralph is eager to harmonize pricing. At the end of the day, it is the inefficiency and unfairness of the present situation that is forcing his hand.

"We would love more business from more hospitals, or the new Supply Ontario organization," he says. "However, with all the talk about costs and ways to save, it would be good for the government to actually do something."

Tim Wilson is a Peterborough-based freelance writer and researcher.

Vscan Air™

See more. Treat faster.

Get crystal-clear images with the power of a high-performance ultrasound machine in a small, lightweight and wireless solution.

Insight right in your pocket

Supports early diagnosis and helps you quickly decide on next steps.

Developed for clinicians

It is easy to use, intuitive to navigate and optimized for your mobile device.**

Dual-probe imaging power

Complete both shallow and deep scans without switching probes or compromising on image quality.

Durability, defined

Withstands everyday handling from scratches to drops and even a rainstorm.*

Learn more. Buy online.

*Probe withstands drops: tested to Military drop standards (MIL-810G).
1P67 waterproof, compatible with high level disinfection techniques.
**Works with a range of Android and iOS smartphone and tablets.

AI centres of excellence and companies collaborate to produce apps

BY NORM TOLLINSKY

Artificial intelligence and machine learning are playing an increasingly important role in virtually every sector of the economy, including healthcare. AI algorithms and machine learning models are now used to optimize resource scheduling, flag abnormal chest X-rays and predict the deterioration of patients in intensive care units.

Together, the Montreal Institute for Learning Algorithms (Mila), the Vector Institute in Toronto, the Alberta Machine Intelligence Institute (AMII) and the Vancouver-based Digital Technology Supercluster are positioning Canada as an AI superpower. All four organizations are partnering with hospitals and private-sector businesses to create innovative solutions that improve efficiency and patient care.

Progress is being made, "but there are a number of challenges we're dealing with in healthcare," said Azra Dhalla, the Vector Institute's director of health AI implementation. "We work in a lot of data silos, so the quality and interoperability of the data is an issue. We also need to ensure there is a balance between privacy protection and making sure we can create solutions that have public benefit."

Then there's the issue of dataset shift and its impact on mission critical applications. "Just last summer, "said Dhalla, "we were in discussions with some of our healthcare partners about some of the models they're developing, and it dawned on us to ask what mechanisms are in place for monitoring and evaluating machine learning prediction models because once a model goes into production its performance has the ability to change and, in some cases, even deteriorate."

It was this realization that led to the Vector Institute's CyclOps project, which has as its goal the development of a framework for "rigorous evaluation of machine learning models across time, hospital sites and diverse patient cohorts."

"If I build a machine learning model that shows me a pair of socks and I don't buy it, nothing happens," said Deval Pandya, the Vector Institute's director of AI engineering. In healthcare, however, an incorrect treatment recommendation from a machine learning model can have fatal consequences due to dataset shift.

"What happens a month after you deploy the model?" asks Pandya. "What happens when you take the model from hospital A to hospital B? And what happens when there's a pandemic like COVID? To establish trust in the model, you have to do very rigorous evaluation, not just from the mathematical perspective, but also by bringing in the domain expertise of physicians and front-line workers who use the model."

Pandya is aiming for a first release of the CyclOps framework on an open-source basis in the next few months and believes it will go a long way toward realiz-

ing the potential for machine learning in healthcare.

In addition to research projects like CyclOps, the Vector Institute and other AI-focused institutions across the country are engaged in the development of AI talent and the deployment of AI solutions. "Research isn't enough," remarked Dhalla. "We have to be a bridge to translate it into something tangible that can be used in a clinical setting."

One recent application of AI co-funded by the Vancouver-based Digital Technology Supercluster and Synthesis Health is making a huge impact on access to health-

Mara Cairo, product owner, advanced technology team, AMII.

Deval Pandya, director of AI engineering, Vector Institute.

Azra Dhalla, director, health AI implementation, Vector Institute.

care in several remote Indigenous communities in Saskatchewan.

Just this summer, Dr. Deepak Kaura, a pediatric interventional radiologist and chief medical officer of Synthesis Health, delivered an integrated AI-powered diagnostic imaging solution to several Peter Ballantyne Cree Nation communities whose residents were previously required to travel up to six hours to Prince Albert for a simple chest X-ray. The solution includes an algorithm trained to flag abnormal chest X-rays, a cloud-based clinical management platform called Synth.OS and ultra-portable X-ray machines from Fuji that can be used in a nursing station or easily carried on a snowmobile to someone's home.

The algorithm developed by Synthesis Health was trained on a million cases from the Saskatchewan Health Authority, and

other sources, and has been approved by Health Canada.

The Synth.OS images are accessed in the cloud and read by radiologists within 24 hours, but nursing station staff in the remote communities receive an AI-generated report within minutes. "The thing that's pretty amazing about what we're doing is that it changes the economics of healthcare delivery as well as access," said Dr. Kaura.

Using so-called portable X-ray machines on wheels that are popular and well-suited for hospitals, together with conventional PACS software, would cost

A cloud-based, AI-powered diagnostic imaging solution using ultra-portable Fuji X-ray machines was delivered to the Peter Ballantyne Cree Nation community of Southend, 460 kilometres north of Prince Albert, Saskatchewan, in July. The solution provides nursing staff with near real-time reports of abnormal results.

hundreds of thousands of dollars, noted Dr. Kaura. "We can do the X-ray machine, the AI algorithm and a cloud-based PACS system with a reporting solution all for $2,100 per month. That's in stark contrast to the cost of sending a few patients away every month for X-rays. We are now at the point where we have a lot of interest expressed by health systems from across the country and overseas."

Synthesis Health is also leading the Digital Technology Supercluster-funded Iris project to develop an AI-based platform or "co-pilot for diagnostic imaging analysis and course-of-treatment planning and monitoring." Announced in July, the $13.5 million project is being carried out in partnership with GE Healthcare, Konica Minolta Healthcare, the University of British Columbia, the Vancouver Coastal Health Research Institute and BC Cancer.

Iris is being developed to increase the speed and accuracy of front-line course-of-treatment decisions and improve the ability of radiologists to consistently find abnormalities in diagnostic images. The algorithms will be trained on more than 10 years of imaging data from Canadian health authority partners with the objective of seamlessly integrating them into PACS and radiology information systems.

Funding for the Iris project will also go toward the establishment of a National Advisory Council on AI in

Healthcare. A healthcare specific council was thought necessary to bring together stakeholders from across the country. "There is a huge opportunity for Canada to lead the rest of the world in artificial intelligence, but we need to have a more intelligent and wholesome dialogue around how that happens and work toward overcoming the challenges we face," said Dr. Kaura.

The Digital Technology Supercluster has also co-invested in several other AI-related projects, one of which uses AI technology to detect fragments of DNA shed by cancer tumors, said supercluster CEO Sue Paish. Another project uses AI to expedite the generation and validation of novel compounds with desirable properties for the development of new drugs to combat the SARS-CoV-2 virus.

The Alberta Machine Intelligence Institute (AMII) is also helping healthcare organizations harness the power of AI. In 2019, AMII received funding from PrairiesCan, the federal government's economic diversification agency for the three Prairie provinces, to work with nine healthcare organizations on AI adoption, said Mara Cairo, product owner of AMII's advanced technology team.

The Cross Cancer Institute in Edmonton and CardiAI, a Calgary-based medical device R&D company, were among the organizations with the most impressive results, said Mehadi Sayed, president and CEO of Clinisys, one of several companies hired to provide the nine companies with AI consulting services.

CardiAI, for example, applied AI technology to more efficiently and accurately analyze Holter monitor data for abnormal

> **"The thing that's pretty amazing ... is that it changes the economics of healthcare delivery," says Dr. Kaura.**

heartbeats. Current methods of analyzing Holter monitor data can be time consuming and error prone, according to Sayed, creating an opportunity for CardiAI to patent and license an AI-based solution. CliniSys used the University of Alberta's new AI supercomputing hub to process and find patterns in the data.

AMII's work with these and other organizations is consistent with its focus on "taking machine learning out of academia and applying it to real world problems," said Cairo. "We're producing more and more data and there's so much we can do with it."

There's no doubt that AI is having a positive impact on healthcare in Canada, and no better example of that is the availability of AI-powered diagnostic imaging in some of the country's most remote Indigenous communities. All too often, residents of remote Indigenous communities in need of diagnostic imaging won't bother making the journey to a distant hospital.

"Many Indigenous people in remote communities end up getting treated with a presumptive diagnosis or no diagnosis at all," said Dr. Kaura. "As a physician, I'm deeply moved by the capacity to actually help change lives beyond what I'm able to touch with my own hands."

AvidityHealth™

Simplifying patient support programs through digital innovation

The AvidityHealth digital platform accelerates patient access to therapy and streamlines how physicians and healthcare organizations interact with patient support programs by:

- Providing a digital enrolment solution

- Integrating into the healthcare provider's workflow

- Minimizing redundant administrative tasks and unnecessary back-and-forth communications

Created with feedback from hundreds of healthcare providers in Canada that use AvidityHealth

Enabled 1000s of patients to quickly access needed medications

Existing connectivity to Canadian EMRs

For more information, please visit **innomar-strategies.com/digital-health-solutions** or email **support@avidityhealth.ca**

PatientTrak now available in emergency departments in Nova Scotia

BY LAUREN MACDOUGALL

HALIFAX – It is now faster and easier for physicians and other authorized care team members to access the latest patient census and health data at emergency departments across Nova Scotia.

A new software solution – PatientTrak – is now available in emergency departments at Nova Scotia Health's eight regional hospitals as well as IWK Health in Halifax, which serves women, children, youth and families across the Maritimes.

The solution provides clinical teams with an overview of the number of patients in the various areas of the emergency department – for example, triage, registration, waiting room – and informs clinical-care decisions in real-time. Access to this new technology has the potential to positively impact the experience of clinical teams and patients and lead to improved patient health outcomes.

As patients arrive at an emergency department, they are entered into the PatientTrak system, immediately recording wait time, health concern and status. As data is entered at various stages of a patient's visit, it is available on a centrally located digital whiteboard, which can also be accessed from any emergency department computer. For example, details about treatments already received by a patient and what is pending – such as tests.

The digital whiteboard has replaced traditional physical whiteboards that would have previously been the hub for patient information in the emergency department. In the past, to access current patient information, clinical staff would have had to check a whiteboard or log into the clinical information system to access patient information.

"Compared to a traditional whiteboard, the digital whiteboard gives us a better sense of where the patient is in their progression through the emergency department," said Dr. Everett Fuller, Emergency Department Site Lead, Cape Breton Regional Hospital. "It also raises awareness about the patient's status and supports better communication within the care team."

PatientTrak offers custom clinical alerts relevant to the patient, such as allergies, interpreter or education required, and pending tests. For hospitals that have a pharmacy on site, an alert can be created to notify emergency department pharmacists that there is a patient medication requisition pending, the room where the patient is located and the attending physician. This removes manual processes that previously may have taken longer and allows the physician to focus more on the patient rather than following up on requested treatments.

For patients, PatientTrak offers improved privacy. With traditional whiteboards, more patient identifiable information would be displayed, which could be seen by other patients. With the digital whiteboard, only the first three characters of the patient's name is shown on the large screen; however, a patient's full details can be accessed on emergency department computers by authorized healthcare team members.

PatientTrak further advances Nova Scotia's Action for Health Strategic Plan to improve healthcare across the province by exploring and implementing innovative solutions to optimize resources and capacity while ensuring quality and safety. And, by implementing IT solutions to improve patient care, access and flow across the system.

"This is an important step forward in supporting clinicians and improving the experience of Nova Scotians that come to us for care," said Derek Spinney, vice president Corporate Services, Infrastructure and chief financial officer for Nova Scotia Health. "Most importantly, there is also an opportunity to realize improved patient health outcomes as the result of physicians having faster access to information needed for clinical care decisions."

Improved access to timely patient information increases awareness of patient wait-times at the various levels of care, potentially streamlining patient flow through emergency departments and improving the experience of both clinical care teams and patients are some of the possible benefits that are on the horizon because of the PatientTrak technology.

"We are excited to see the improvement in workflow visibility and reduced wait-time Nova Scotia Health has experienced while using our system. Emergencies require fast response and real-time information and PatientTrak delivers this for staff and patients," said PatientTrak CEO James Hermann.

Streamlining the patient journey with RACE

ble via web browser at www.raceapp.ca or for free on Apple and Android devices.

Specialist advice lines exist in other provinces outside of BC. For example, Nova Scotia, Alberta and Saskatchewan all have telephone advice lines. While these programs are similar to RACE, they have different approaches for providing primary care support.

The success stories around RACE are heard across BC. Dr. Christina Thompson, a family physician working in Bella Bella and other rural communities, uses the RACE app on a regular basis. Being in communities where specialists are scarce, Dr. Thompson sees RACE as a valuable resource to her everyday practice.

"I have found RACE specialists are often very understanding of our rural context and limitation," she said. "I often do not have the lab tests or imaging resources easily accessible that would be at a larger centre."

And the range of specialists she consults with, especially given her location, is vast. In fact, over the past three months, she's used the app to connect with cardiologists, obstetricians and gynecologists, orthopedic surgeons, neurologists, pediatricians, rheumatologists, and more.

"As a rural physician, it makes my work easier knowing I have the support of my specialist colleagues in a timely and collegial nature. As a patient, it helps provide treatment options and access to care more on par with what urban communities experience," she added.

For more information, visit raceconnect.ca or contact our administrative team at RACE@providencehealth.bc.ca.

Miranda Defer is Project Leader, Virtual Health and Shared Care, with Providence Health Care.

Every detail matters to you, so every detail matters to us.

Getting the full picture from your medical imaging is critical to patient care. That's why LG Medical Displays use the latest innovations to help medical professionals easily distinguish even delicate details with accuracy and efficiency. And with the added convenience of ergonomic design, intuitive hot keys and lighting features, we've made our displays more user-friendly. Learn more about all the details that go into an LG Medical Display and request a demo at: **lg.com/ca_en/business/digital-showroom/medical-display**

31HN713D-B
31-inch 12 MP IPS Display
Designed for Mammography

LG | Business Solutions

LG Medical Display — **See Beyond Sight**

New hope for Indigenous mental healthcare: Talking Stick platform

How does one build hope? TryCycle Data Systems would argue that a fundamental part of the answer is in building connections – facilitating meaningful connections with real people in real-time.

Nowhere has hope been more sought after than in Canada's Indigenous communities. It is no secret that these often isolated and under-served populations have consistently been pushed to society's margins. The social determinants of health play a dominant role in influencing health outcomes, often restricting access to critical services. These are exacerbated by historical inequities that have led to intergenerational trauma and the related consequences – substance use and mental health disorders, and a pervasive lack of hope.

In February 2022, the Federation of Sovereign Indigenous Nations in Saskatchewan approached TryCycle Data Systems to leverage its technology and build an application to facilitate grassroots connections. The Government of Canada, through Indigenous Services Canada listened, recognized the opportunity to work with its partners, and answered the call, investing in a community-based, culturally safe initiative that would have an immediate impact.

Out of this commitment, Talking Stick was conceived – a First Nations-to-First Nations digital chat platform. Every chat is entirely anonymous, which provides the foundation for safe, judgement-free conversations to fill gaps that have persistently sustained the feelings of isolation and hopelessness among Indigenous peoples.

"Talking Stick is not just an app; it's a campaign," explains John MacBeth, Founder and CEO of TryCycle. "It's about human beings; how we identify and look after people at risk."

Talking Stick is providing options to people who are seeking support, in an environment where there has been a seemingly insurmountable chasm between need and help. Connection is key. The solution provides a secure connection between a Guest and a trained Peer Advocate, using a completely anonymous chat platform. It is free, accessible, and provides a destination that was never there before.

The program aims to hire 200 Indigenous Peer Advocates, with 80 Peers already mobilized across the province. The Peers themselves are screened, trained, and supported by a team of Regional Managers who provide coaching and guidance to the group of cultural resources. The main role of the Talking Stick Peer Advocates is to listen without judgement, creating a safe environment for anonymous Guests to share feelings ranging from loneliness to anxiety, emotions related to home life, school, relationships, or struggles with mental health.

James Smith Cree Nation is one of the many communities that has adopted Talking Stick. A small community which, on September 4, 2022, was devastated by one of the worst mass killings in Canadian history. The horrific events left ten people dead, while eighteen more suffered physical injuries. The community and surrounding areas continue to deal with unimaginable grief and loss that will take generations to heal.

Formal systems are often paralyzed in circumstances like this, where the appropriate response is not clear. Investments are made in perceived solutions, satisfying the expectation that "something has to be

Charlene Gardiner, Provincial Director, Talking Stick

done." Unfortunately, once the acute phase of these events has passed, the tendency is to return to "business as usual."

Nothing is left behind to support the ongoing emotions and grief. That is, until now. Talking Stick Peer Advocates were ready, and still are today ensuring that someone is available to listen and support their healing journey.

"Talking Stick is a means of communication, and to some, it may be their only lifeline. People use this as a safe place to unload their feelings and emotions, without judgement," said Charlene Gardiner, TryCycle's provincial director for Saskatchewan.

One such example occurred in June 2022, when a Talking Stick Peer Advocate maintained a text-based chat for over four hours, listening to and comforting a Guest who was contemplating suicide. This event provided the Guest the space they needed to process their feelings and allowed the Peer Advocate to offer phone numbers to professional health resources. After this chat, the Guest connected with the same Peer Advocate, to let them know they were okay. Mostly, this person wanted to say thank you for listening.

The challenges being faced by Canada's Indigenous peoples are longstanding, and consequently they are complex. There are layers of trauma that have transcended generations and will continue to fester until hope is established in a sustained and consistent way. Further, the importance of Indigenous ownership of and participation in solutions like the Talking Stick app, cannot be understated.

TryCycle is proud and honoured to be a trusted partner in the campaign to bring hope and increase cultural connections between real people, offering real support, to real problems.

Plakk leverages AI for stroke prevention

BY KATHERINE O'BRIEN

MONTREAL – Dr. Karina Gasbarrino, a graduate from McGill University's Experimental Medicine program, has a big goal: improve current medical prediction and prevention methods for strokes. Her family history of cardiovascular disease adds a personal motivation to focus her research on the early detection of unstable plaques, potentially harmful fatty deposits located in the arteries of the neck, the rupturing of which is the number one determinant of strokes.

What sets Plakk's innovative technology apart from current approaches used in stroke prevention is that it goes beyond simply assessing artery blockage. SonoPlaque, the first artificial intelligence-powered ultrasound image analysis software, uses deep learning technology to not only automatically detect the mere presence of a plaque in the neck artery, but goes a step further and performs an in-depth analysis on that plaque, quantifying crucial parameters not yet being measured in standard care, such as the area and the composition of the plaque.

"What we're trying to do with our technology is provide more information to the clinician about what the plaque is made up of," says Dr. Gasbarrino. "The research shows that this provides more accuracy in determining the risk of a stroke."

Currently in the validation phase, Plakk has recruited radiologists and two deep learning engineers to annotate ultrasound images – sometimes referred to as AI image tagging or AI data labelling – in order to create training data for the SonoPlaque model so that it is subsequently able to identify key parameters of a plaque.

"All the training is done on those annotations," she explains. "But once this phase is done and we're meeting clinical standards in terms of accuracy, the model will be able to work on its own."

Wireless at The Ottawa Hospital benefits doctors, nurses and patients

BY JERRY ZEIDENBERG

The Ottawa Hospital was on the leading edge of technology deployment in 2010 when it equipped 1,500 clinicians with iPads. It made life much easier for these clinicians by enabling them to conduct online e-ordering through the iPads in 2012; things were improved even further in 2013 with the addition of medical reconciliation.

Since then, the three-hospital organization has deployed 3,000 iPads to clinicians.

It made sense, as physicians are constantly on the go, and need to work wherever they might be on the hospital floor.

"We freed the clinician from sitting at a desk and using a workstation or paper chart," said Dr. Glen Geiger, chief medical information officer at the Ottawa Hospital.

Now, the organization has gone a step further – automating the tedious and time-consuming tasks that nurses typically conduct when gathering vital signs from the patient bedside and re-entering them into the EMR at the nursing station.

Using middleware, the hospital has connected a panoply of vital sign devices at the bedside to the enterprise EMR, so that the patient's vital signs are downloaded directly into the Epic electronic medical record.

Dr. Geiger outlined the mobile computing journey the hospital has been on during a webinar called 'Back to the Bedside'. It was hosted by Digital Health Canada with sponsorship from Hillrom Canada.

In analyzing the back and forth conducted by nurses as they go from the nursing station to patient bedside to collect data – something the hospital called 'The Last 30 Metres Problem', it discovered that a great deal of time is spent in this process.

Not only do nurses walk numerous steps to the bedside, on the way, they often search for various vital sign devices to get the patient started; they then need to do the setup and cleaning; they may also be dealing with a battery problem; and of course, they're taking time to write down the various readings – such as blood pressure, oxygen saturation, and other figures.

Later, these numbers have to be transcribed into the electronic patient record.

When calculating the time needed for all these functions, The Ottawa Hospital concluded that it required 252,000 hours yearly of nursing time – at a value of $11.3 million.

The idea, naturally, was to replace the walking and manual procedures with automation.

"The future state we envisioned," said Dr. Geiger, "were wireless monitors at the bedside that eliminate these problems."

The goal was to have the equipment collect the data, have nurses at the bedside review it, press a button, and have the in-

Dr. Glen Geiger, CMIO, The Ottawa Hospital.

formation sent wirelessly right into the patient's electronic record.

With the go-ahead from the hospital's top leadership, the I.T., medical and nursing teams went ahead with the wireless project. Much of the existing equipment was in need of refreshing, in any case, and the hospital went ahead and replaced some 1,800 vital signs devices with wireless equipment for a total of $7 million.

Next to the annual cost of $11 million or so in nursing time, that amounted to a net cost of $4 million, said Dr. Geiger. Of course, in this reckoning, the equipment

paid for itself in less than two years in nurse time-savings alone.

Dr. Geiger noted that hospitals are not going to see the savings on their bottom lines, as nurses will still be on the job for the same number of hours. However, they're using their time more effectively in patient care, rather than scribbling notes and transcribing vital signs.

"There's no need for transcription, and vitals are now available in real-time, anywhere you might be in the hospital," said Dr. Geiger.

He said there was strong, positive feedback from the nursing staff as soon as the shift to automated transmission of vital signs was made. Dr. Geiger recalled one nurse telling him, "You no longer have to take a scrap of paper into the room to document."

After a small pilot, the project was rolled out across the hospital, which has three campuses and about 1,100 beds.

The wireless strategy was also extended to other equipment, such as dialysis machines and ECG carts.

Dr. Geiger said these advances have empowered doctors and nurses, as they can instantly obtain information about their patients, in real-time, from any location in the hospital.

In many cases, there used to be information silos within the hospital, such as in the dialysis unit. "Only the dialysis team was able

British Columbia announces health HR and technology strategy

VICTORIA – British Columbia has announced a wide-ranging program of investments in the healthcare sector's human resources. The strategy aims to address shortages of professionals by ramping up training and education, as well as through the expansion of technologies and services.

"We are taking the next step in increasing access to public healthcare for people in BC," said Adrian Dix, Minister of Health. "We know that people are facing real challenges right now and there is much more work to do, and this strategy will guide our next steps in building a strong, resilient public healthcare system now and in the future."

The strategy will support patients who rely on the public healthcare system by adding more doctors, nurses and health sciences professionals, adding new education and training seats, taking actions to improve retention and to optimize the system to help with workload.

This is a multi-year strategy with several actions starting in 2022-23. Actions that government are announcing immediately include:

• Forty new undergraduate medical education seats and up to 88 new residency seats at the University of British Columbia's (UBC) faculty of medicine, which will be phased in throughout the province beginning in 2023. The expansion will create more opportunities for

students and resident doctors to learn, train and stay on to practise in communities around BC.

• Beginning Oct. 14, pharmacists will adapt and renew prescriptions for a wider range of drugs and conditions, and they will be able to administer, further to a prescription, a wider range of drugs by injection or intranasally. The province is also working toward extending the valid period of prescriptions to two years, which is anticipated to be in effect on the same date. These changes will, for example, help patients dealing with mental-health and substance-use disorders, and for those without a regular primary care prescriber to access the medications they need.

• The Ministry of Health is working with the College of Pharmacists of BC on regulations that will enable pharmacists to prescribe for minor ailments and contraception by spring 2023.

• New regulations to enable paramedics and first responders provide a broader range of services to better care for their patients during emergencies.

• There will be efforts made to attract and onboard new healthcare workers by removing the barriers for people educated abroad.

• And the creation of a provincial artificial intelligence and health workforce technology strategy.

Expanding the number of people who will be entering and graduating from UBC's school of medicine is in addition

to work underway with Simon Fraser University to open the second medical school, in Surrey. The province has provided $1.5 million to Simon Fraser University to support planning and development of the business case, and a project board has been established.

Optimizing the scope of pharmacists means pharmacists can safely provide many drugs by injection or intranasally and adapt or review many prescriptions, relieving pressure on primary care providers and enabling people to access some types of care more quickly.

Once regulations are in place, it is expected patients may be able to get pre-

> **The improvement plan includes expanding the scope of practice of both pharmacists and paramedics.**

scriptions from their local pharmacists for treatments for minor ailments, such as allergies, indigestion and acne, and for contraception. For example, a patient with a urinary tract infection may be able visit a local pharmacy for assessment and recommendations for treatment, instead of seeing a primary care provider, such as a doctor, or visiting the emergency room at a hospital due to a lack of options.

Community pharmacists will have additional support in renewing some

prescriptions if needed for people who do not have a family doctor or consistent primary care provider.

For example, pharmacists will now be able to administer long-acting antipsychotics by injection in a community pharmacy. They can also renew opioid agonist therapy for patients with substance use, up to the quantity last prescribed.

New regulations enhance the work of paramedics and first responders. People will now have more primary and emergency care services with new regulations in place that expand the range of services that paramedics and first responders can provide.

With the appropriate training and licensing in place, paramedics and first responders will be able to better assist and treat patients on scene. For paramedics, depending on licensing level, this means the ability to provide more interventions such as:

• Enhancing airway management skills; and

• providing expanded life support and pain management procedures and medications during transport.
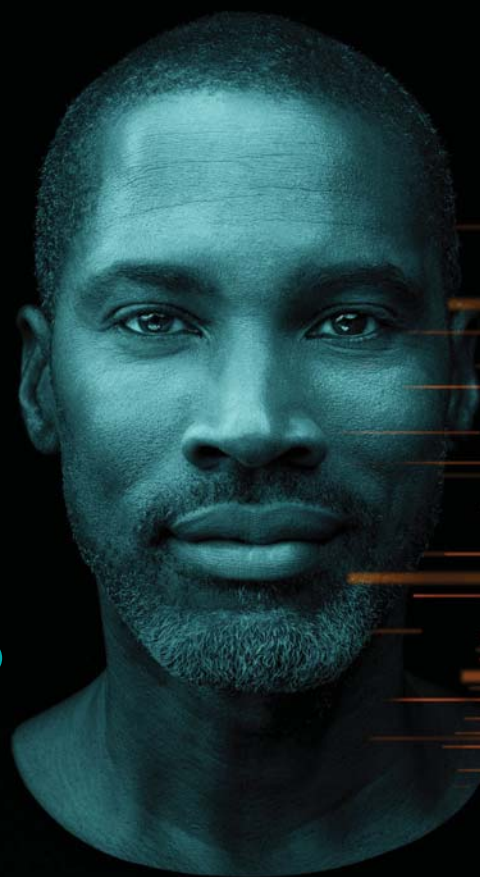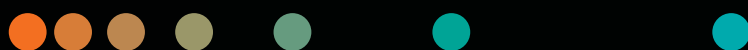
First responders will be able to:

• Provide additional diagnostic testing, such as blood pressure and blood glucose while on scene, that can better inform paramedics;

• Administer epinephrine when needed for a life-threatening allergic reaction; and

• Support the preparation or packaging of patients for transport by paramedics.

AI-Rad Companion

siemens-healthineers.ca/ai-rad-companion

Over the past few years, AI-based imaging decision support has become more and more important in healthcare as physicians have struggled to cope with a growing workload, severe shortage of staff, as well as an increasing complexity of diagnostic tools.

The AI-Rad Companion is our family of augmented workflow solutions that support radiologists in their diagnostic task interpreting medical images. Its solutions provide automatic post-processing of imaging datasets through our AI-powered algorithms.

AI-Rad Companion seamlessly integrates into the physician's workflow transferring data securely helping to ease today's challenges in routine radiology.

Two AI-Rad Companion tools we offer currently include:

Brain MR: Benefit from this post-processing image analysis software to assist you in viewing, analyzing, and evaluating MR brain images as a diagnostic aid. AI-Rad Companion brings value to the interpretation process in supporting the clinician by automatic segmentation and analysis of individual brain structures.

Organs RT: Organs RT automatically contours several organs at risk. This input can be used for further processing in a treatment planning system. This enables physicians to free up resources for other time-consuming tasks and drives standardization across different individuals and institutions.
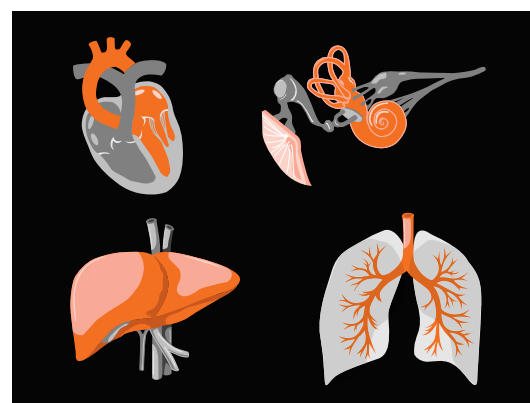
Find out more, email: **niles.geminiuc@siemens-healthineers.com**

SIEMENS
Healthineers

GE's Edison accelerator helps get innovative AI solutions to clinicians

BY NORM TOLLINSKY

Six digital health startups have been selected to join the first cohort of GE Healthcare's Edison Accelerator in Canada, a program designed to validate and scale innovative artificial intelligence solutions for medical imaging and market them through GE's Edison Digital Health Platform, a marketplace that will put hundreds of clinical, workflow, analytics and AI tools at the fingertips of clinicians around the world.

One of the six companies, 16Bit Inc., is Canadian, but the AI products from all cohort members will be validated and scaled within the Canadian healthcare ecosystem and introduced to physicians, leaders in AI and radiology, investors and government officials at an Innovation Showcase in Toronto November 16.

The six companies selected for GE Healthcare's Canadian accelerator are:

• 16Bit: This Toronto-based company has developed an AI algorithm that opportunistically identifies patients at risk for osteoporosis by analyzing X-rays acquired during routine clinical practice for any clinical indication.

• Bot Image: Bot Image, of Omaha, Nebraska, developed an AI algorithm called ProstatID that assists with the detection, assessment and characterization of suspicious lesions indicative of prostate cancer.

• CardioWise: This Fayetteville, Arizona, startup uses cardiac CT data to produce an easy-to-understand, colourized 3D image model of the human heart to help physicians make more informed decisions about patient care.

• contextflow: contextflow, of Vienna, Austria, has developed SEARCH Lung CT, a deep learning tool that provides quantitative and qualitative analysis of lung disease patterns and nodules related to interstitial lung disease, COPD and cancer.

• Coreline Soft: Coreline Soft, of Seoul, South Korea, has an early screening and prevention medical image processing solution that can, for example, identify nodules that can progress to lung cancer.

• Finally, US2.ai: a Singapore-based startup, uses artificial intelligence to produce high-quality, consistent, and inexpensive echocardiogram analyses.

A seventh company, Calgary-based Circular Cardiovascular Imaging, has already integrated its stroke-focused AI tools with GE Healthcare's FastStroke processing platform and is now working with GE to accelerate the integration of its Stroke-SENS software with the Edison Digital Health platform.

Paritosh Dhawale, senior vice-president and general manager of GE Healthcare, compares the vendor agnostic Edison Digital Health Platform to Apple's iOS App Store or its Android equivalent in that it will make hundreds of regulatory approved AI tools, or apps, seamlessly available to radiologists around the world.

Inclusion in the platform connects AI startups with a global market that would otherwise be challenging to reach.

"Any good idea or innovation can be proved out within a test environment by friendly users – typically institutions that co-created it or provided data to validate it, but the challenge all innovators face is scaling beyond that," said Matthew Khoory, GE Healthcare senior director of Partnerships and Digital solutions.

Laure Tessier-Delivuk, Client Solutions Director

How the solution fits within the workflow is another challenge. "A friendly site may be more amenable to having a separate logon or a separate step in the process, but how do you introduce a solution seamlessly, so it's just another tab or one click away?" asked Khoory.

Having a startup's solution as part of the Edison Digital Health Platform makes it easier to create the necessary links and positions the solution within the radiology workflow.

Inclusion in the platform also eases market acceptance. "Medicine by its nature is a very conservative industry. It doesn't adapt well to change, so introducing anything new that might support decision making – even if it's regulatory approved – can be met with skepticism and resistance, but having GE's name behind a startup gives it credibility," said Khoory.

Furthermore, modestly sized compa-

nies have limited sales, marketing and customer support resources. GE, by contrast, operates in 160 countries, employs 10,000 salespeople, and has thousands of healthcare customers around the world.

GE doesn't provide funding to startups participating in its accelerators, but it supports their fundraising efforts and introduces them to venture capital investors at events like the Innovation Showcase scheduled for November.

There have been a few other GE Healthcare accelerator programs in India, China and the EMEA(Europe, the Middle East and Africa) region, but the goal going forward is to double the number of accelerators organized annually, said GE Healthcare client solutions director, Laure Tessier-Delivuk. That includes more GE-sponsored AI accelerators in Canada – hopefully with more Canadian-based startups, she remarked.

For this first Canadian accelerator, "we were looking very specifically for mature startups ready to commercialize in domains including cardiology, oncology, neurology, pediatrics and women's health," she said.

"Once you narrow down that field and add that we wanted them to have regulatory clearance in at least one jurisdiction and be ready to go to the customer and implement their solution, what we found was that while we have a great number of innovative startups with great ideas within the Canadian ecosystem, they weren't as far along as we'd like them to be to join this current cohort," said Tessier-Delivuk. "We are optimistic that, in time, they will mature and be able to join an upcoming cohort."

Using AI to improve organ-at-risk contouring in radiation therapy

The process of contouring all organs at risk is a tedious and time-consuming process. Radiation therapy professionals spend a significant amount of time contouring manually on each slice of the CT dataset. Manual contouring can also lack consistency because contours can differ from user to user.

While the task of organs at risk contouring is necessary, it's a task that can be automated to help deliver consistency across users and patient encounters.

The predicted increase in cancer cases worldwide will lead to a growing number of patients who need to be treated with radiation therapy.

Automating these routine tasks can help free up staff to focus on more value-adding work.

In Canada, Siemens Healthineers offers a solution for AI-powered contouring support for organs at risk.

Organs RT is an AI-based solution that provides radiation therapists with automatic contouring of organs at risk, which is input to their radiation therapy planning. The images acquired at the CT scanner are sent to Organs RT to be processed, and then the RT struct (DI-

COM) results can be pushed directly to the treatment planning system or first assessed in the Organs RT interface.

Organs RT provides organs at risk contours using deep-learning (AI) algorithms for various body regions, including head and neck, thorax, abdomen, and pelvis. It also supports the use of organ template configurations that can be aligned with institutional protocols; this may save time and improve standardization in clinical workflows.

The automatic process of contouring organs at risk (OARs) relies on a deep-learning-based model which consists of a two steps approach. In the first step, the target organ region in the optimal input image is extracted using a trained Deep Reinforcement Learning network (DRL). The result is a cropped image of the target organ region. In the second step, the cropped image is used as input to create the contours. This step is based on a DI2IN. The DI2IN was trained to its optimal performance in the Siemens Healthineers AI environment. The DRL algorithm also has the ability to detect multiple target regions.

What are the key benefits? By leveraging Artificial Intelligence to generate OAR

contouring, AI-Rad Companion Organs RT, enables high quality OAR contouring to drive standardization with AI-powered algorithms. These benefits can potentially free up staff to spend more time on other tasks and help to simplify radiotherapy planning workflow.

Deployment model: Organs RT can be seamlessly integrated in your daily workflow using either cloud-based approach with AI-Rad Companion or on-

site deployment with Syngo.via. This flexibility enables the institution to select the option that best fits to their privacy requirements and desired workflow.

"The use of AI-Rad Companion Organs RT makes our life easier. Especially the contouring of organs in the upper abdomen, leads to a noteworthy reduc-

tion of turnaround time," commented Dr. Alexandros Papachristofilou, University Hospital Basel, Switzerland.

On another imaging front, AI can be effectively used for analysis of MR brain images. Siemens's AI-Rad Companion is post-processing image analysis software that assists clinicians in viewing, analyzing, and evaluating MR brain images as a diagnostic aid. The solution brings value to the interpretation process in supporting the clinician by automatic segmentation and analysis of individual brain structures. The volume of each of these structures will be compared to a normative database and results will be offered in graphics and numerical values.

Over the past few years, AI-based imaging decision support has become more and more important in healthcare as physicians have struggle to cope with a growing workload, severe shortage of staff, as well as an increasing complexity of diagnostic tools.

The AI-Rad Companion is a family of augmented workflow solutions that support radiologists in their diagnostic task interpreting medical images. Its solutions provide automatic post-processing

Hamilton General Hospital ED shows 'Epic' ability to rise to the challenge

Moments after a new digital records system went live, an air ambulance helicopter landed on the roof.

BY LISE DIEBEL

It was trial by fire for the emergency department (ED) team, who had just gained access to the new Epic hospital information system for the first time when these two patients came through their doors. With the flip of a switch, at around 5:30 a.m., Epic replaced dozens of electronic and paper systems, making every patient's medical information available in one secure place online. Instantly, long-established medical and administrative workflows changed dramatically.

Epic's many benefits include improved communication between HHS doctors, nurses and other health care providers, faster access to patient information including test results, and improved patient safety.

The ED team was well-prepared for the transition thanks to months of advance practice using Epic's training tools. But there was a learning curve once the new system went live.

"We didn't expect perfection at Epic's launch, but our team was well-trained and ready," said Dr. David Quinlan, an ED physician and trauma team leader at HHS' Hamilton General Hospital.

Training included practising nine simulations in the weeks leading up to the launch – three code blues meaning vital signs were absent; one stroke simulation where the patient needed clot-busting therapy; and five trauma simulations including an air ambulance scenario.

"The stroke and air ambulance simulations were very similar to what the ED team experienced on launch day," said Dr. Quinlan. "As a result of all their practice and preparation, including these simulations, our patient-centred goals and treatment weren't delayed. At the end of the day, that's what counts."

Simulations were prepared by a focus group that included Quinlan and ED clinical educator Sarah Hayhow. They were run in the trauma bays during quiet times, with mannequins posing as patients. Everyone involved in ED care participated, including doctors and staff from radiology, surgery, transfusion medicine, and allied healthcare such as the pharmacy team.

"We ran these simulations as if these emergencies were happening in real-time," said Dr. Quinlan.

"For example, when simulating our response to an ED patient needing a blood transfusion, we used dummy blood products to represent real blood. This

included ordering blood products through the Epic system's practice tools.

"These dummy blood products were put in a cooler and retrieved by a porter who delivered them to the trauma bay. Units of blood where then checked and hung above the mannequin for the transfusion."

Hayhow was instrumental in co-implementing the simulations along with Dr. Quinlan. "Our team really had the opportunity to practice," said Hayhow, who was working the morning that Epic went live to help with trouble shooting.

"We had just turned on the Epic system when the air ambulance arrived, followed about five minutes later by the stroke patient," recalled Hayhow. "Every nurse was trying to log onto Epic for the first time and access the equipment needed to work in the new system. But our team members stayed calm, dug in and quickly got our patients the help they needed because that's the emergency way."

While there were some glitches on launch day, the team was able to work through them efficiently.

"For example, there was difficulty printing blood labels, but we were prepared with a back-up plan," said Hayhow.

Since the launch, ED team members continue to work through smaller challenges, like adjusting to the new workflows and processes.

"Everything has changed, from the way we document, to the way we draw bloodwork, to the way we administer medications," Hayhow said. "Every day we're learning more through hands-on experience about how it all works and looks in an ED environment. And every week, it gets easier."

While change is never easy, in Epic's case it's welcome.

Epic is considered among the best systems in the world and is used internationally by many top-ranked hospitals. Hamilton Health Sciences is among the first hospitals in Canada to implement Epic's cutting edge and fully electronic system.

"Epic's clinical applications and tools are unparalleled and will enable our staff and physicians to continue providing the best care possible for our patients," says Dr. Barry Lumb, executive lead for the system's implementation at HHS.

Michelle Leafloor, vice-president of health information and technology services and chief information officer for HHS, said Epic has far-ranging capabilities for the hospital.

"With Epic, not only will we be able to do even more to improve the health outcomes of our patients," said Leafloor, "we will also be able to contribute to research that will be life-changing for countless patients beyond our own community."

Ten ideas for how virtual care in Canada may change in the future

BY ZAYNA KHAYAT, PhD AND TIMOTHY FOGGIN, MD

With 20+ years' experience in virtual care, and 90+ million people accessing Teladoc Health's virtual care services in 170+ countries across 600+ health systems, we have a unique lens on where virtual care is going. Here are 10 areas that practitioners, policymakers, payers and toolmakers will contend with as we expand future modalities for Canadians to access care.

An evolved definition of Virtual Care: Because Canada is behind in creating seamless digital and physical channels for citizens to access care and services they need, the focus of "virtual care" has largely been on enabling an in-person doctor visit to happen by phone or video. We suggest a new definition will anchor approaches to virtual care in the future – "a care exchange or service that occurs untethered by place or time". With this framing as the starting point, the focus on replacing an in-person, synchronous, physician-mediated one-on-one visit by a digital alternative becomes a very minor use case. In a digital world, and in a country with as vast of a geography as Canada, the majority (>70 percent of care) will occur agnostic to place … and agnostic to time. We believe asynchronous care exchanges will dominate most care that's experienced and delivered. As well, we expect Canadians will soon drop today's regular qualifiers that precede the words "care" or "health" such as "virtual", "mobile" "digital", "remote monitoring", "e-health" and many other variants. Care is care.

The future is omni-channel: Until now there have been blunt segmentations used to describe and compare care in virtual channels, such as pitting in-person 'visits' against virtual 'visits' and attempting to set ratios for how much care can be virtual by different clinical or specialty area. These

> **Asynchronous care exchanges will dominate most care that's experienced and delivered.**

binary segmentations will go away. Instead, the focus will become "how do we create an omni-channel experience" for our patients and clinicians? That is, a seamless, hybrid mix of physical and digital channels, asynchronous or synchronous will be possible. New ways to segment how patients and clinicians take up different channels will emerge. For example, by preference for digital experiences, availability of digital channels, or level of digital literacy, to name a few.

Reframing access: The discussion to date has remained focused on the surface issue of the impact of virtual care on access – i.e., that virtual care makes it more convenient for patients (and providers) to access care, with a manageable downside risk being that those who cannot access digital channels could be at a disadvantage. We idealize access to one's own in-person care physician as the 'bedrock' of good healthcare access; yet, more than 15 percent of Canadians do not have a primary care provider and all data suggests access and waits are getting worse. Further still, even citizens that are attached

The ideal state for interoperability in Canada: when will we achieve it?

BY MICHAEL GREEN

Canadian digital health leaders are joining clinicians and patients who say it's vitally important to improve health system interoperability – the ability of health data to flow seamlessly across the care continuum and across different IT systems with different infrastructures.

This will result in greater efficiencies for the system and for clinicians, and most importantly, better healthcare and better outcomes for patients.

In a recent article, I wrote about a new Canada Health Infoway survey of more than 800 Canadian clinicians that found they are overwhelmingly in favour of greater interoperability:

• 92 percent said having more complete, timely and accurate information at their disposal would enable safer patient care;

• 88 percent said it would improve their ability to collaborate and coordinate care with providers outside their practice; and

• 85 percent said it would increase their productivity.

Patients might not be familiar with the term "interoperability", but they understand the benefits of being able to access their personal health information (PHI) online in a timely manner and being able to share it with their circle of care.

Our survey of Canadians found that, of those who are able to access their PHI online: 88 percent said they are more informed about their health; and 82 percent said they are better able to manage their health.

We wanted to see if digital health leaders shared the sentiments of clinicians and patients, so we recently conducted in-depth interviews with 77 key digital health leaders from across the country. This group included clinicians who have been leading the way in the use of technology, primarily electronic medical records (EMRs), and connecting with systems outside their practices. It also included non-clinicians who are CEOs of Health, Chief Information Officers, Directors of Information Management and Digital Health Standards, program and regional managers, solution architects and digital health advisors. These leaders were in the public sector (governments, health organizations) and private sector (vendors).

They overwhelmingly told us interoperability is a high priority. They shared clinicians' and patients' understanding of interoperability and the many benefits that can result – more efficient and effective care, enhanced access to care, and greater collaboration among healthcare professionals. And they agreed that the current state of interoperability is far from ideal.

The clinicians we talked to had three main issues: incompatibility of their practice system with external systems; technical issues and malfunctions; and inability to connect seamlessly from their EMR to specialists and hospitals.

Administrators shared the clinicians' views about lack of compatibility between systems, especially between hospitals, private practices and pharmacies whose systems don't speak the same language. They also expressed frustration with lack of consistency across regions, provinces and

organizations, and they said this lack of standardization makes any rollout of systems difficult.

Government representatives were similarly frustrated by this lack of standardization. While they expressed a desire for greater interoperability, they said they have to balance these larger system changes with more immediate priorities, such as the COVID-19 pandemic and emergency room capacity.

Vendor representatives said a disjointed health system makes it more difficult for them to deliver systems, and that we need a "whole-system" approach to truly experience the positive impact of technology.

All these digital health leaders were confident that we will be able to advance interoperability by working together, but they said it will take time and funding because the challenges are significant and complex.

They agreed that implementing standards-based solutions that allow systems across clinical settings to communicate is a central challenge. They also identified challenges with data privacy, funding and differing strategies among the provinces and territories. And they said it's essential to focus on work flows and intuitive design, and provide change management support and incentives for clinicians.

Michael Green

Most agreed that it is up to governments – federal and provincial/territorial – to provide the leadership to overcome these challenges and drive interoperability forward. They said governments have the ability to set policy and

make investments, two key drivers that are beyond the capabilities of other stakeholders. They also said Infoway is a trusted partner and thought leader who can play a key role.

While many of the digital health leaders said the ideal state for interoperability could be achieved within five years, nearly all agreed that it will take up to 10 years.

These valuable insights from Canada's digital health leaders reinforce what we have heard from clinicians and patients, clearly showing that we are all on the same page about the benefits of interoperability and the challenges in achieving its ideal state. Now we need to move forward together to overcome these challenges so patients, clinicians and our health system can realize the benefits.

Michael Green is President and CEO, Canada Health Infoway

Technology will remove disruptions from healthcare

BY DR. MARK PRATT

From self-driving cars to 3D printing, technologies that were once the stuff of science fiction are now becoming a reality. Healthcare has trailed many consumer industries in terms of innovation due to the complexities of human biology and regulatory constraints. However, we are now on the precipice of a new technological evolution during which devices will remove friction from our healthcare interactions and provide rich insights into our health. Here are some of the exciting ways advanced technology will change the patient and provider experience in the not-so-distant future:

Reimagining the hospital setting: The hospital room of tomorrow will be shaped, in many ways, by what people don't notice, as smart technology will enable less obtrusive experiences for all. Most everything – from TVs and beds to toilets and showers – will gather information and deliver it to the provider. Sensors will automate routine data collection and tasks for both clinical and operational purposes.

For example, a provider will no longer need to wake a patient in the middle of the night to gather vital signs as these will be monitored without physical human intervention. Stockrooms equipped with sensors will maintain precise counts of supplies coming in and going out. As a result, these technologies will help alleviate pressure induced by healthcare workforce shortages and support human-to-human interaction between patients and providers as well as within care teams.

Though many of the advancements to come will be subtle, we can also expect more noticeable changes that will delight the senses. Patients may find digital displays of nature in their hospital rooms, for instance. Studies indicate that even these virtual scenes of the out-

doors can have stress-relieving, healing benefits. Soundscapes will cut through the noise of louder environments like intensive care units, where alarms often create a cacophony that distracts providers and disturbs patients. As we learn more about our bodies and minds, we will be able to create healthcare settings that work in service of both.

Connecting our everyday lives to our care: During the pandemic we've seen healthcare increasingly shift to the patient's home, and we foresee this trend

continuing. The rise of artificial intelligence and the internet of things (IoT) will bring innovation to new levels. Medical IoT like Bluetooth-enabled glucometers, blood pressure machines and heart rate monitors are already on the market. With time, these will grow more commonplace and enable patients to give providers relevant health measures from the comfort and convenience of their homes in real-time, around the clock.

In addition to traditional medical devices, consumer technologies will provide even more data to form a more complete picture of patients' health. Eighty-six percent of Canadians own smartphones and big-tech companies are developing new features to break further into the

healthcare space. For example, the accelerometer in an Apple iPhone can detect a person's risk of a fall. From smart thermostats to smart scales, we will know more about patients' behaviors and environments than ever before.

In terms of wearables, more than one in four Canadians currently own a smart watch, and many of these are now equipped with applications that measure heart rhythm, sleep patterns and blood oxygen levels, to name a few. Sensors woven into the fibers of clothing

are also in development and will provide additional means to track and analyze a person's health. Much like the features of the new hospital room, these innovations will integrate seamlessly into our lives.

Putting the pieces together: As this future ecosystem of health takes shape, the EHR will sit at the center of it all, ingesting data from the world around us to enable providers and patients to make more informed care decisions together. At Altera Digital Health, we will drive a new era of healthcare to make this vision possible.

Dr. Mark Pratt is Chief Medical Officer at Altera Digital Health.

AI spreads across hospitals, becomes an enterprise-wide solution

After starting out as small-scale pilots, some AI projects are expanding across the organization.

BY DIANNE DANIEL

Once relegated to fragmented, one-off solutions, artificial intelligence (AI) in healthcare is now coming of age as an enterprise-wide strategy. All it took was a global pandemic to highlight the strategic role machine learning and algorithms can play in helping to reduce costs, optimize staffing and scheduling, improve bed management and provide enhanced care.

"The time is now for AI adoption in a healthcare setting," said Tomi Poutanen, CEO of Signal 1, a start-up launched earlier this year to help integrate AI-driven insights into hospital workflows. "Hospitals don't have to wait to get on the most modern electronic medical record system … it's fully possible to make use of AI and the cloud environment to gain these benefits now."

According to Deloitte Insights, AI is one of the biggest areas of investment as healthcare organizations look to improve efficiency of internal processes. The pandemic served as a catalyst, prompting hospitals to begin to adopt AI enterprise-wide, with 85 percent of 220 global healthcare executives surveyed saying they expect their AI investments to increase in the 2022-23 fiscal year.

"When healthcare organizations apply AI across the value chain, they can improve consumer health and well-being and support better outcomes while boosting organizational efficiency and reducing costs," Deloitte Insights reported.

At Signal 1 – a collaboration between Unity Health Toronto, TD Bank Group and TD Bank Group's Layer 6 AI division – the goal is to help healthcare systems deal with unprecedented challenges emerging from COVID-19 by making enterprise AI solutions attainable.

The start-up combines validated AI applications developed at St. Michael's Hospital, part of Unity Health, with the power of Layer 6's enterprise-ready AI engine, originally built for TD Bank. As a Layer 6 co-founder, Poutanen has wanted to work in healthcare for a long time and says he is confident the robust, secure and highly regulated environment built for the bank will transition nicely into a healthcare setting.

"Obviously the data is very different but the underlying engine we built is very effective in predicting future events that have come from data laid out over discrete time events," he explained. Just as a bank looks at a number of data elements over time to determine the likelihood of a client going bankrupt, for example, a hospital looks at numerous interventions and data points throughout a patient's hospital stay to understand their level of acuity and predict when their health is likely to deteriorate.

"You're trying to predict what's going to happen in the future. That's what the core engine we built is very good at in the banking setting and it turns out, is very effective in a healthcare setting as well," said Poutanen.

Since launching in April, Signal 1 has been busy customizing the Layer 6 platform for healthcare and moving applications already in use at St. Michael's over to the new environment. One of the first to transition is ChartWatch, a real-time patient risk predictor that accurately predicts those hospital patients who are likely to deteriorate and those who are

clinically stable. ChartWatch version 2.0 is now up and running as an enterprise IT service managed by Signal 1, said Poutanen.

Anonymized patient data is sent to a Microsoft Azure cloud environment in real-time where it is run through the Layer 6 machine learning algorithm to calculate an output – or prediction – which is then returned to the hospital either via email, page or alert on a dashboard for instance. Originally designed to improve patient outcomes and prevent deaths by alerting clinicians to intervene with life-saving measures, the application is also proving beneficial in helping to alleviate bed and staffing pressures as well.

Signal 1 clinical advisor Dr. Muhammad Mamdani, who also leads a dedicated applied AI program at St. Michael's as Unity Health vice-president of

Data Science and Advanced Analytics, calls it a "surprise use" that was identified by clinicians.

"Nurses were a little apprehensive at first when we were deploying ChartWatch because they felt it would create a lot more work for them, but within a few weeks they were very creative and said, 'You know, this actually helps us a lot,'" he said. What they discovered is that the ability to accurately identify high-risk patients made it easier to assign nurses more equitably, helping to reduce stress and burnout among staff.

Another spin-off use is to that ChartWatch can help with bed management by identifying low-risk patients who will soon be ready for discharge, allowing staff to start the process early and free up needed beds sooner.

Mamdani's team of 27 – one of the first of its kind in Canada – has developed more than 40 AI applications to date. Some of the more enterprise-level tools include:

• one that uses historical hospital data along with publicly available information such as weather or city planning events to predict expected ER volumes three days in advance;

• an ER staff scheduler that saves four hours of

manual work per day by automatically setting nursing assignments according to staffing rules;

• an application called RUSHH that identifies hospital patients at risk for hypoglycemia so nurse practitioners know who to treat before it becomes problematic; and

• a predictor for the hemodialysis unit that identifies high risk patients so more intensive care can be provided, reducing the likelihood that they will return to hospital.

The need for a company like Signal 1 was born out of necessity, he explained. During the pandemic, several Ontario hospitals expressed interest in using algorithms developed by the St. Michael's team and though they willingly shared their code, at least five of those hospitals didn't have the expertise required to run the models in-house.

"We ended up being their help desk for IT support and it wasn't sustainable," said Dr. Mamdani. "To do this in a financially responsible manner, we had to go the start-up route."

Signal 1 – so named because doctors look for 'signals' in patient data to treat their patients and the company wants to be the first signal they consider – is using an AI-as-a-service model to help hospitals deploy clinical AI at scale.

The first step is a data sharing agreement, enabling Signal 1 to access unique hospital data through APIs. The company then finetunes ChartWatch to reflect the practices and workflow for each hospital before delivering insights specific to their environment.

The delivery model solves one of the biggest challenges facing hospitals as they look to benefit from enterprise AI: the need for robust machine learning operations or MLOps. Signal 1 provides the backend infrastructure and ongoing monitoring to guard the integrity of models, and hospitals need only be concerned with providing data, explained Dr. Mamdani.

"What we can say to the hospital is we're not asking you to do anything. Just feed us the data as dirty and messy as it is, we'll feed it through our AI engine and it will clean it up, analyse everything and spit the result out in close to real-time," explained Dr. Mamdani.

Signal 1 is currently working with four other Ontario hospitals as it brings ChartWatch 2.0 to market. The goal is to distribute the work of Dr. Mamdani's team, which is already having a positive impact at St. Michael's. Their next project will be a clinical AI tool to optimize emergency room triage.

"Signal 1 is not looking to solve niche point solutions," said Poutanen. "We're looking to solve enterprise-wide data AI problems for a hospital and ChartWatch 2.0 is a perfect example of that."

Another start-up company working to create enterprise AI solutions tailored specifically to the healthcare industry is Predictive Health Solutions (PHS), a joint venture between SAS reseller Pinnacle Solutions Inc. and the Center for Discovery, Innovation and Development (CDID) at RWJBarnabas Health's Children's Specialized Hospital in New Brunswick, N.J.

Launched in February of this year, PHS is laser fo-

cused on solving the problem of patient no-shows, a reality that is estimated to cost the U.S. healthcare industry $150 billion dollars annually.

The idea came about as both partners were exploring ways to apply analytics to create positive change. Pinnacle Solutions brings the technology expertise to PHS and CDID offers the understanding about people and processes.

"We've been working on the solution and talking about it with customers, but it wasn't until we met Children's Specialized Hospital that we realized what we were missing," said Pinnacle director, U.S. Sales and Alliances, Elizabeth Stack.

Expected to be available to hospitals and health systems as a software-as-a-service (SaaS), based on the number of appointments managed per month, the Patient No-Show Predictor tool is supported by the SAS enterprise-grade analytics platform. Similar to what Signal 1 is doing, the approach means AI models will be robustly managed at the backend end, including the ability to auto-tune and dynamically adjust as data parameters change, and the complexity of customizing models for each individual hospital will be handled by PHS.

"Custom developing and coding a solution to one health system's data and population doesn't easily translate to another health system," said SAS strategic advisor Rich Kenny. "The underappreciation for this complexity is what has stalled many other AI-related efforts in the past."

All of the advanced math fueling the Patient No-Show Predictor – which makes predictions based on a multitude of factors as to why a patient may miss their appointment, including transportation, weather, past history, or simply forgetting – is hidden from users who are presented with an easy-to-digest visual dashboard. Each patient is scored on a scale from one to 100, with one indicating they're not going to show and 100 that they will, and results are colour-coded red, yellow and green respectively.

Not only can schedulers see the likelihood of a patient showing up on the morning of the appointment, but they can also use the tool at the time of scheduling.

"We can see what their probability is, and what their history is of not showing up, and then if we see they are a high no-show risk … we can start to understand from the dashboard reasons why they may not show up and offer preventive measures right then," explained CDID director Victoria Gregorio. "It highlights a scope of where the problem areas are."

For example, if patients living within the same zip code are showing a high percentage of missed appointments, the hospital might partner with a service like Uber Health to offer rides at the time of booking. CDID is also starting to screen a subset of outpatients to determine a correlation between no-shows and social determinants of health so that broader strategies can be implemented to prevent no-shows.

"We're working very hard to make sure the average front line worker, who's touching patients and really has the power to make decisions, doesn't need to understand the analytics or the math, they just need to see the information," said Stack. "Our dashboard really puts the power of

all of that into the hands of people who ordinarily might be frightened by statistics."

Following a positive reception at Children's Specialized Hospital, PHS is now working to improve the tool and is in conversation with prospective customers. Currently, the AI model receives a steady stream of data from the hospital and "is getting smarter literally every day," said Gregorio, as hospital staff continue to use the analytics to identify actions that can be quickly taken to prevent no-shows, such as identifying patients who regularly miss Friday appointments and scheduling them on another day instead.

"If you have, over the course of a month, 100 appointments that went unused because someone didn't show, that's 100 appointments that someone else needed and didn't have access to," said Stack. "So this is not just about recovering the revenue, which is really important. It's about filling those spots for patients in need."

"I'm on a wait list for a doctor I'd love to see tomorrow but I can't get in for three months," added Gregorio. "We know every organization has between a 15 to 30 percent no-show rate. Wow! What that could do to serve other folks who really need to see a doctor in a shorter period of time."

Promoting a culture of transparency is the key to a trustworthy AI

BY ALLIE DELONAY

Recently, I spoke at the 22nd Annual Healthcare Summit in Vancouver, where we explored the importance of promoting a culture of transparency and explainability in healthcare AI. According to research from the Brookings Institute, medicine trails every industry but construction in demand for AI-literate employees, and if providers don't know what factors contributed to an AI's decision, providers will be more reluctant to utilize the AI to aid in decision making. We need to promote a culture of transparency and explainability in healthcare AI otherwise the promise of new, innovative technologies like these will not be realized.

Interest in AI healthcare applications isn't waning, though investment in startups has cooled slightly – we're on pace for AI investments of $6 billion (US) in 2022, down from $10 billion last year, but still more than double the $2.4 billion invested in 2019. And AI applications won't be as obvious as robots doing examinations. They may be largely hidden from the patient, for example, in scheduling processes, workflow, business processes and diagnostics.

So why the apparent trust hurdle?

The black box: A cornerstone of AI concerns is the "black box" issue, the lack of transparency about how applications make their algorithmic decisions. While data scientists and technologists strive to create models that reflect real-world conditions as accurately as possible, healthcare providers don't know in more than the most general terms what information was fed to the model or what relative significance was associated with it. Sometimes, providers aren't even informed of the most basic factors that contribute to models. As a result, practitioners will be inclined to lean on their own expertise and judgment.

Human expertise can be subject to bias. But so can modeling. And within the "black box," how do we find the biases that can creep into our decision-making?

Biased models: Biases aren't always overt or intentional. Modeling based on historical data collection can be vulnerable to these. Who could be underrepresented in the data collection, and why? Rural populations, for example, could be underrepresented simply because they have had less interaction with hospital data collection systems. Some populations can't or won't comply with data collection because of religious, cultural or language barriers, or because of historical mistreatment by the system.

Healthcare consumers are also increasingly aware of the risks of electronic data breaches and might opt out of data sharing. We don't have to look too far back to cite a recent example of a data breach. According to the U.S. Department of Health and Human Services, ransomware and data breach attacks have doubled in 2022 over last year.

How does this impact the deployment of the AI model used? Every region has its own distinct population characteristics and healthcare usage patterns; models must be tailored to local or regional populations.

Establishing an appropriate model for a population isn't the end. Models must be monitored to ensure they're fair and accurate over time. Data drift over a period can be a symptom of a model whose usefulness is fading. Metrics must be established to warn of unacceptable change levels; this could require retraining the model, or retiring it altogether.

Bias can creep in through data that is defined or used inappropriately. Consider the STONE score, used to evaluate patients presenting at an emergency room with flank pain to predict kidney stone risk. If a patient identifies as non-Black, three points are added to the score, increasing the likelihood of further investigation. A Black patient would have to present with much more serious symptoms to be assigned the same level of risk.

Since race is a social and a political construct, it shouldn't be used for clinical decision-making unless there is a strong justification for doing so. But we still need to continue collecting sensitive data to test our AI models for bias. This information should be used for descriptive purposes, not for prescriptive purposes.

Allie DeLonay

AI is worth it – here's why: Speaking at the recent Toronto stop of the SAS Innovate tour, Reggie Townsend, director of the SAS Data Ethics Practice, pointed out how there is both risk and reward in the use of AI in healthcare, and public perception is focused heavily on the risk side. But what are the potential upsides? What is AI good at? How can it contribute to healthcare?

• AI is good at automating repetitive tasks. For example, Pinnacle Solutions has developed a No-Show Predictor that aggregates patient history, clinical records and demographic information with third-party data including weather and traffic reports to predict which patients are most likely to miss appointments, allowing clinics and hospitals to supplement appointment rosters to avoid blank slots and accommodate more patients.

• AI is good at making existing processes more efficient. Take an overburdened radiologist. Rather than screen every image in the order they are filed, they can prioritize the files prescreened by an application with a higher likelihood of variation, reducing the time to catch health threats to hours from perhaps days, depending on the volume of imagery.

• AI helps with decision-making. AI can discover relationships in big data that providers may not be able to discover on their own based on the information they have access to in the electronic health record. Providers can consider the information discovered by the AI to help influence the patient's care.

AI will be an advisor, a tool, an instrument for healthcare providers. "There's too much doom and gloom," Townsend said, and too much focus on risk, he added, will drive AI underground to "bad actors."

The primary mission of AI is the same as that of the medical profession: First, Do No Harm. We must cultivate a culture of transparency and explainability around AI or we won't be able to realize the promise of innovative technologies. We must be clear and upfront in explaining how AI algorithms work. That includes knowing where the data comes from, and acknowledging possible biases in the repository.

Allie DeLonay is a Data Scientist with the SAS Institute Data Ethics Practice.

Medical coders, assisted by AI, will produce more accurate data

BY LAITH SARHAN

TORONTO – Medical coding is one of the most important operational activities in Canadian hospitals, as it helps us to understand and analyze the care we deliver. Accurate coding is essential to hospital funding and to the work of policy planners. However, health information management (HIM) professionals can become overloaded by the increasing volumes of work in hospitals today. Moving forward, artificial intelligence (AI) will play a key part in supporting the HIM department's productivity, accuracy, and capacity.

AI and big data have already embedded themselves in day-to-day life outside the healthcare system. Think about how Google Maps helps us navigate traffic, how banks can identify fraudulent purchases on our credit cards, and how Netflix offers catered content suggestions. In healthcare, we have yet to see the full potential of how data-driven innovations can better support patients and their medical needs. Nevertheless, opportunities are there, and data will fuel the next phase of Canadian healthcare. Better treatments, shorter wait times, and preventive care require it.

When we talk about data, it's important to draw out a few key definitions. The first is the distinction between structured (data points in a standardized format) and unstructured data (free-form notes). For the most part, technology will perform better if data is structured because it is simpler to ingest and understand. Importantly, we are able to turn unstructured data into structured data, and this is largely what medical coders are doing: taking free-form notes to identify the unique diagnosis (ICD-10-CA) and treatment (CCI) codes.

It's important that data is high quality to be usable and actionable. Suppose you were trying to bring your team's favourite chocolate to a department party. To buy the right chocolate, you would need to know exactly which chocolate every individual liked best. If you had the wrong information about a few people or missed half the team, you would likely buy the wrong chocolate. If data quality is poor, the same challenge arises in a data-driven healthcare system – only the consequences could be much worse than bringing KitKats instead of Dairy Milks to the office.

Medical coders are largely responsible for building our accurate and actionable healthcare data. They are the ones who spend countless hours transforming (unstructured) clinical documentation into (structured) medical codes. In Canada, their coded data is then sent to the provincial Ministry for funding/resource allocations and CIHI for analytic purposes. This data also holds untapped potential: hospitals can start to use it

Laith Sarhan

for planning, operational decision-making, and improvements in medicine and care. The current challenge, however, is that many Canadian medical coders do not have the time and capacity that they need to handle the volume of digital data being generated while still ensuring the quality of coding. As data volume and complexity increase, staffing shortages rise, and analytics demands grow, medical coders are increasingly being asked to do more with less. This emphasizes the need to identify new opportunities to boost efficiency and accuracy, and this is where we come in.

At Semantic Health, we believe that AI can fill the support role that medical coders need. We have built an AI-assisted medical coding and auditing platform, the Semantic Health Information Platform, that helps to code and audit charts in real-time. Already in place at several leading Canadian hospitals, including SickKids and Humber River Hospital, our platform increases the speed that coders can work by 20 percent and identifies 25 percent more opportunities to improve coding than existing audit processes.

This efficiency increase is largely in part to Semantic Health's AI engine, which, unlike legacy audit and CAC software, continues to learn from the clinical data and adapt to how the process is completed at each site. Our platform leverages NLP algorithms to parse clinical data and understand the specific clinical context. This means the platform can suggest appropriate codes and audit suggestions, and produce an evidence trail

New regulations on the horizon for cybersecurity and artificial intelligence

BY KARIM BHALOO

Thirty-two. That's the number of privacy breaches caused by cyberattacks as reported by the health sector to the Information and Privacy Commissioner (IPC) of Ontario this year. Forty-five. That's the percentage increase in such attacks over 2021.

It seems that this trend will continue unless institutions make their I.T. infrastructure more robust and be vigilant on an ongoing basis.

Cyberattacks are not restricted to provincial entities. Indeed, many federally regulated industries are also targets. To that end, on June 14, 2022 the federal government introduced Bill C-26 (An Act respecting cyber security, amending the Telecommunications Act and making consequential amendments to other Acts).

This bill has two parts. The first part is to amend the Telecommunications Act in order to promote the security of the Canadian telecommunications system, and the second is to enact the Critical Cyber Systems Protection Act (CCSPA), which will allow the government to designate services or systems that it views as vital to national security and to impose data protection obligations on their operators, and to require mandatory reporting of cyber-security incidents. The act designates the following systems and services as vital:

- Telecommunications services
- Interprovincial or international pipeline and power line systems
- Nuclear energy systems
- Transportation systems that are within the legislative authority of Parliament
- Banking systems
- Clearing and settlement systems

The act also outlines some impressive enforcement mechanism. One of them being the ability to impose an administrative monetary penalty, or AMP, of up to $1 million per individual and $15 million per organization. The exact amount is dependent on further regulations which could mean that the final penalty could be contextual.

The other piece of legislation that everybody should pay attention to is called Bill C-27. This bill has three main parts:

- Consumer Privacy Protection Act (CPPA),
- Personal Information and Data Protection Tribunal Act (PIDPTA) and
- Artificial Intelligence and Data Act (AIDA).

The CPPA attempts to strike a balance between protecting personal information (PI) of individuals and the needs of organizations to collect, use, or disclose PI in the course of commercial activities.

It also repeals part 1 of PIPEDA and changes the short title of that Act to Electronic Documents Act. Further, it mentions the definition of de-identification but also recognizes the risk of re-identification of individuals. The CPPA will apply to associations, partnerships, a person or a trade union.

PIDPTA establishes an administrative tribunal that would hear appeals of certain decisions made by the Privacy Commissioner under CPPA and have the ability to impose penalties if appropriate. The tribunal would be composed of three to six members, part-time or full-time, to be appointed by Governor in Council recommended by the Minister.

A party to a proceeding before the tribunal may appear in person or be represented by another person, including legal counsel. Hearings before the tribunal would be public with exceptions, the standard of proof would be on the balance of probabilities, the decisions would be enforceable and costs may be awarded. An interesting item to note is that the decisions are final and binding and not subject to

Karim Bhaloo

appeal or review by any court (the exception is that a judicial review is possible under the Federal Courts Act). And finally, AIDA would regulate the use of artificial intelligence (AI) in international and interprovincial trade and commerce vis-à-vis risk of harm and biases.

Organizations should keep in mind that this act authorizes the Minister to order the production of records related to AI systems. Further, it prohibits the possession or use of illegally obtained PI for use in AI system if such use causes serious harm.

The act also defines what an AI system is, regulates activities including the processing or making available for use any data relating to human activities for the purpose of designing, developing or using an AI system and designing, developing or making available for use an AI system or managing its operation.

Organizations should be aware that the act defines a person as a trust, joint venture, a partnership, an unincorporated association and any other legal entity.

It also instructs that data must be anonymized by the person carrying out a regulated activity and that the same person is responsible for assessing if the AI system is a high impact system (criteria to be established by regulation).

Under this act, the Minister may request and audit, if necessary, conducted by the person or engage the service of an independent auditor (qualifications to be determined by regulation). The AMP, once again, will be established by regulation. The purpose is to promote compliance and not to be punitive.

Karim Bhaloo, BSc, MLT, DPPS, CIPP/C is a Cancer Cytogenetics Technologist at the University Health Network, in Toronto.

Pentavere AI for patients with rare diseases

BY NEIL ZEIDENBERG

Pentavere, a Canadian AI digital health discovery company, was recently awarded the first Takeda Canada Innovation Challenge. The win includes $200,000 in funding from Takeda Canada Inc. (www.takeda.com/en-ca), a Canadian affiliate to Takeda Pharmaceutical Co. – a global biopharmaceutical leader.

The innovation challenge aims to accelerate identification of new digital technologies and AI solutions that support enhanced patient care in the therapeutic areas of inflammatory bowel disease (IBD) and other rare diseases. Researchers aim to identify patients currently receiving therapy for rare conditions but are not responding well to treatments.

Because rare diseases affect such a small percentage of the population, there tends to be a lack of expertise in treating the disorder. And of the treatments that do get approved, about half make it to Canada but can be delayed by several years.

"Rare diseases can take up to eight years to properly diagnose," said Aaron Leibtag, co-founder and CEO, Pentavere.

Moreover, "misdiagnosis of a health condition can negatively impact both the patient and the community, so early diagnosis is imperative to improve patient outcomes."

Pentavere's breakthrough AI engine, called DARWEN, accelerates the discovery of evidence from huge amounts of clinical text.

According to the company, DARWEN can unlock insight and evidence from large volumes of clinical information that would be impossible to analyze by human intelligence. "Our AI engine uses a unique ensemble of AI models to quickly analyze, gain insight and discover evidence hiding in vast amounts of data," Leibtag explained.

"We're going after the totality of events in a patient's electronic health record by analyzing all clinical text across multiple systems and formats."

Leibtag added that Pentavere aims to provide faster diagnosis to identify patients earlier, using innovation and a faster approach – namely, the application of AI to text and image files.

In partnering with Takeda Canada Inc., Pentavere benefits from Takeda's extensive

> **Pentavere's breakthrough AI engine, DARWEN, accelerates the discovery of evidence from huge amounts of data.**

international network of scientists, global infrastructure, and funding, to build a proof-of-concept project in the therapeutic areas of inflammatory bowel disease and other rare genetic diseases.

As for the timeline, the project will be completed over a 12-month period. Initially, Pentavere's research will focus on Canadian patients, but they also aim to demonstrate how it can positively impact global patients as well.

Each year, one in 12 Canadians are impacted by a rare medical disorder – a condition that affects five of every 10,000 individuals. According to Canadian Organization for Rare Disorders (CORD), more than half of these diseases begin in early childhood.

A lack of appropriate care and misdiagnosis can greatly affect an individual's quality of life and mortality.

---

linked back to the documentation. Because of this, Semantic Health takes the next step forward from the rules-based software of legacy solutions that other vendors provide.

Rules-based software requires the developer to establish a list of keywords for their platform to search for in the clinical documentation.

These manual tools cannot understand the clinical context, so they often produce incorrect suggestions for coders and auditors to review. By comparison, in using NLP rather than rules-based technology, we've found that you can increase efficiency and identify over 25 percnt more CMG+/HIG weighted cases.

The Semantic Health Information Platform works by integrating with a hospital's EMR to ingest clinical documentation on a real-time basis. It then offers auto-coding suggestions alongside the clinical documentation for coders to review and accept.

This means simple charts can be coded automatically and more complex charts can be streamlined for expert review. Then, after charts are coded, our engine will review 100 percent of the coded data – contrasting current, manual audit processes where providers are often able to review less than 10 percent of coded charts

– and compare it with the clinical documentation to flag instances of undercoding, overcoding, or documentation deficiencies. These AI-powered auditing suggestions are then presented for review with inline reference to the documentation.

In a recent case study, three hospital sites using Semantic Health's AI-assisted auditing software were able to review 100 percent of coded data before submitting data to the Ministry without adding additional staff.

On average, the AI software identified 450 data quality opportunities per 15,000 inpatient charts reviewed. This offered HIM staff a streamlined list to review, cutting down the amount of data that they needed to parse through. Each data quality opportunity reflected an average of 1.17 change in weighted cases, uncovering new funding opportunities for the hospital.

Across all hospital sites, the auditing process was 3x faster, and user agreement rates with audit suggestions were over 85 percent. Given these results, it is clear that limited staff capacity and tight timelines, both of which are not relieved by legacy software, are hurting Canadian auditing processes.

Laith Sarhan is Director, Business & Legal Operations at Semantic Health.

Ten ideas for how virtual care in Canada may change in the future

still struggle to get timely access to needed primary or specialty care or tests. Assuming appropriate governance is hardwired to ensure appropriate, safe care, access to care in the lowest barrier channel available, even if it is with "a" clinician instead of "your" clinician is better than no care at all. This aspect of access is where changes need to focus going forward as we transfer power to patients, giving them a choice of channel and provider for their given situation.

Equity becomes a driver: The equity of access conversation too often focuses primarily on direct financial and geographic barriers to access but doesn't give enough thought to other disproportionately high barriers. Virtual care will help close other real equity gaps such as: the cost of waiting and the cost of physical contact (source – Will Falk, Longwoods Papers 2022), language barriers, physical or mental health barriers in mobility or communication, intimidation by sterile-feeling clinics and white coats, and people who have sadly learned that they "cannot trust" the system. The message is clear: patients most in need of support are not looking for "perfect care". Rather, they are happy to no longer be forgotten. Going forward, policy and practice will take a more balanced consideration that includes the new fifth element of the quintuple aim: equity.

Practice standards with teeth: To date modalities to deliver care virtually have been compared to the "gold standard" of in-person visit-based care delivery. Further, within today's virtual modalities there is a perceived inferiority of older telephonic technology vs newer video technologies. Just as with teleconsultations generally, telephonic visits should not be rejected on the basis of being lesser than video when it is a more appropriate channel for a given context, or when needed infrastructure and digital literacy still remain inaccessible to so many. If the choice is between virtual care or no care, it would be unsafe to insist on a particular modality of

"modern" technology. Tomorrow we will have new technologies to deliver care that are not even on Canadians' radars, such as voice, teleholoportation, and immersive therapeutics. Shared decision-making in choice of channel – within the whole lens context of safety, clinical reasoning, equity and access – will be at the forefront of progress on the standards front.

Modernizing payment: Because of the dominant fee for service model, the focus of paying for care that is delivered virtually has been fee schedule tactics such as opening billing codes for tele-consults, and renumeration rules to encourage continuity of care while forcing a desired ratio of in-person-to-virtual care. Real value will be captured when payment aligns with desired outcomes – for example, in capitated payment models where the modality or channel through which care is delivered does not have any bearing on payment. Ultimately modality neutral payment will mean the clinical team and patient decide what combination of humans and machines, in person and virtual, synchronous and asynchronous care exchanges they wish to engage in, with payment terms set based on outcomes desired.

Licensure and scope of practice rules: Just as physical care sites represent static structures that struggle to support a dynamic service … strict licensure and scope of practice rules are equally static infrastructure that increasingly no longer serve in a digital world. Objections to changing licensure and scope of practice of health professionals may be many but the cost of inaction is equally real. In the

EU we see numerous benefits to patient access to safe care as well as workforce management benefits from a cross-jurisdictional medical licensure. Allowing a mix of clinicians – including mid-level providers as extenders – we now have experience not only with care provided by physicians, but also with psychotherapists, physiotherapists, nurses, physician assistants, pharmacists, and other allied healthcare workers.

Regulatory adaption is the lock and key: Everyone grapples with adapting regulations as we shift away from analog models of care delivery. There are numer-

> **Patients most in need of support are not looking for perfect care. They're happy to be no longer forgotten.**

ous examples where good 'regulatory code' unlocks new value from virtual care, whether by extending care through telestroke programs or bringing tele-mental healthcare support to entire populations. For some stakeholders, the main focus is data security and patient privacy. For others, it is safety and scope of practice. New principles are emerging: do regulations benefit the patient and promote their welfare? Do they help avoid harm? Do they allow for patients to exercise their capacity for decision-making (autonomy) and do they support fair and equitable access to appropriate medical support and treatment (justice)? These principles will an-

chor the future regulation in a virtual care world, keeping patient outcomes and experience top of mind rather than focusing on specific technologies.

Systemic changes: We have all experienced the "emergency life rafts" (Will Falk, 2022) thrown during the pandemic to enable care to continue to be available. Future-proofing our healthcare systems for an ever-unfolding virtual future is a systematic, multi-layer, multiyear process. Our most advanced health system partners approach the important work of modernizing their care delivery models as part of a systematic change program, not as one-off reactions to the latest crisis.

Virtual care meets climate change: Virtual care can and will impact another key public concern: climate disruption. Leading healthcare organizations are beginning to track and report on their carbon footprint as part of their strategies and scorecards; the asset-light nature of virtual care can go a long way to helping reduce carbon emissions from already high polluting healthcare delivery activity.

Zayna A. Khayat, PhD is Vice President at Teladoc Health Canada and Adjunct faculty, University of Toronto, Rotman School of Management – Health Sector Strategy Stream. Timothy M. Foggin, MD, FRCP is Medical Director, Teladoc Health Canada and Assistant Professor, School of Population and Public Health, University of British Columbia. This article was adapted from an article submitted to Longwoods Healthcare Quarterly as part of a fall 2022 issue on Virtual Care in Canada.

Wireless technology benefits doctors, nurses and patients

to see the data," he said. "Now, we can see it, at any time, from other places in the hospital. We don't have to be in the dialysis unit."

Every part of the hospital – including the ICU and ED – now has vital signs and

other equipment feeding patient data into the EMR. The hospital plans to continue integrating devices with the Epic EMR. It already has IV pumps that are capable of automatically transmitting their data, and the integration is in the works.

In particular, the team would like the

pumps to download data about what they've infused, minute by minute, directly into the patient's EMR.

Moreover, the hospital is discussing plans to transmit alerts – such as the bag is empty – directly to the nurse's mobile device.

On another front, the hospital is working on a Hospital at Home (HaH) strategy. Wireless devices could be deployed in the homes of patients, including glucometers, BP cuffs, weight scales, inhalers, infusion devices and point-of-care testing.

"They can all be connected (to the electronic record), and the information becomes one seamless whole," said Dr. Geiger.

> **Wireless tech could soon connect patients at home, using medical devices, to their electronic record at the hospital.**

"There's nothing to stop us from viewing the patient's home as the bedside."

In this way, a clinician conducting a video visit from the hospital can also see up-to-the-minute vital signs and other data in the electronic record, while he or she is examining the patient.

And with the help of AI-powered technology, machines can monitor groups of patients, alerting nurses and doctors when home-based patients have readings that drift outside the normal range. "With AI, you can predict problems before they happen," said Dr. Geiger.

Using AI to improve contouring in radiation therapy

of imaging datasets through our AI-powered algorithms.

AI-Rad Companion seamlessly integrates into the physician's workflow transferring data securely and GDPR compliant helping to ease today's challenges in routine radiology.

Clinical use for brain volume analysis in dementia patients: "[AI-Rad Companion] is effective in dementia sufferers, particularly those with Alzheimer's disease. The algorithm can detect a reduction in brain volume in a variety of locations. Percentage of brain volume in that location is relative to the whole brain compared to the average population and reported as Percentile Colors. Percentile Colors are used to represent abnormally reduced brain volume at different levels. To compare values, tables and graphs are also generated. This allows the doctor to

make more accurate and reliable decisions," said Dheeratama Siripongsatian, MD, a Nuclear Medicine Physician National Cyclotron and PET Centre, Chulabhorn Hospital, in Bangkok.

"In patient reporting, the reported results were similar to the visual analysis of a radiologist who specializes in neu-

> **AI-Rad Companion may detect small changes in brain volume, when there are not any obvious abnormalities.**

rology. In addition, the results of the volumetric study can be stored in the database and compared with the results of previous patients or the following results to show the change in volume, precise brain tissue, increase diagnostic sensitivity, and tell changes rather than

just visually analyzing results."

The system is also being used in research together with analysis of Metabolic Imaging and Molecular Imaging.

"PET scans are a type of imaging that looks at the molecular and functional levels of cells, such as improper protein accumulations that cause disease or metabolic problems, which are more sensitive to diagnosis than morphological imaging like CT or MRI.

However, the program was used to test whether [it] can detect small changes in brain volume when there may not be any obvious abnormalities from the Radiologist's eyes. How are they related to the detection of the abnormalities in the PET scan? The results of the research may lead to the use of brain morphometry software in conjunction with the diagnosis of dementia more widely in the future," said Dr. Siripongsatian.

PATIENT-CENTRIC
INNOVATION AND TRUSTED
COLLABORATION ACROSS
THE HEALTH ECOSYSTEM.

"Together, SAS and Microsoft Azure are building
deep technology integrations that unlock value
by making disparate data and advanced analytics
more accessible to health and life science organizations."
Gail Stephens, Vice President, Health Care and Life Sciences, SAS

Learn how at www.sas.com/microsoft/health

UKG

People management software that creates a smile.

Keep your people productive, connected, and happy with our second-to-none suite of cloud-based HR and workforce management software. From staffing and automated scheduling to absence and record management, our technology helps you create a better workforce experience for everyone.

The **smiles** start at **ukg.ca**