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CANADIAN
Healthcare Technology

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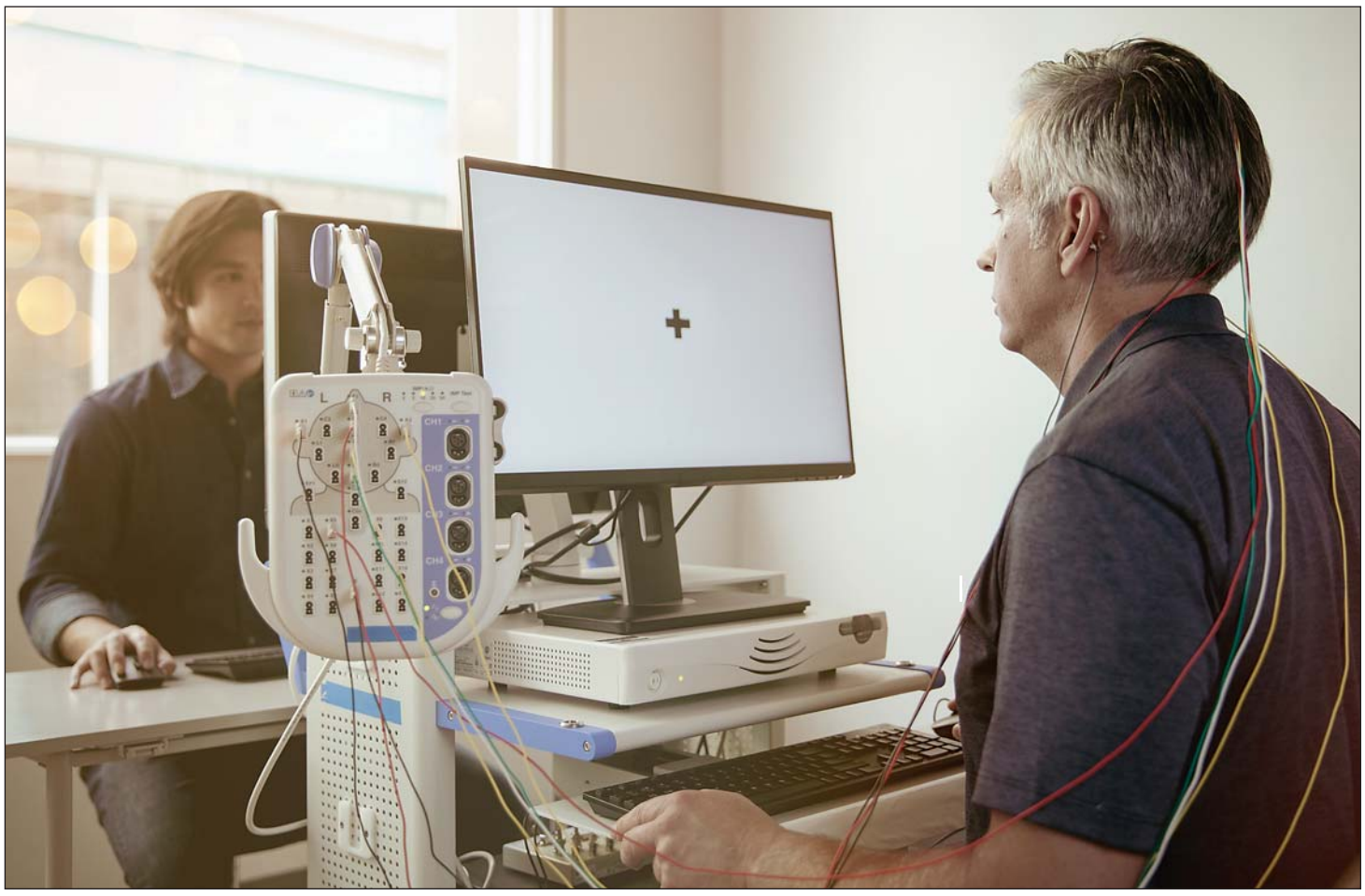

PHOTO: STEVEN KIM

VoxNeuro's data-driven future of brain health

VoxNeuro, a Canadian neuroscience and health tech company, has developed a 30-minute, non-invasive Cognitive Health Assessment that records tens of thousands of data-points from a patient's brain waves while they perform a series of tasks on a computer. The company's medical software then rapidly analyzes, transforms and compares the patient data to a database of healthy cognitive function. **SEE STORY ON PAGE 8.**

MGH leverages Connexall to enable SMART expansion

TORONTO – Michael Garron Hospital (MGH) is a busy community facility serving over 400,000 people in 22 neighbourhoods across East Toronto. The hospital is currently expanding its site with an eight-floor tower and an additional three-floor extension that will add 500,000 square feet of clinical space to the medical centre.

With the opening of their new building (known as the Ken and Marilyn Thomson Patient Care Centre), expected to open sometime in late 2022, the hospital will expand its use of Connexall's enterprise platform. It's the largest construction project in the hospital's history, with an estimated cost of $560 million.

At the same time, MGH is engaged in master planning via 'Project Imagine', an effort to re-design healthcare and create an intelligent, "connected" hospital.

One of the hospital's key challenges was to determine how to connect clinicians, staff, patients and equipment in real-time, making it possible to communicate instantly and locate people and resources as soon as possible. To achieve this strategically, MGH chose to leverage its existing partnership with Connexall, an industry leader in clinical communication and collaboration.

> **It's the largest construction project in the hospital's history, with an estimated cost of $560 million.**

Simplified approach and system architecture: Hospitals utilize a multitude of systems and associated devices. Connexall integrates its solutions in healthcare facilities without having to make any additional investment to update their current infrastructure or replace their existing vendor relationships. The company's sophisticated enterprise-grade platform and suite of solutions are vendor and device agnostic, supporting all types of systems and devices that hospitals use now and plan to use in the future.

One such solution within Connexall's portfolio is the MobileConnex application, an extension of its enterprise grade platform. The app will be a standard tool aiding clinical and corporate staff via integrating information from different systems into single mobile device interface from

CONTINUED ON PAGE 2

MGH leverages Connexall to enable its SMART Hospital expansion

CONTINUED FROM PAGE 1

which they can communicate and coordinate responses.

"It's great that you're not tied down to a desk to see what's happening," said Nicole Gagne, telecommunications coordinator at MGH. "Our staff can be at the bedside and on the floors and still see all of the information."

Moreover, the combination of Connexall's enterprise platform and MobileConnex is helping caregivers handle multiple alerts and hand them off in order of importance to the most appropriate caregiver. If that caregiver is unavailable, it will escalate to the next logical person. MobileConnex will also ensure that the message is received and acted upon.

On MGH's plans for the future, Sandy Saggar, SVP Innovation, Analytics and CIO at Connexall shared, "We are excited about MGH enabling their clinicians with our Enterprise Connected Hospital Solution, with a mobile-first strategy utilizing MobileConnex to prioritize all the alerts and messages they receive on any given shift. We need to help clinicians manage their workload, especially with burnout on the rise, with tools to enable their day-to-day workflows in turn improving the patient experience."

MGH has been using technologies from Connexall since 2009, but the latest project will substantially expand the scope and capabilities.

"Since we began our partnership between MGH and Connexall in 2009, we have greatly benefited from the use of the Connexall products to enable streamlined communications amongst our clinical teams for patient care delivery," commented Amelia Hoyt, CIO at Michael Garron Hospital. "We continue to work together to build additional communication pathways with the use of Connexall products, like MobileConnex, in support of our new Ken and Marilyn Thomson Patient Care Centre opening in 2022."

Previously, MGH used Connexall on its inpatient floors with nurse call integration to their mobile devices, allowing response teams to manage critical events such as code blue and code pinks. With the opening of their new tower, the hospital will expand its use of the company's enterprise platform. This will include providing support to outpatient clinics including day surgery, complex continuing care and the maternal newborn areas.

Doing more with Connexall: Connexall's vast portfolio of solutions are integrated into critical systems such as Nurse Call, Patient Monitoring, RTLS, EMR and many more.

> **Connexall's platform and suite of solutions are vendor and device agnostic, supporting all types of systems and devices.**

For instance, Connexall will receive alarms from MGH's Nurse Call system and deliver these alerts to the appropriate staff members via the MobileConnex app. MGH staff will have the ability to respond to events, including accepting and escalating, and initiate a patient room call to clarify the situation promptly.

Similar to the Nurse Call solution, the Patient Monitoring solution will prioritize and escalate alerts through Connexall whenever the system receives a critical alarm. In the new tower, Connexall will process the desired alarm types, based on staff and clinician feedback and deliver them to the appropriate team members via MobileConnex. These alarms will be prioritized and communicated based on the workflow designed for each alarm type.

An example of the RTLS integration is Connexall's patient wandering solution, which "will be particularly helpful for patients with dementia, with sensors and tags enabling alerts – all showing up on MobileConnex for the closest and most appropriate staff to be able to respond to," said Gagne.

The deployment of MobileConnex will allow for meaningful utilization of information transmitted by various systems and enable faster response to changes in patient and system performance. The opportunities to scale automation and enhance data usage are promising for future workflow enhancements.

Greater insights and analytics: For hospital management, an important aspect of their quality improvement strategy will be its ability to automatically collect and produce actionable analytics.

"We're very excited about this for quality improvement and reporting," said Linia Shaji, manager of Health Records and Telecommunications. "Currently, we collect statistics manually which is labour intensive and can be inconsistent. Connexall will automate all of this. It will be ideal for quickly assessing which units require the most staff attention for alerts, alarms and rounds and how long staff members are taking to respond to incidents."

With real-time statistics, the hospital will be able to implement quality improvement programs in an efficient and effective manner. By automating the collection of metrics, the hospital will be able to create custom analytics, with comparisons of different units – such as medical, complex care and palliative care – enabling it to match its resources with high-demand areas better.

Digital resiliency: "The hospital is undergoing substantial transformation of it digital maturity through this and other technology upgrades which will better position us for the future of care delivery," said Hoyt.

Gagne also noted that there is a significant change management and training program slated to begin, as many new systems will be deployed in the new tower next year. Hundreds of clinicians will be moving over from the existing building to the new tower. Connexall will be involved in helping these efforts to ensure there is seamless user adoption. It's all part of the shift towards modernized healthcare delivery, which depends on fast and accurate information.

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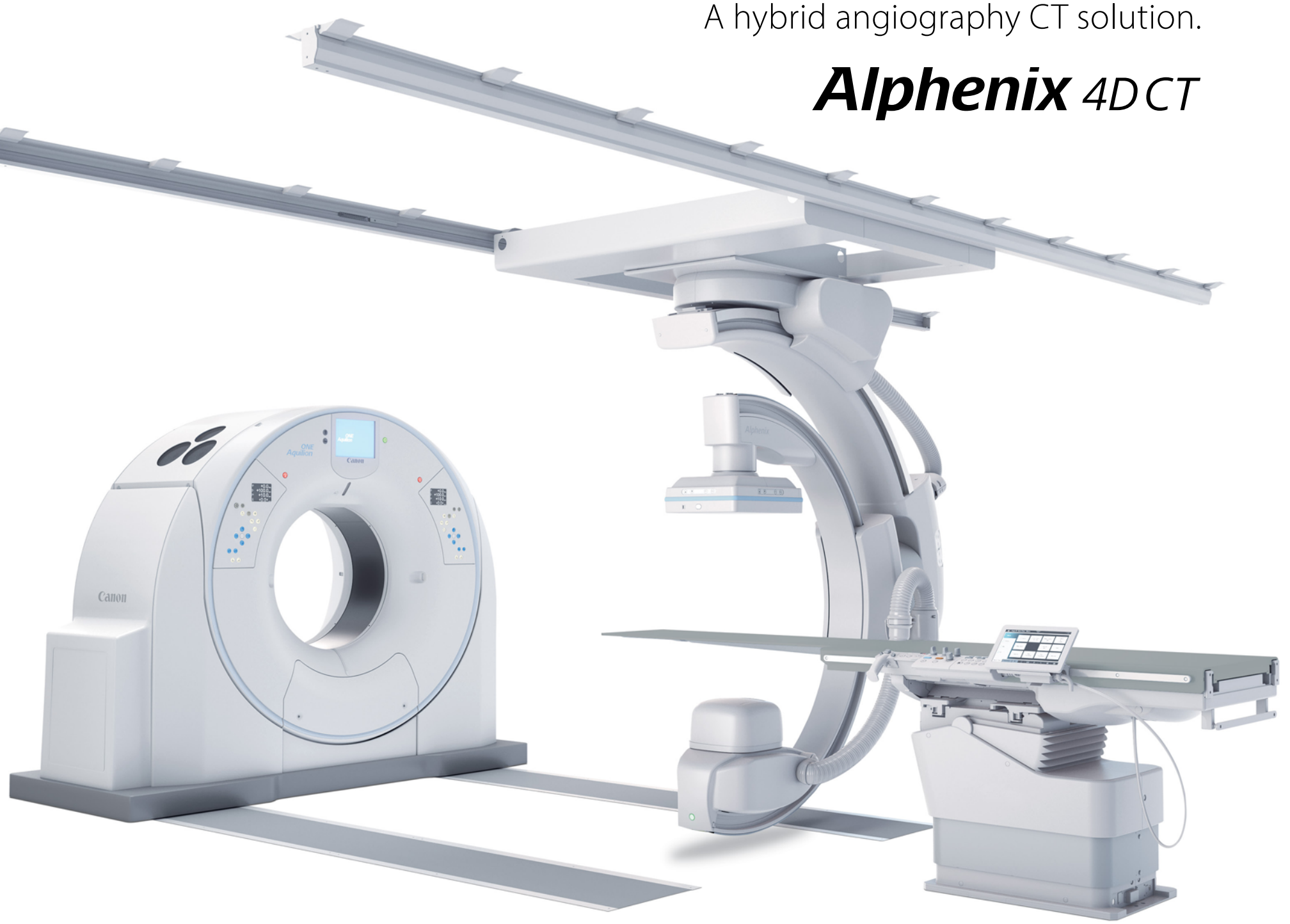

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Made For life

Rogers and Hypercare to offer digital solution to healthcare industry

Rogers for Business, the last of Canada's big three telecommunications companies to exit the paging business, is now working with Hypercare Inc. to promote the latter's smartphone-based communications solution to healthcare systems across the country.

Pager subscriptions have fallen steadily over the years, and as network technology advances with 5G, Rogers for Business saw an opportunity for the healthcare industry to leverage the benefits of this next generation technology as they migrate from the legacy paging platform. With this new agreement, Rogers and Hypercare offer pager customers an easy way to transition to a more comprehensive communication solution over smartphones and to better meet current and future needs of modern medicine.

Dr. Joseph Choi, co-founder and chief medical officer of Hypercare, says it's long overdue. "I can tell you real examples of how patients have been harmed due to missed or delayed pages. It's been a problem for decades, and I'm excited that healthcare is embracing these digital tools that we already use in our everyday lives. I think it will really improve the care we can provide our patients."

Hypercare has advantages over most alternatives to paging, said company CEO, Albert Tai. "Our solution isn't just pager replacement. It's a complete communication solution for healthcare across different settings.

"Our core functionality is the ability to send text messages, pictures, videos, and other multimedia in a fully encrypted HIPAA and PHIPA compliant manner. Our messaging feature allows providers to convey the urgency of the message to ensure the message gets through. Every message has receipts, so the sender knows exactly when a message was read for maximum situational awareness. We manage on-call schedules and allow clinicians to easily connect to the on-call provider accurately and easily. Hypercare even allows for automated escalation of care in critical situations ensuring you get a timely response. We integrate into different IT systems such as EHR and nursing call systems to make an all-encompassing platform for clinical communication."

Pictured, left to right: Albert Tai, chief executive officer of Hypercare; Dr. Joseph Choi, chief operating officer and chief medical officer of Hypercare; Natalie Ellis, senior product manager at Rogers Communications Inc.; Serena Xie, director, Wireless Product Management at Rogers Communications Inc.

Hypercare's cloud-based solution is independent of a hospital's existing communication networks, allowing for redundancy in case a customers' network experiences issues such as downtime or a ransomware attack. Moreover, it's one of the few solutions on the market that enables providers to connect across multiple care settings for their patients. This capability is ideal for Ontario Health Teams, which enable hospitals, primary care physicians, skilled nursing facilities, home care and other healthcare organizations in the community to coordinate care and streamline patient transitions between care settings.

Although transitioning to new technology can be daunting, the move to Hypercare has been easy, said Tai. "Since most users are already familiar with instant messaging, it isn't a very big jump. Wi-Fi infrastructure is decent in most hospitals, and since it runs on mobile devices, it can switch seamlessly to cellular data connections when coverage is poor. Hypercare's encryption enables users to securely use their own device for clinical work."

With Rogers and Hypercare working together, the solution provides the hardware, network, and software, all in one package.

Dr. Choi is also optimistic about the future. "This is an exciting opportunity to help transition healthcare organizations to more modern and effective communication technologies. I truly believe it will help healthcare providers be more efficient and provide better care for patients. As we know, the system is already stretched to its limit and providers are becoming increasingly burnt out and frustrated with their jobs. Anything to make the lives of healthcare workers easier is desperately needed."

Many forward-thinking hospitals are already using Hypercare, including Michael Garron Hospital, and Huron Perth Healthcare Alliance consisting of four hospitals across Southwestern Ontario. The company has also recently expanded into the United States with a hospital system in upstate New York.

"It's been great to see the amount of growth and adoption into different care settings such as mental health, palliative care, nursing homes, and hospices allowing them to quickly communicate internally but also to be connected to vital resources such as specialists at the hospital," said Tai. "It's really been an incredible journey."

Asked about the impact of the change, Serena Xie, Rogers director of Wireless Product Management, replied "We're very excited about this work. This solution will allow our customers to truly improve healthcare outcomes for both patients and providers. With the arrival of 5G technology, these types of improvements are only going to accelerate."

Hospital and community services partner to bring care to vulnerable

BY GARY BUFFETT

Kingston Health Sciences Centre (KHSC) has partnered with the Street Health Centre (SHC) and the University Hospitals Kingston Foundation (UHKF) to bring innovative ultrasound services to where they are most needed by vulnerable populations in Kingston.

SHC provides care to vulnerable populations by operating low-threshold, barrier-free access to primary care and addiction services for those who are homeless or precariously housed, may have been incarcerated, and may be affected by or at risk of acquiring Hepatitis C.

"One challenge faced by Street Health's Hepatitis C program relates the requirement for clients to undergo diagnostic liver ultrasound to support the development of a treatment plan," says Brittany Couto, manager of Street Health. "However, there is a very high no-show rate for this diagnostic procedure, with as many as eight out of ten patients not showing up for their appointment. This leads to delays with the treatment plan and inefficient use of healthcare resources."

SHC's Hepatitis C program is one of 20 provincially funded teams in Ontario providing access to education, testing and treatment for individuals who have difficulty accessing mainstream healthcare services. KHSC partnered with the Street Health Centre to deliver the ultrasound imaging at its Barrack Street site rather than at the hospital. This innovative collaboration will bring the care to the patient's location for the best outcome and best use of resources.

"We knew that we needed to look at a new way to deliver care that was more patient centred for this population," said Mike McDonald, vice president of Patient Care and chief nursing executive at KHSC.

"Partnerships such as this demonstrate KHSC's ability to be a hospital beyond walls that delivers complex, acute and specialty care where and when it is needed most. This important initiative is a great example of placing our experts and services in the community, and actively involving community partners as members of our care teams to improve access to care and improve the health of our community.

"As KHSC strives to improve the health of the community through innovation, partnerships with our healthcare partners, and donors from the community through UHKF, we can improve patient outcomes and make our communities healthier," said McDonald.

As part of the Kingston Community Health Centre, the Street Health Centre is open 365 days a year to deliver health services through a wrap-around care model for people who face barriers accessing mainstream health services. SHC began as a needle exchange program in 1992, and has evolved into a multi-service model, providing health, disease prevention, primary care, and treatment services.

Brittany Couto, manager of Street Health, and Mike McDonald, vice president of Patient Care and chief nursing executive at KHSC, led a partnership to bring innovative ultrasound services to where they are most needed by vulnerable populations in Kingston.

Gary Buffett is Strategic Communications Advisor at Kingston Health Sciences Centre.

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Technology use fuels rising burnout among physicians and nurses

BY DIANNE CRAIG

When we think of physician burnout, the many challenges relating to delivering and managing care during the COVID-19 pandemic seem to be the most likely reasons for the jump in reports of burnout this year. To a large extent, they are. Contributing significantly and adding fuel to the fire – according to a recent survey by the Ontario Medical Association (OMA) – is technology, and specifically issues involving tech usage, which were at the top of the list of reasons physicians cited for burnout.

These include stressors such as the time necessary to complete large amounts of required documentation associated with using different digital health tools – sometimes resulting in duplication – and the fact that many physicians have to spend more time completing documents than caring for patients. Also contributing to burnout are frustrations when different systems don't work seamlessly together, and the multiple steps often required to log in to reach key data, which can lead to feelings of 'click burnout'.

The OMA, which represents Ontario's 43,000 plus physicians, medical students, and retired physicians, revealed 72.9 per cent of physicians surveyed said they experienced some level of burnout in 2021, up from 66 per cent the previous year when they were polled on burnout in 2019. Just over one third – 34.6 per cent – reported either persistent feelings of burnout or feeling completely burned out in 2021 – up from 29 per cent in 2020. Presumably, much of this jump is attributable to the demands of treating a huge influx of patients with COVID-19. Dr. Adam Kassam, president of the OMA, observes "We do believe this is highly attributable to the pandemic. All the physicians I've spoken to have expressed burnout."

The pandemic has been a key stressor. "The scale and severity of the pandemic has stressed healthcare workers in significant ways," says Dr. Kassam, who indicates that the lack of respite time has made this challenging situation even more stressful for physicians to cope with.

Asked how serious physician burnout has become, Dr. Kassam said the situation is 'increasingly dire'. "There are physicians on the cusp of retirement that may consider exiting the profession earlier than anticipated. Generally, the rising burnout sentiment is a challenge that has been fueled by the pandemic," says Dr. Kassam.

The issue of physician burnout is not new. Just prior to the pandemic, the OMA established The Burnout Task Force with a mandate to drive system-level changes and provide support to members. Even then, nearly one third of Canadian physicians were reporting high levels of burnout, according to the OMA, which acknowledged many other healthcare workers – especially nurses – were also experiencing burnout.

Some physicians indicated they felt weighed down by the 'burden of technology': When he spoke with Ontario physicians, Dr. Kassam said he was made aware of the frustrations they were feeling and the "burden of technology." That burden includes issues such as the time and effort needed to complete large, and in some cases, seemingly excessive amounts of documentation associated with using technology tools and systems, and frustrations with systems that don't work seamlessly together.

Dr. Kassam reveals "Many physicians are spending six hours a day working on electronic charting – in addition to their clinic hours."

Following the survey, the OMA made five recommendations designed to address physician burnout, the first and third of which relate to technology usage:

- Reducing and streamlining documentation;
- More work/life balance through flexible work arrangements;
- Making digital health tools a seamless part of physicians' workflow, including by ensuring different systems can speak to each other;
- Support for physician wellness at their workplaces; and
- Fair, equitable compensation for all work, including administrative work that cannot be reduced.

Dr. Adam Kassam

Dr. Lynn Nagle

The need to reduce and streamline documentation has long been a big issue for nurses as well. According to Dr. Lynn Nagle, the founding president of the Canadian Nursing Informatics Association, and editor-in-chief of the *Canadian Journal of Nursing Leadership*, nurses can spend 20 to 50 per cent of their time dealing with documentation. "There is so much paper, and so much duplication," she says.

Document duplication is increasingly problematic and can lead to inefficiencies: Dr. Kassam, who acknowledges some duplication is necessary for legal requirements, also cites the amount of duplication as a key problem. "There is a growing concern about duplication and carrying forward of documentation. It would be good if we could try and have physician and patient interaction more emphasized than the taking down of information."

The issue of duplication is increasingly problematic for nurses as well. While Dr. Nagle also notes sometimes "duplicative effort is required in an organization," she says that in some settings, "nurses are asked to document in the organization's information system and then to document again for the purposes of reporting to external organizations."

Nurses call for streamlining of information and more standardized approaches: "We need a unified approach to nursing documentation in this country. Even if we are using different vendors, the information should be streamlined, and include just essential, relevant information in the (patient) care encounter," says Dr. Nagle.

"If we're going to computerize, take advantage of that and don't just replicate all the old paper documents. The information should be pulled forward and updated," she adds.

"In Toronto, 10 different teaching hospitals have different document practices. Some are still doing paper documentation," says Dr. Nagle. "We have a preponderance of hybrid records – a mix of paper and electronic. So often things are missed because somebody forgets to look at either the paper or the electronic document.

Stressors include the time necessary to complete the documentation associated with using different digital tools.

"Often, she adds, "we have to go looking for things."

Some physicians are becoming weary of what Dr. Kassam calls 'click burnout': Speaking from his own experience, Dr. Kassam said, "I work at a rehab hospital. Often we don't know what's happened at another hospital when patients have had work done at different hospitals." He explained that often multiple steps need to be taken, from logging in and finding the patient's number, to getting to the key patient information needed. "I call that 'click burnout," he says.

Solutions should make digital health tools a seamless part of physicians' workflow: Asked to elaborate on how the OMA recommendation for 'making digital health tools a seamless part of physicians' workflow, including by ensuring different systems can speak to each other' might be achieved, Dr. Kassam offered the following specific recommendations regarding the usage of digital health tools:

- Seamless access: Ensure physicians can seamlessly access patient records and share patient health information among care providers, which would reduce the administrative burden of obtaining patient information;
- Inclusion in development: Involve physicians as key partners from the start in the procurement, design, implementation and ongoing optimization of digital health tools to ensure usability;
- Ongoing training: Equip physicians with comprehensive and ongoing training on digital health tools, beginning in medical school;
- Ongoing support: Provide physicians with easily accessible and ongoing technical support, which can free up time for more direct patient care; and
- Effective innovations: Explore technological innovations including 'virtual scribes' and voice dictation that will reduce and simplify administrative demands, including billing administration.

Virtual scribes, which listen to a patient encounter virtually and give patients a greater sense of privacy by not having someone else present in the room, have already proven to be a valuable and necessary transition from in-person scribes for some physicians during the pandemic.

Doctors and nurses want to be included at the table when new systems are developed: Historically, observes Dr. Nagle, "systems have been designed without the aid of clinicians – up until the mid-2000s when that started to change."

Dr. Kassam's call for physicians' 'inclusion in development' is echoed by Dr. Nagle in her call for nurses to be included in development of the systems they would use. "Nurses need to be involved in the development to ensure the systems work for them. There's a clear recognition now that that is important," says Dr. Nagle. "For example," she adds, "we haven't asked enough nurses about what (information) gets captured in charts. Let's capture the information once and use it many times."

Dr. Nagle also suggests including some patients 'at the table' for development of systems they would use.

Reducing the backlog of delayed appointments, procedures is a current OMA priority: "Right now, we're trying to navigate through the backlog," says Dr. Kassam, referring to the massive backlog of appointments and procedures delayed by the pandemic. "In Ontario," he said, "16 million points of care have been delayed – things like mammograms, cancer surgery and diagnostics, addiction screens and mental health screenings."

The OMA survey has put a spotlight on the dramatic increase in physician burnout in the past year. While Ontario physicians focus on tackling the backlog of appointments and procedures delayed during the pandemic, Dr. Kassam hopes these survey results and recommendations will motivate government, healthcare organizations, and other healthcare stakeholders to drive implementation of new solutions.

"We need more integration. We want to make physicians' tools more integrated, more seamless," says Dr. Kassam.

Microsoft cloud provides ideal platform for ground-breaking imaging technology

illumiSonics' PARS systems needed a solution delivering high availability, scalability and interoperability.

BY NORM TOLLINSKY

IllumiSonics, a medical device company with offices in Toronto and R&D facilities at the University of Waterloo's PhotoMedicine Labs, has selected Microsoft Azure's cloud services to accelerate the commercialization of its ground-breaking optical imaging technology.

illumiSonics' Photoacoustic Remote Sensing (PARS) system uses lasers and the physics of light-matter interaction to identify the optical absorption rates of different tissues within the body.

"The incredibly high-resolution images require cloud capabilities for processing and storage," said Lisa Carroll, Microsoft Canada's National Public Sector Lead. "This innovation in imaging needs a platform that delivers high availability, scalability and interoperability to enable rapid deployment, making illumiSonics an ideal candidate for Azure."

While attempting to source a powerful GPU-powered server for its research, the company realized that no amount of onsite hardware would accommodate its rapidly scaling requirements. A cloud computing solution using Microsoft Azure with its machine learning and assorted capabilities was the ideal solution.

"As we began to transition from a technology development company to a products and partnering company, our needs for a scalable platform that regularly uses the latest technological advances in hardware without requiring regular updates or maintenance on our end became paramount," said illumiSonics Chief Executive Officer Rocky Ganske. "We needed a GPU-inclusive platform capable of scaling with our business and delivering the real-time results of PARS microscopy to what will soon be a steadily growing number of customers."

Real-time, non-invasive pathology is one of the most exciting potential applications for PARS, notes Ganske. "Surgical excision with the goal of removing all of the cancer is an integral part of the treatment for most solid tumors. Deciding how much tissue around the margin of a tumor to remove, however, is seldom obvious because differentiating healthy from malignant tissue by eye or palpation can be highly inaccurate. The current gold standard – post-operative histological analysis – can take anywhere from five working days to several weeks for results to be returned after interpretation by a pathologist."

If the post-operative analysis reveals unexcised cancer tissue, follow-up surgery may be required. However, using PARS imaging while the surgeon is still in the operating room would provide the analysis in seconds and allow for the complete removal of a tumor.

"PARS technology can also be used as an advanced ophthalmology tool capable of real-time, non-invasive eye imaging," said Ganske. "An estimated 1.5 million Canadians suffer from vision loss and an estimated six million more have been diagnosed with sight-threatening eye disease. Canada spends $23.5 billion on vision loss every year even though approximately three-quarters of cases are either preventable or treatable.

"After cataracts, the three leading causes of blindness in Canada are age-related macular degeneration, diabetic retinopathy and glaucoma. These diseases have no cure and because they have no symptoms and no technology can accurately screen for them at their earliest stages, they are usually diagnosed only after vision has been irreversibly affected.

"However, all three diseases have metabolic foundations that with the right imaging tool could be detected pre-symptomatically through abnormal retinal blood oxygen saturation, metabolic rate of oxygen and melanin loss in the retinal pigment epithelium allowing early interventions to prevent or significantly slow vision loss. Currently, there is no clinical tool capable of providing these crucial details, so there is a desperate need for a real-time, non-contact, safe, and accurate ophthalmology tool capable of structural and functional imaging."

The selection of Azure cloud services made sense because of its wide adoption in hospital and research communities and the familiarity of illumiSonics' ultimate customer base with its user interface.

Security was also an important consideration because the patient data collected by PARS microscopy must comply with health information privacy standards.

"The goal has been to adopt a platform that grants us knowledge and control over which of our images can be accessed by a customer," said Dr. Haji Reza, illumiSonics' Founder and Chief Technology Officer. "We also need those images, which can be up to 70 gigabytes in size, to be viewable without requiring download."

"Building and validating HIPAA-compliant platforms takes a lot of investment, both in terms of money and energy," added Ganske. "That compliant modules are readily available as part of Azure was a big plus."

illumiSonics is looking forward to using Azure Machine Learning to accurately colourize image generation, identify cancer cells and build libraries of different cancer images.

"As more people begin using PARS images for diagnostics, Azure AI will play a major role in delivering fast, accurate results," predicted Ganske.

Another important component of Azure cloud services is its Research Centre of Excellence on Cloud (RCEC) service, which helps institutions seamlessly migrate their research workloads to the cloud, scale their research, collaborate with partner organizations and simplify their computing needs.

"At its core, cloud storage enables users to store and share data with ease and security, but Azure is more than that," said Microsoft's Lisa Carroll. "Microsoft's Cloud for Healthcare provides trusted and integrated capabilities that deliver automation for high-value workflows as well as deep data analysis for both structured and unstructured data that enable healthcare organizations to turn insight into action.

"There has been a tremendous increase in the amount of data collected in the healthcare sector with fragmentation and disparate data formats across providers and care teams. The global adoption of Fast Healthcare Interoperability Resources (FHIR) has transformed the healthcare industry by enabling the rapid exchange of medical information electronically between healthcare providers across a single, simplified data management solution.

"This summer, we introduced Azure API for FHIR, which offers a turnkey platform for a cloud-based FHIR service where healthcare providers can quickly connect existing data sources such as electronic health record systems and research databases."

The Research Centre of Excellence on Cloud offering will leverage Azure's capabilities to enable accelerated research outcomes in a secure and trusted environment.

"This research offering will allow our customers to easily collaborate and jointly share their experiences," said Ganske.

Azure will also enable illumiSonics to make the apps and infrastructure it's building available to customers through a subscription-based model. The first of these apps, created with Microsoft's help and using a prebuilt custom vision API from Azure Cognitive Services, allows remote clinicians to view PARS images and automatically identify multiple types of cancer cells.

"Microsoft's Web App development toolkit allowed us to easily deploy a fully functional medical imaging viewer for our clinician collaborators, enabling them to securely access large images from any device, zoom in and zoom out, and validate the quality of our PARS images in comparison with state-of-the-art imaging modalities," said Ganske.

"The hands-on support we received from different teams at Microsoft was unmatched and helped us make the transition from no experience on Azure to being capable of running workloads and deploying applications."

illumiSonics anticipates commercialization of a clinical product in two or three years, but may be ready to introduce a pre-clinical product even sooner.

VoxNeuro technology pointing to the data-driven future of brain health

VoxNeuro is ready to change the way brain health is managed and treated across the globe. Today's cognitive assessments are reliant on subjective measures like patient self-reporting and observed behaviour, opening the door for faulty results. The types of brain health assessments using objective measures that are available today, such as MRI or CT, only scan for structural issues (e.g. lesions in brain tissue, brain bleeds, or damage to the skull) and cannot provide an understanding of a brain's cognitive health.

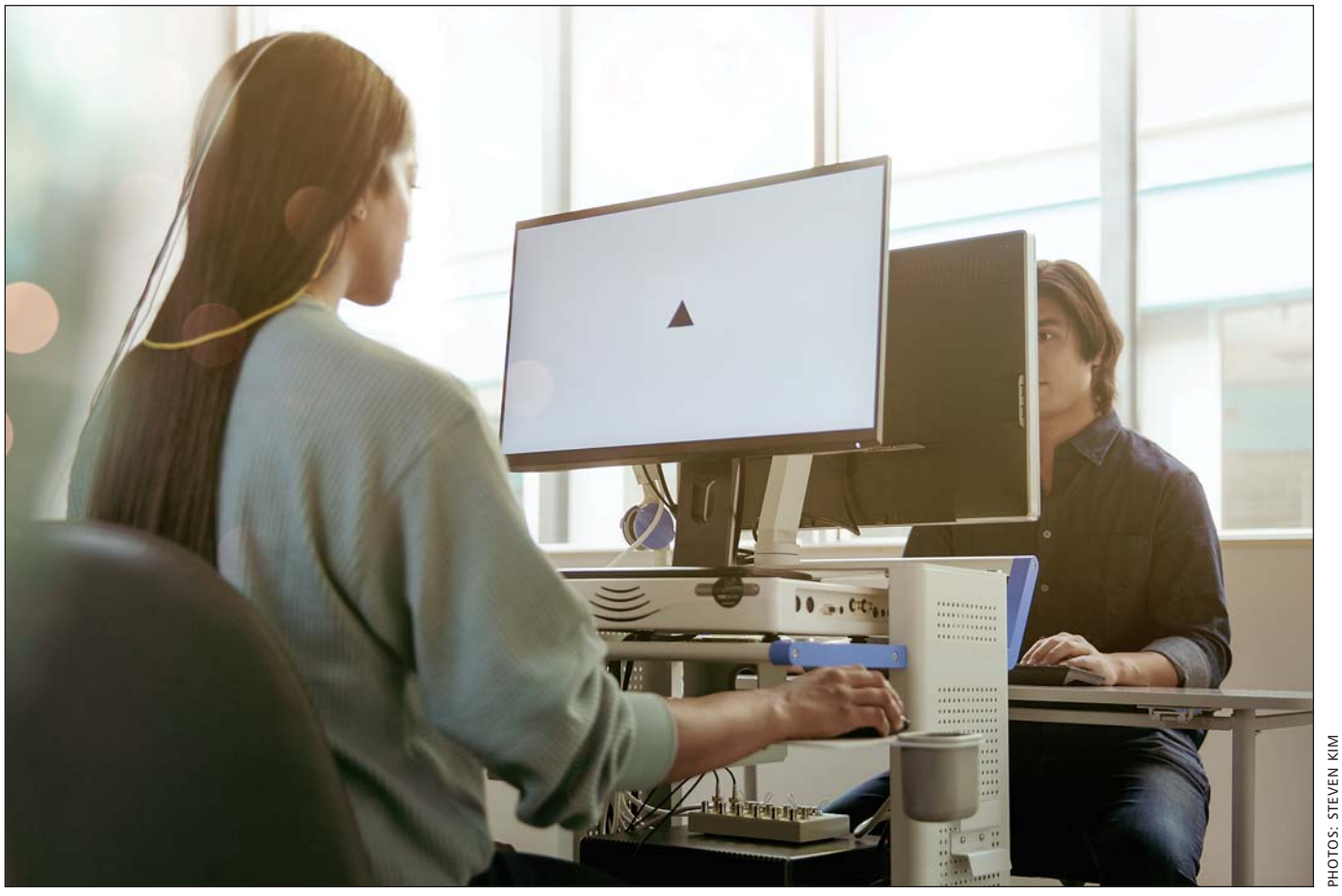
Enter VoxNeuro. The Canadian neuroscience and health tech company has developed a 30-minute, non-invasive Cognitive Health Assessment that uses electroencephalography (EEG) to record tens of thousands of data-points from a patient's brain waves while they perform a series of tasks on a computer. The company's medical software, the Cognitive Health Assessment Management Platform (CHAMP), then rapidly analyzes, transforms and compares the patient data to a database of healthy cognitive function. This is a procedure similar to that used with MRI and CT scans, which compares a patient's brain structure to a healthy brain structure database. The result of VoxNeuro's assessment is a report that objectively scores the patient's cognitive function in the areas of attention and concentration, information processing, and memory.

When used as part of existing protocols to assess brain health, clinicians are now armed with a technology that provides them with a reliable report to support their clinical findings, decision making, and treatment of a patient's condition. The addition of VoxNeuro's technology makes an immediate impact, as clinicians are no longer forced to leverage patient self-reported symptoms or subjective measures of other observable behaviours in order to diagnose an issue. Instead, they can now accurately measure the neurophysiological health of a patient's brain.

Dr. Abdel Kaleel is a neurologist and the owner of HeadworX Neurology Clinic in Kitchener, Ontario, one of five sites across southern Ontario where VoxNeuro's technology is currently available to patients.

"VoxNeuro rounds out my practice very well and acts as an extension to our clinical exam, allowing us to develop a more realistic and complete picture of the patient's road to recovery," says Dr. Kaleel. "With the addition of VoxNeuro, our patients can feel very comfortable that we have the most current means of giving them a true understanding of their condition and a way to ensure their treatment is working." He concludes, "With the objective data provided by VoxNeuro, we will be better able to determine if a patient's cognitive concerns warrant further investigations or management options."

With its success in southern Ontario, VoxNeuro now seeks to continue scaling across North America. This fall, the company launched in the USA through a network of diagnostic imaging centers in New York state. It will also soon be deploying at the first of many neurology clinics in the south-eastern United States where its assessment will become available in the next 12 months. VoxNeuro plans to be operational in approximately 100 clinics in North America by the end of 2022.



PHOTOS: STEVEN KIM

VoxNeuro has developed a 30-minute, non-invasive Cognitive Health Assessment that uses electroencephalography (EEG) to record tens of thousands of data-points from a patient's brain waves while they perform a series of tasks on a computer.

As VoxNeuro continues to grow, so do its ambitions to improve cognitive health by taking brain healthcare into the future. Data-driven at its core, the company seeks to build the largest database in the world on neurophysiological measures of cognitive function. The database will fuel unprecedented insights that can be leveraged to improve patient diagnosis and treatment – a process that has already begun.

With the use of machine learning, VoxNeuro's database has enabled the identification of neurophysiological biomarkers that reflect whether a patient who has suffered a concussion is experiencing a level of cognitive dysfunction that requires therapeutic rehabilitation. As the Cognitive Health Assessment becomes more widely used, its normative database will grow ever-larger. Machine learning will continue to be used to parcel out the key factors that affect brain health for certain conditions, such as dementia or Alzheimer's, and to establish biomarkers that can help with early detection of these conditions.

VoxNeuro's goal is to get to a point where its normative database reaches a scale that would enable personalized treatment, informed by a data set of comparable circumstances. The future of VoxNeuro's work is to be able to identify the optimal treatment for individuals, depending on their specific situation and conditions, through continual collaboration with healthcare providers and systems and the use of machine learning. With the use of artificial intelligence, the company believes it may even be possible to administer therapeutics at specific moments where they'll be most effective. For example, VoxNeuro's scientists envision this being useful in identifying comatose patients on the verge of emerging. In this case, notifications could be sent to attending healthcare personnel that a particular patient's prognosis is improving. Even information relevant to a patient's chances of being rehabilitated after their emergence based on their cognitive state could be sent.

As brain health becomes more emphasized in healthcare, VoxNeuro aims to become an integral part of people's lives. The company sees a future where its Cognitive Health Assessment can be incorporated into annual checkups to promote long-term well-being and prolonged quality of life, be integrated into pharmaceutical trials to add an objective data point and prove effectiveness, and be provided through remote healthcare services for enhanced and more convenient monitoring of brain health.

VoxNeuro is backed by 30+ years of globally celebrated, peer-reviewed scientific research, which has shown time and again that their technology has the speed, accuracy and objectivity to offer nearly limitless clinical applications. As of this summer, VoxNeuro is an FDA Registered Medical Device Establishment, while their medical software, CHAMP, is listed as a Class II Exempt Medical Device in the USA and a Class II Medical Device in Canada.

GE Healthcare offers radiology departments access to innovative AI tools

Edison True PACS[1] aims to help healthcare organizations keep current with rapidly evolving technology.

GE Healthcare has developed a next-generation, cloud-based Picture Archiving and Communication System (PACS) that aims to help healthcare organizations keep current with rapidly evolving technology, relieve the pressure on capital budgets and free up IT resources. The subscription-based diagnostic imaging solution called Edison True PACS encompasses diagnostic reading, exam workflow, AI Applications, 3D post processing, enterprise visualization and archiving in a single platform.

Currently available in the United States, GE Healthcare is preparing for a Canadian launch in 2022.

What distinguishes Edison True PACS from traditional PACS systems is how it offers radiology departments access to innovative artificial intelligence tools, claims Peter Eggleston, GE Healthcare's Global Product Marketing director for radiology. "We see the cloud as a way to democratize access to AI because the reality now is that the AI market is fragmented. There are a lot of different vendors focusing on very narrow areas and the cost to an organization to work with all these vendors is very high."

GE Healthcare simplifies the adoption of AI through what it calls the Edison ecosystem. "We take away a lot of the work of finding, acquiring and standing up the AI," said Eggleston. "In the cloud, it's very easy for us to provision new services, so we can greatly shorten the amount of time it takes for an organization to adopt AI. And, it's only one vendor, GE, that you have to work with because we serve as a distributor of AI tools through resell and distribution agreements we have with third parties."

Currently, GE Healthcare offers AI algorithms that are available through Edison True PACS, but it's working with more and more companies that are developing algorithms for a whole suite of AI use cases, noted Matthew Collingridge, General Manager of GE Healthcare's Digital Solutions Group. They include for example, algorithms being developed to help identify and prioritize likely cases of pneumothorax, stroke and cancer, speed workflow and help enhance diagnostic confidence.

"AI is gaining confidence among users," said Eggleston. Aside from prioritizing studies that are truly critical, "it's good at doing things like measuring and quantifying physiological changes compared to previous readings and identifying things that aren't visually perceptible to humans because the comparative data is so low or it's so small. "Acceptance of AI is pretty high because radiologists are always concerned that they're going to miss something," he added. "They'll tell us, for example, that they feel like they've got a second set of eyes and that somebody is watching their back."

A study by the American College of Radiology found that clinical adoption of AI by radiologists went from virtually zero to 30 per cent from 2015 to 2020. Other studies cited by GE Healthcare have found that read times using AI applications are 26 per cent[2] faster for evaluating lung nodules and up to 60 per cent faster for evaluating multiple sclerosis cases[3].

Radiologists see the value of AI, "but haven't had an easy way of using it. That's what the Edison ecosystem does," said Eggleston.

"We're excited about the next 24 months," commented Collingridge. "We see a number of new technologies emerging that have had early clinical validation and we now need to push into broader access that we think will benefit not only the large institutions,

but also many of the rural and regional areas. We're embarking on an initiative in Quebec, for example, to bring AI access to radiologists serving rural areas."

GE Healthcare's Edison True PACS is deployed on the Amazon Web Services in the United States to ensure a high level of security and data protection, so hospital IT departments don't have to worry about maintaining all of the security and intrusion protocols themselves. It also takes care of software upgrades, freeing IT staff to spend their time on other enterprise challenges.

Neuro Imaging Winter Park, an imaging centre in Florida, is one GE Healthcare customer that saw the value of a cloud-based PACS during their evaluation of the cloud based solution.

"With storage getting so expensive and constantly having to switch out drives, maintain them and make sure the RAID arrays are in good shape, it just makes sense to have it hosted offsite," said Richard Duemmling, Neuro Imaging's Chief of Business Operations. "If we have a fire or there's a cyber attack on our network, we are likely in a better position with our data on the cloud-based PACS. It's also easier and less expensive to deploy a new PACS because we don't have to buy new server hardware. We don't have to maintain it, or worry about operating software updates and patches. There are a lot of hours involved in maintaining an onsite server and when you go with a cloud-based solution, IT infrastructure is effectively managed as a Service. If you don't have a big IT team that's constantly dedicated to making sure everything is up to date, then you're at risk." A cloud-based PACS is also ideal for hospitals forced to leverage outsourced or distributed reading due to increasing workloads and the shrinking radiologist workforce, said Eggleston because "if you're initiating a relationship with a third party and everything is in the cloud, it's much easier to connect and scale that infrastructure to another organization."

Matthew Collingridge

Pete Eggleston

Edison True PACS is available through software as a service (SaaS) or on premise in three subscription-based models: Edison True PACS Technologist, Edison True Essentials and Edison True Professional. Hospitals opting for the on premise solution look after their own storage. For the SaaS solution, "we manage the servers and everything that goes along with that such as the third-party software, and since we manage them, we're also responsible for keeping them updated, so the customer doesn't have to do that," said Eggleston. "When you're on premise, software updates often incur charges or disruption. Usually, you have to find a server to stand it up and test it because you don't want to just take it and put it into production, so there's time and cost there. With the SaaS version, you don't need to do any of that." The on premise offering "is a toe in the water to help healthcare providers and hospitals move to a more native cloud environment where things can be more seamless and secure, particularly from the threat of cyber risks, and enjoy the advantage of continuous improvement and upgrading of functionality and features," said Collingridge.

Edison True PACS Technologist accommodates the QA or technologist workflow and is designed for organizations that just acquire the images and outsource the reading. Edison True Essentials includes a diagnostic viewer and the basic requirements for diagnostic reading. Edison True Professional is for organizations that want all the latest technology, including GE Healthcare's Open AI Orchestrator that can integrate AI tools into the radiologist's workflow.

Cloud technology, interoperability and AI have all reached a state of maturity that was required for the launch of a cloud-based picture archiving and communication system, said Collingridge.

"Edison True PACS," he predicted, "lays the groundwork for what we think will be an exciting two or three years in Canada for machine learning."

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1. Edison True PACS Solution consists of the following products: Universal Viewer, Enterprise Archive, Centricity Universal Viewer Zero Footprint, Edison Open AI Orchestrator and 3rd party AI applications
2. Source: Riverain Technologies Medical DeltaView FDA 510(K) Reader Study Results, 2011
3. Source: Lo, S. B., Freedman, M. T., Gillis, L. B., White, C. S., & Mun, S. K. (2018). JOURNAL CLUB: Computer-Aided Detection of Lung Nodules on CT With a Computerized Pulmonary Vessel Suppressed Function. *American Journal of Roentgenology*, 210(3), 480–488. doi: 10.2214/ajr.17.18718

App helps Canadians access services while waiting for a family doctor

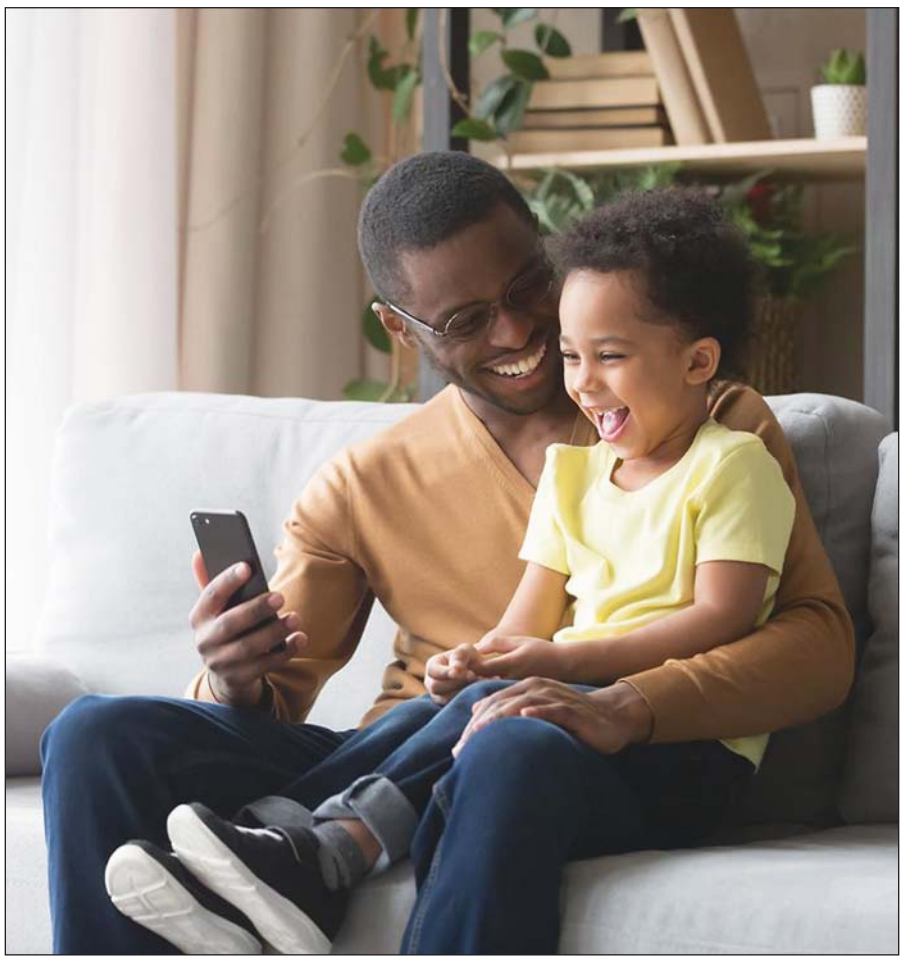
The most recent Physicians in Canada report, commissioned by the Canadian Institute for Health Information (CIHI), showed that for the last 13 years, the growth rate of the physician population has outpaced that of the general population. However, according to Statistics Canada, roughly 4.6 million Canadians in 2019 didn't have access to a family healthcare provider.

Canadians needing immediate healthcare support, whether it's because they live in rural or remote communities, have no luck on waiting lists, or don't have timely access, either delay care or end up in busy emergency rooms and healthcare clinics. Though the impact is not always obvious, putting off healthcare can have long-term effects, especially to those with pre-existing health conditions.

These are issues the booming telehealth industry is trying to address. For example, Maple, a leading virtual care platform, has seen tremendous growth and adoption during the pandemic, eliminating barriers to accessing healthcare for Canadians who didn't have a family healthcare provider prior to the pandemic and for those worried about leaving home during a public health crisis.

Founded in 2015 with a vision to improve healthcare accessibility and relieve pressure from hospital systems, the Maple platform has since supported long-term care homes and independent clinics, implemented virtual emergency room support for busy hospitals, and provided care for patients without primary care doctors in various provinces.

"After years of practice, the strains on our healthcare system became clear to me," said Dr. Brett Belchetz, CEO and co-founder at Maple, and practicing physician. "I knew there was a role that technology could play in improving the sustainability of our system and people's healthcare experiences across the country."



Prior to the pandemic, there were roughly 47,000 people on the Need a Family Practice Registry in Nova Scotia, a provincial list of those looking for a primary care provider. Last fall, the number of people adding their name to the registry began to rise.

Dr. Gail Tomblin Murphy, vice president of Research, Innovation and Discovery and chief nurse executive at Nova Scotia Health, recognized an opportunity to leverage the adoption of virtual care that had been occurring in the province during the first two waves of the pandemic and apply it to those on the registry.

In May 2021, Nova Scotia Health launched VirtualCareNS, a proof-of-concept initiative where local family doctors and nurse practitioners provided care delivered through the Maple platform. This started with a few communities that had the highest number of unattached residents, with access expanded over the summer to communities in the northern and western parts of the province. A gradual expansion is planned for the rest of the province beginning in December.

"Our Research, Innovation, and Discovery team has worked closely with the Department of Health and Wellness, Primary Health Care and other health system partners to find a solution to provide virtual care for those who have been on the Need a Family Practice Registry the longest," said Dr. Tomblin Murphy. "VirtualCareNS is based on best evidence and examples in other jurisdictions and provides another option to access care for those who are without a family doctor or nurse practitioner."

Thanks to the successful implementation of VirtualCareNS, unattached patients in Nova Scotia are now able to get virtual diagnoses, referrals to specialists, prescriptions, and lab requisition forms all within the Maple platform, which can be accessed from a smartphone, tablet, or computer.

So far, VirtualCareNS has seen promising results, with over 1,600 consultations over a four-month period.

One reason for this success can be attributed to Maple's easy-to-use platform. "As evidenced by the thousands of Canadians accessing care through our platform every day, Maple was built with the patient and provider experience at the forefront," says Peter Forte, director of Public Sector Business Development at Maple. "A big focus of ours is to be seen as a partner and ally in furthering the modernization of Canadian healthcare, versus a standalone solution that exists in parallel to the traditional healthcare system."

Hospitals, clinics, and long-term care homes have started taking notice of the benefits of a virtual care offering because of its ability to enable a more modern and tailored care experience for patients. Maple's technology platform has been used to take pressure off of hospital emergency departments, reduce wait times for specialty clinics, and help with staff shortages across care systems. In addition, long-term care homes have benefited from this technology, leveraging Maple to facilitate services like remote bedside consultations and provider-to-provider care collaboration.

To learn more about Maple's virtual care technology solution for hospitals and other healthcare systems, visit their website at www.getmaple.ca

Syngo Carbon provides enterprise-wide image reading and reporting

OAKVILLE, ONT. – Syngo Carbon is Health Canada licensed and is now commercially available in Canada. The new platform has been designed by Siemens Healthineers to provide clinicians with easy access to all relevant data generated in the processes of imaging and reporting.

While in theory, companies and researchers have been saying for years that radiological and other imaging data have been unified, in practice, clinicians have found obstacles to accessing the information they need.

Syngo Carbon has been created to quickly and easily reach the images and data contained in various silos and to make it easier for different areas to work together.

"With our daily clinical environment being so highly fragmented, we face a demand to have clinical images and datasets meticulously prepared and enhanced using AI, and to ensure knowledge can be shared," said Niles Geminiuc, director of Digital Health and Business Development, Siemens Healthineers Canada.

"Many clinical departments have different image management systems for archiving and drawing up findings. That means reports can differ, and the data isn't always available. Syngo Carbon enables our customers to break down barriers in Enterprise Imaging and Reporting. It provides holistic insights across departments and responsibilities to meet certain decisions along the patient pathway."

Syngo Carbon protects existing investments by integrating and continuing to use existing technologies and data. It also incorporates existing Syngo solutions conveniently and seamlessly. Its open data concept is another key aspect in making it possible to incorporate third-party solutions, enabling data management and archiving systems from various departments within a hospital to be combined and consolidated.

> **Syngo Carbon protects existing investments by integrating and continuing to use existing technologies and data.**

Integrated AI tools help with the efficient performance of image-based diagnostics. Unlike a traditional Picture Archiving and Communication System (PACS), the focus in this case extends beyond only DICOM-based medical images.

Syngo Carbon works with all image-related data of relevance for diagnostics and decision-making. Examples include images from pathology, endoscopy, and cardiology, and information generated as part of a longer process, e.g. camera images from surgery to document the condition of a wound.

Syngo Carbon is said to be the starting point for a new type of organization-wide system for imaging and reporting, which combines existing technologies to form a unified solution. Refinements are made in close collaboration with users. Thanks to its open architecture, it can adapt to constantly changing conditions, modules and functions can be expanded, and the system can be scaled to suit customer needs.

For more information, visit siemens-healthineers.ca/syngo-carbon

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A BETTER WAY TO WORK

How can we improve the security of Canadians' healthcare information?

BY ABIGAIL CARTER-LANGFORD

While we have seen impressive advancements in virtual care and digital health tools during the pandemic, a recent survey found that 74 per cent of Canadians are worried about the privacy and security of their personal health information. This is because cyber attacks that affect the integrity of healthcare quite literally hit Canadians where it hurts most. The risks associated with these attacks, such as the loss of access to or misuse of one's critical healthcare information, are pain points for patients across the country.

Both before and during the COVID-19 pandemic, healthcare information has been a focus of attack among bad actors. However, it is also clear that digital health solutions and virtual care, which is any interaction between a patient and a healthcare provider that doesn't involve direct contact, such as a video or phone appointment, are here to stay. According to a Canada Health Infoway survey, 51 per cent of patient-reported visits are now virtual, over double pre-pandemic levels.

This data reveals that while Canadians have concerns about privacy and cybersecurity when it comes to their health information, they still want virtual care and digital health services to exist. Someone who is cautious about privacy is not inherently anti-digital, but it does mean they expect their information to be privacy protected. That is why it is more critical than ever for physicians, pharmacists and patients to choose trusted providers within the digital care space that prioritize privacy and security.

Take the prescription process, for instance. e-Prescribing services like PrescribeIT modernize the prescription process by enabling physicians to electronically transmit a prescription directly from an Electronic Medical Record (EMR) to the pharmacy management system of a patient's pharmacy of choice. e-Prescribing can be a significant asset when in-person visits with healthcare professionals are not possible or recommended, which has certainly been the case over the course of the pandemic. Prescribers and pharmacies can also send secure clinical communications to each other through an integrated messaging tool, permitting them to quickly align on an appropriate course of action and provide the best approach to medication for their patients.

Of equal importance, e-prescribing decreases the risk of privacy breaches due to fax transmission issues or unsecured email. When we compare the old paper world to the new digital world, we often consider the risks associated with the latter much more critically than the former. Fax is the most common transmission tool used within healthcare, yet fax machines do not have any security or protection features to protect patient data. There is no record or accountability to show who has seen the information that comes through a fax machine, nor is there a way of guaranteeing that data ends up in the right hands.

Conversely, digital tools like e-prescribing allow physicians and pharmacists to know where the information on a prescription has been, who has seen it, and whether it has arrived at the intended destination. Before a care provider can use PrescribeIT, their identities and credentials are verified. The credentials they use must be unique, and they must use two-factor authentication to place an order. Security controls are in place to ensure that the information shared is protected from inappropriate disclosure and from tampering.

In the same way Canadians have come to expect that their banking information will be kept safe, patients need the assurance that their healthcare information will be kept safe end-to-end. The beauty of something like e-prescribing is that data is encrypted, in transit and at rest, using industry standard cryptographic algorithms to significantly improve data integrity, with antivirus and firewall protections also in effect to combat the risk of data loss and manipulation or cyberattack.


Abigail Carter-Langford

It is also important that a patient feels confident their information is being used only for the benefit of their own healthcare. Concerns that the information will be sold or otherwise exploited for profit are real among Canadians, making the choice of trusted digital health providers and tools all the more important. Services like PrescribeIT, for instance, have data protection woven into their DNA, and work closely with ministries and oversight bodies to prioritize transparency and the protection of patient data from commercial exploitation.

While there are risks associated with any form of aggregated electronic information, we must ask ourselves if those risks outweigh the rewards, and secure digital health tools have proven themselves to be fundamental to receiving good quality care. In the same way that someone chooses to get into a car – despite the risks – to perform essential tasks, digital health tools play an essential role in improving a patient's healthcare journey. To someone who has experienced the benefits of virtual care first hand during the pandemic, the notion of having to go somewhere and experience the potential of additional risk, in order to get a prescription that could have been readily, safely and securely sent to their pharmacy of choice using e-prescribing, seems counterintuitive.

As we look beyond the pandemic, the question will no longer be whether we continue to implement electronic tools like e-prescribing into our healthcare system. Canadian patients, physicians and pharmacists across the country have already answered that with a resounding yes. The question will be how to implement these tools safely, ensuring that their benefits outweigh their risks. When it comes to e-prescribing, this means investing in the latest security measures and equipping physicians and pharmacists with the tools and information they need to prioritize privacy and cybersecurity throughout the prescription process.

Abigail Carter-Langford is Chief Privacy & Security Officer and Executive Vice President, Governance, Risk & Compliance at Canada Health Infoway. Since 2017, she has worked to promote Infoway's commitment to addressing health information governance, including the privacy and security of personal health information, throughout the digital health industry and within Infoway.

Sustaining the strides recently made in digital health

BY DANIEL MARTZ

The COVID-19 pandemic has been a catalyst for innovation, and has forced Canada's health ecosystem to reimagine its capabilities. In the past year alone, we've learned a lot about the shifting healthcare needs of Canadians, including the importance of adaptability and flexibility when it comes to how we access care.

Prior to COVID-19, timely access to primary care support was a challenge for many people in Canada, and the pandemic exacerbated these issues. Many Canadians have continued to delay care out of fear of being exposed to the virus in clinics and hospitals, or have had care delayed as a result of the pandemic response. While Canada's healthcare system still faces significant COVID-related hurdles, solutions such as virtual care have shown us that digital services are now an essential component of our healthcare system.

According to the *Canadian Medical Association Journal*, by June 2020, virtual care represented more than 70 per cent of ambulatory care provided by hospitals and doctors' offices. As of March 2021, more than five million virtual care appointments had been conducted in Canada. TELUS Health met the urgent demand by leveraging its suite of existing digital health tools, already used by Canadians long before the pandemic hit, and new digital health tools. The accelerated focus that the pandemic placed on virtual care inspired us to quickly bring new services into the hands of Canadians who needed them most, across a variety of healthcare issues.

One of the most pressing issues faced by Canadians throughout the pandemic has been mental health challenges. According to Statistics Canada, since the onset of the pandemic, 55 per cent of Canadians reported having good or excellent mental health; this is a 13 per cent drop from 2019. In response to growing mental health concerns, TELUS Health expanded its virtual care services beyond primary care to include access to mental health counsellors and other well-being services, to ensure Canadians and their families felt supported in every aspect of their healthcare journey – both physical and mental. Understanding that a one-size-fits-all approach to care never works, the company also launched Espri by TELUS Health, a mobile app specifically designed to deliver mental health resources that support the unique, ongoing and ever-changing challenges faced by frontline workers.

In addition to providing a variety of services and support to patients, virtual care has also enabled Canadians to rethink how they're able to access care. For example, the ability to access care from the safety of their homes has forced Canadians to rethink what they want from their careers, employers and health benefits plans, and has them looking to their employers to support them with flexibility, including both in-person and virtual clinical services. TELUS Health Care Centres enables Canadians to do just that, offering a variety of services from preventive health assessments, wellness coaching and primary care, to nutrition, mental health support, and occupational health.

> **One of the most pressing issues faced by Canadians throughout the pandemic has been mental health challenges.**

The end of the pandemic won't mean the end of shifting health needs and expectations in Canada. Looking ahead, 2022 needs to be about strengthening a system that will support advancements such as virtual care in the long-term and across the entirety of the care continuum. Technology enables access to services and interventions that address not only current challenges and changes, but also those that will continue to impact Canadians long after the pandemic. In response to these growing obstacles, TELUS Health diversified its offering to meet the unique needs of many diverse demographics, providing support where and when it is needed.

Moving forward, we must ensure innovative solutions are designed so they can be adapted to meet the unique, constantly evolving needs of all Canadians, throughout the entirety of the patient journey, and foster a healthcare ecosystem that supports sustainability into the future.

Daniel Martz is vice president, Virtual Care, TELUS Health.

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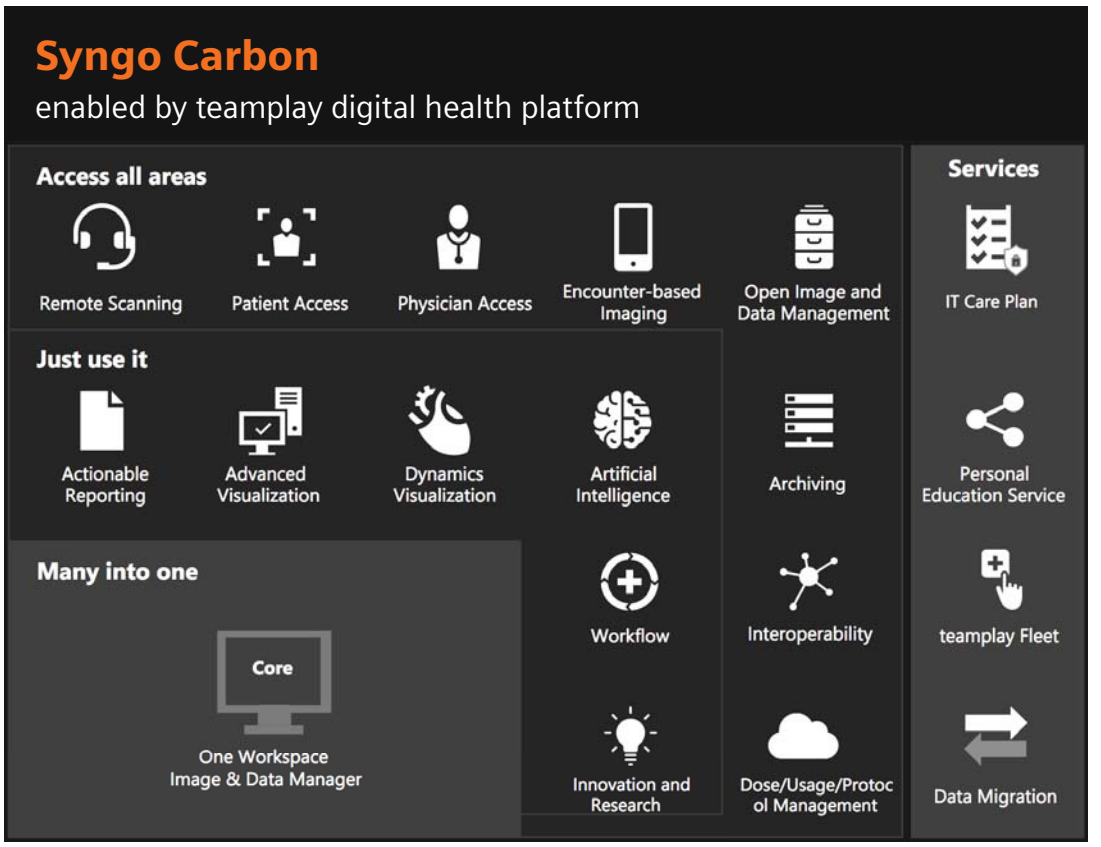

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New technology at SLMHC brings more precise breast cancer surgery

BY IRENE DUBE

In September 2021, Sioux Lookout Meno Ya Win Health Centre's surgical team received the new Sentimag Localization System that will be used for breast procedures. The Sentimag system uses magnetic sensing to detect magnetic markers using the Magseed or Magtrace method. Pictured, left to right: Jeremy Doke, Sentimag representative, Dr. Eric Touzin, Dr. Justin Poling, and Dr. Matthew Parkinson.

SIOUX LOOKOUT, ONT. – For years, patients with breast cancer who required a lumpectomy have undergone a multi-step process on the days leading up to their surgery. The process is often uncomfortable for patients and can sometimes cause delays and added stress on patients. But now, here at Sioux Lookout Meno Ya Win Health Centre (SLMHC), we are thrilled to announce the purchase and use of the Endomag system – a game-changer for breast cancer patients.

"Compared to a conventional procedure known as wire localization before breast surgery, our newly purchased Endomag system allows the diagnostic imaging department to precisely mark the sites of lesions and tumors in a highly accurate method that can occur at the time of biopsy, which eliminates the need for additional procedures to occur immediately before the surgical intervention," explains Dr. Neety Panu, lead radiologist at SLMHC.

Not only is this cutting-edge technology making it easier for the SLMHC health team and our patients, but this is an important step forward for rural hospitals, as SLMHC is now the first hospital in northwestern Ontario, and one of only two rural hospitals in Canada, to adopt this technology and demonstrate that this kind of technology can be accessible to more Canadians.

"We could be at the forefront here with this technology, as many smaller hospitals like ours experience logistical challenges for breast cancer patients," explains Dr. Justin Poling, surgeon at SLMHC. "There are hundreds of hospitals like ours who I think we could be a really good example for, and this technology has potential to be game changing for Canada's geographically-distributed population."

The Endomag system process starts with a tiny Magseed marker, that is easily placed by the radiologist before the surgery. Ideally, it is placed at the time of biopsy so that the patient requires only one visit/procedure before surgery in order to mark the exact site of breast cancer. Once placed, it can't be broken or dislodged in any way, and it is detectable using a Sentimag probe. The use of Magseed markers at SLMHC provides patients with a more accurate placement of a detector pre-surgically, and enables a more seamless transition to their surgical care and a better outcome post-surgically.

Prior to this, a wire would have been inserted into a patient's breast on the same day as the surgery. This meant that patients would first be scheduled with the radiologist in the diagnostic imaging department, and then make their way to their scheduled surgery. Coordinating the care between two different departments creates a logistical challenge, and also requires a two-step process for the patient (the first step at the time of biopsy and the second being a very early start on the day of the surgical excision).

"In the past, if a lesion or area of concern was spotted and surgery was recommended, a patient would be booked for when the radiologist would be on-site for the localizer wire insertion. Because the wire could come loose or be dislodged, the wire insertion and surgery needed to be the same day," explains DeAnna Lance, medical radiation technologist at SLMHC. "This meant that all our breast surgery patients would be booked ahead to meet the schedule requiring coordination between two very busy radiology and surgical departments. Now, with the Magseed technology, the radiologist can implant the Magseed at any time and it will stay there until it is surgically removed. This means we can have patients have their biopsies/Magseed placement independent of department schedules, and this removes a big hurdle in logistical care for the patient."

SLMHC is now the first hospital in northwestern Ontario, and one of only two rural hospitals in Canada, to adopt this technology.

"It really frees us up with regards to a lot of scheduling challenges," adds Poling. "It makes us less dependent on the time frame. Not only that, there are so many other benefits to our patients, including a lot less travel and stress. A patient might have had to drive to Thunder Bay to get a radioactive tracker injected at the end of the day, then once injected they'd have to drive back right away since we would only have 12-18 hours to operate after that injection. In the middle of winter, driving on a dark highway at night and worrying about your surgery the next morning… this was obviously stressful for our patients."

Now, our team at SLMHC can inject a patient with Magtrace and that need for radioactive tracer injection and back-and-forth travel to Thunder Bay is eliminated.

The use of Magseed markers at SLMHC was made possible through the generous support of the SLMHC Foundation, which provided approximately $95,000 in funding after the SLMHC team sent their proposal in for the equipment request this past summer.

"Our rep at Endomag said this was one of the quickest turnarounds for the time between the presentation of the technology to the processing of the purchase… we are thrilled that the SLMHC Foundation understood how valuable this equipment purchase was to our patients and team and that they acted so fast to make this dream a reality," says Poling.

"The breast imaging department and patients are truly grateful for the SLMHC Foundation in bringing this new technology to our region," adds Lance. "We are able to improve the efficiency and decrease the time delays of patients requiring surgical removal of suspicious or cancerous breast lesions."

For other rural hospitals looking at the purchase of the Endomag system, Poling adds that while it does cost a lot up front, it does save the healthcare system more over time.

"With a huge reduction in travel costs related to breast cancer treatment and surgery, this new technology saves the healthcare system a lot of money. There are a lot of rural hospitals across Canada that have well-trained breast surgeons not able to do breast procedures because of significant logistical challenges. This new technology is going to open doors for a lot of hospitals to reinitiate breast cancer programs and provide better care for patients. I think we are setting a really good example," adds Poling.

"In the era of COVID-19 and throughout this pandemic, there have been many hardships in healthcare across the country. However, despite all of that, to see a project like this lift off quickly and efficiently speaks volumes to the level of collaboration between our physicians and administration here at SLMHC," says Panu. "We can't thank the Foundation enough for seeing the value in this, how it will positively impact so many patients and their families."

"SLMHC is thankful for the continuous support of the SLMHC Foundation, and the tireless work of volunteers and community members, who ensure crucial funding is provided for necessary equipment and upgrades at SLMHC," adds Heather Lee, president and CEO of SLMHC. "We're excited to be a part of something so innovative, and to be providing better care closer to home."

After training and completing trials of the technology at SLMHC, the surgical and diagnostic imaging team is excited to announce that the technology is here and already in use for breast cancer patients. SLMHC is proud to continue growing our care capacity as we strive to provide crucial services to keep quality healthcare.

To learn more about the important work the Foundation does, visit the Foundation website at www.slmhc.on.ca/foundation. To learn more about SLMHC's mammography services and breast care in our diagnostic imaging department here at SLMHC, visit slmhc.on.ca/di.

Irene Dube is corporate communications manager at Sioux Lookout Meno Ya Win Health Centre.

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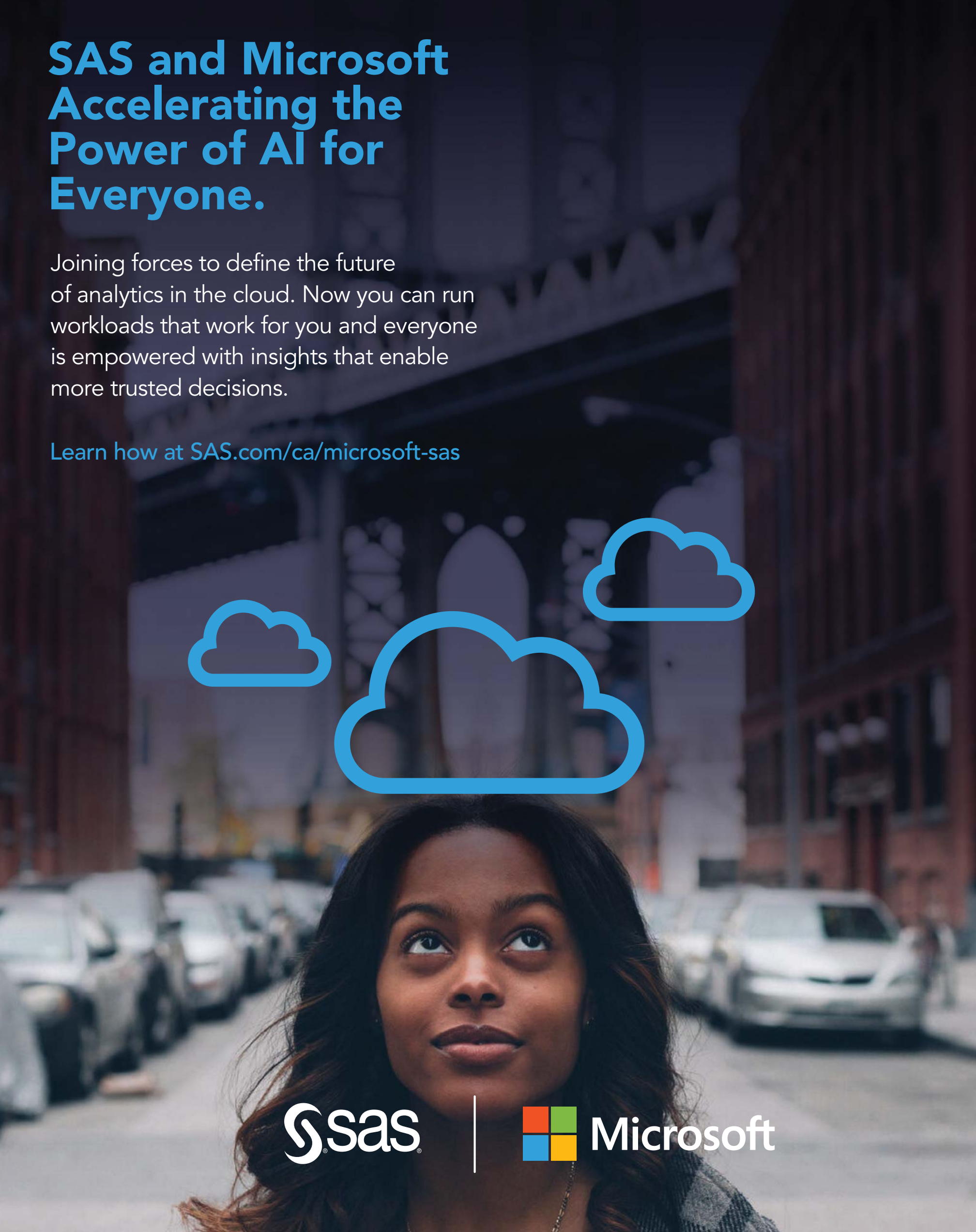


VIEWPOINT

MIIT 2021: How to correct biases and inclusion issues in radiology and medicine?

The first steps are to be aware of the biases being generated by technologies, and of systemic social biases.

BY DAVID KOFF, MD

With the ongoing pandemic, and no prospect to return to an in-person meeting in 2021, MIIT has again been delivered online this year, but with a different format. Instead of a full day conference, the program committee decided to divide the conference talks into a session in Spring and one in Fall, as well as a keynote talk and several panel discussions.

Lectures were uploaded and made available for participants to view at their own pace, followed 10 days later by a roundtable discussion with the speakers. In an environment where many webinars are offered to our public of professionals, we wanted our conference to be as flexible as possible.

We've been privileged that Dr. Rasu Shrestha agreed to deliver the keynote address at the kick-off session. Dr. Shrestha is chief strategy and transformation officer at Atrium Health, one of the largest not-for-profit health systems in the United States. He told us about the new VUCA (volatility, uncertainty, complexity, ambiguity) environment we are living in and how it brings us unique opportunities to re-imagine and re-build.

Other speakers gave us their perspective on a number of topics related to medical imaging and its future, with of course a share for artificial intelligence and a special focus on the human impact of our initiatives. As I cannot quote them all, I'd like to highlight three of the talks.

Dr. George Shih, an associate professor of Radiology and Vice-Chair Informatics at Weill Cornell University in New York, told us about "Bias and Fairness in Artificial Intelligence", a major issue with the exploding development of AI-based solutions designed to assist radiologists, where AI detects abnormalities and generates reports.

But AI is not always accurate. A good example is facial recognition where algorithms don't perform as well on women and people with dark skin, with one highlighted case leading to jail time due to incorrect identification. This unfortunately also applies to healthcare where AI would not discriminate based on attributes, and will not take into consideration minority populations, minority diseases, and minority manifestation of diseases.

The issue of Bias and Data was raised in a recent joint statement between the American College or Radiology, European Society of Radiology and Canadian Association of Radiologists, titled "Ethics of AI in Radiology" and published in the journals of all societies in 2019.

The document, which calls for the implementation of a Code of Ethics for the use of AI, states that "ethical use of AI in radiology should promote well-being and minimize harm resulting from potential pitfalls and inherent biases" (source ACR, Oct 1, 2019). Bias is a systemic deviation from the truth, which may happen when the sampled data do not represent the population accurately or when the reported data does not represent the real world.

Dr. David Koff

Aiden Kivisto, is a Trans Educator, developing organizational policies for healthcare institutions, and providing workshops for non-profit, social welfare sector organizations on gender and sexuality. His talk addressed "The Patient Perspective on HL7 Updates," and he also told us about his personal story of gender transition, helping him breaking down social barriers for staff with little experience of the trans community.

Aiden participates in the Infoway Sex and Gender Working Group whose goal is to develop and implement a strategy to modernize Gender, Sex, and Sexual Orientation (GSSO) documentation in Canadian Electronic Health Records.

The focus is on policy and practice to integrate the best GSSO information with organizational structures, policies, and workflow processes. The "HL7 Gender Harmony project" aims to use model information (data elements, value sets, code systems) to define and harmonize some aspects representing sex and gender. The project takes into account user needs including the LGBTQ community and patients.

Ameena Elahi is a senior technical analyst at University of Pennsylvania, the international director of Informatics Operations, RAD-AID informatics and a board member of SIIM, the Society for Imaging Informatics in Medicine. She told us about "Imaging Informatics and Global Health Outreach," and her successful experience implementing a PACS system in a University Hospital in Nigeria.

RAD-AID is an amazing charitable organization, started in 2008 at Johns Hopkins, and whose mission is to improve access to radiology services in the low- and middle-income countries (LMIC) as well as in underserved areas of high-income countries (HIC) like Canada. With more than 14,000 volunteers from 140 countries, they are present in over 38 countries. Ameena told us about their challenges, and how they followed a rigorous Assessment-Planning-Implementation-Training-Analysis strategy to achieve their goal. She also told us how artificial intelligence can improve radiology access in LMIC, and how with the support of a Google Foundation Grant, they developed ways to detect and correct racial bias in AI, to be used in resource-poor hospitals.

These talks gave us good examples of all the work performed to understand and correct biases and discrimination, being artificial intelligence dealing with minority populations, minority diseases and minority manifestation of diseases, Electronic Health Records integrating Sex and Gender considerations or divide between high and low/middle income countries access to radiology. Of course, there is more to do, but all the hard work solving inequities must be acknowledged and recognized.

David Koff is a Professor Emeritus of radiology at McMaster University, and past Chair, Department of Radiology, McMaster University.

COVID crisis prompts NYGH to accelerate its progress in e-referral

TORONTO – The pandemic has served as a powerful opportunity to accelerate digital health capabilities across the healthcare system. Whether through virtual medicine or large-scale use of technologies, over the last 19 months we have seen incredible innovation and adoption of digital solutions to meet the needs of the more than 400,000 people served by North York General Hospital (NYGH).

NYGH's Digital Strategy 2020-2025 is a key driver of the seven-site organization's new Strategic Plan. The Digital Strategy is being delivered jointly by the hospital and more than 20 community and primary care partners that make up the area's Ontario Health Team, North York Toronto Health Partners. United by a common vision of creating a user-friendly, connected, patient-centred community health system, North York providers are using digital technology to achieve a new level of health service integration.

The latest initiative in service of this vision is the introduction of the North York digital eReferral platform. The platform facilitates a seamless, simple process for primary care providers to securely refer patients for common hospital services.

"The traditional referral system of faxing and phone calls is an antiquated multi-step process that doesn't work well for patients. They don't know where they are in the referral process and if the appointment they receive doesn't work, making a change becomes a process for them," says Dr.

> **eReferral enables everyone to see the same information at the same time, speeding up the referral process.**

David Eisen, chief of Family and Community Medicine, NYGH.

eReferral enables everyone to see the same information at the same time which speeds up and simplifies the referral process.

"Expediting, simplifying, and making referrals a transparent and direct process reduces patient anxiety and empowers them. It's exactly this kind of digital platform that enables an integrated health system, bringing to reality the patient's medical neighbourhood as a real supportive system in their care," adds Dr. Eisen.

NYGH is among the first GTA hospitals to offer physicians and patients eReferral, using the well-established Ocean platform. Ocean eReferral senders include primary care physicians or specialists in the community referring patients to the hospital's specialist services.

Ocean eReferral receivers are NYGH physicians and clinicians who

CONTINUED ON PAGE 22

Structured health data and patient consent can unlock the value of AI

BY DERRICK CHOW

The promise of artificial intelligence (AI) in healthcare – ranging from operational efficiencies to patient outcomes – is vast. Still, many organizations struggle to turn that potential into actual value to make it more efficient and collaborative, and most importantly, to improve care. One of the most significant obstacles to unlocking AI's potential is the quality of the data itself.

The healthcare industry creates significant data, but the insight AI provides is limited when data sets are incomplete. While the problem is easy enough to understand, addressing it is challenging – but not impossible – to overcome. Two things healthcare organizations can do are to provide structured, coded healthcare data and improve the patient consent process.


Derrick Chow

In the US, the 21st Century Cures Act will accelerate digital access for patients to their health records in a machine-readable, interoperable form. This will open the door for AI developers who need access to greater amounts of personalized data to provide precision healthcare insights.

While Canada doesn't have a similar regulation, healthcare organizations should still be working toward more structured data to keep pace with patients who prefer providers that can offer data portability to their consumer apps.

Many offices and health systems rely heavily on faxing and mailing information to one another, which seems antiquated when contrasted against how patients use technology via wearables and apps to manage their health.

By digitizing health data, providers can share and combine data from other departments within, or external to, the organization to make their operations more efficient. And when the historical patient data is combined with patient-generated data from their apps and wearable devices, care can be dramatically improved.

Additionally, healthcare organizations are better equipped to address public health emergencies like COVID-19 when health data is available to help them make critical, real-time decisions.

An often-overlooked, but critical, component to freeing data for AI insights is the patient consent process, which can be tedious and unintuitive for patients. When access is stuck at consent, it is difficult to generate the benefits AI can offer. Healthcare organizations can expedite the process by implementing intuitive methods for patients to give their consent. Here are some things to consider:

- Device integration: Digital consent forms should be compatible with whatever device a patient uses, whether it's a desktop computer, phone, or tablet. The experience should also integrate with whatever brand of device a patient uses.
- Transparency: Patients won't want to spend a lot of time giving consent, but at the same time, they need to know what they're consenting to. So, it is essential to include as much information as necessary by law while quickly getting to the specific reason you're asking for their consent.
- Reward: It's also important to share with patients the benefits of giving their consent. In some cases, it may be used for vital medical research, for example. In other instances, the data may be shared with the patient's attorney or insurance company that needs it to represent them in a lawsuit or complete a life insurance submission.

Obtaining access to data is about more than technology – trust is also essential. One way to gain trust is to ensure that the data a patient shares with you is secure. Once data privacy is breached, a slew of issues can occur that may offset the value AI can bring.

Derrick Chow is co-founder and COO of Medchart.

Artificial intelligence making progress in collaborative projects across Canada

Groups are working to build a healthcare system that continuously learns about the population it serves.

BY DIANNE DANIEL

If health data is the next frontier in personalized medicine, the learning health system could be the vehicle to transport us there. That's the vision of recent collaborations across Canada bringing together academics, clinicians, businesses and funding partners to unlock critical health data found in physician notes, imaging databases, electronic medical records and other digital health systems. Not only are the groups enabling researchers and clinicians to access high-quality pools of patient information that have historically been difficult to apply to decision making, they're also working to build a healthcare system that continuously learns about the population it serves.

"What we're doing is building a system so that we'll be prospective, by which I mean that every day the system will be newly updated," said Jeremy Petch, PhD, director of Digital Health Innovation at Hamilton Health Sciences (HHS) in Ontario and founder of the hospital's Centre for Data Science and Digital Health (CREATE). "As every new patient comes in and is diagnosed, we'll be able to access their data," said Dr. Petch.

In collaboration with Dr. Mark Levine, the Buffet Taylor chair in breast cancer research at McMaster University, the team at Escarpment Cancer Research Institute (ECRI) and the Toronto-based artificial intelligence (AI) firm Pentavere, CREATE – which is staffed by experts in artificial intelligence, data sciences and software engineering – is working to digitally recreate patient 'stories' for breast cancer patients currently being treated at the HHS Juravinski Cancer Centre. The platform builds on an earlier pilot of 50 patients that used IBM's Watson Health. Moving forward, the initiative is relying on Pentavere's proprietary natural language processing (NLP) engine called DARWEN to extract real world patient evidence and insights from vast amounts of unstructured clinical data.

The impetus for the project came from Dr. Levine, who, as he was winding down his highly recognized career as a medical oncologist at HHS, had the notion that AI could solve a fundamental challenge in healthcare – how to obtain a clear picture of a patient population before, during and after treatment.

"Thirty-five years ago if a patient asked me, 'How many patients with breast cancer do you see with the same problem as me every year and how do they do?' ... I would either do a chart review myself or ask a resident to do it," said Dr. Levine. "Do you know what we do now, 35 years later? The same thing, and with all of the technology now available, that's unbelievable."

The group's initial pilot demonstrated the ability of AI to accurately identify key information from multiple digital sources for 50 stage three breast cancer patients treated at Juravinski. The current effort, funded in part by Roche Pharmaceuticals and now scaled to include 3,000 breast cancer patients, is using Pentavere's technology to generate similar anonymized information that includes the date of diagnosis, how the cancer was diagnosed, the pathology of the tumour, the data and type of surgery, whether or not chemotherapy or radiation were administered, and the outcome.

"All of this data is very siloed, spread over multiple different source systems, so really the task initially is to bring that data all together in its raw unstructured form, into a data lake – it's still messy, it's still unstructured, it still has conflicting data in it," explained Pentavere medical director Dr. Christopher Pettengell. "Our technology can then be deployed within that environment and structure it to make sense of it."

The idea is to build an automated function into the HHS health system workflow so that disparate health data can be grouped into high-quality row and data sets, preparing it for analysis. Machine learning algorithms are then trained to generate accurate, de-identified patient information from the data, giving clinicians a first-of-its-kind view into outcome data specific to Juravinski cancer patients.

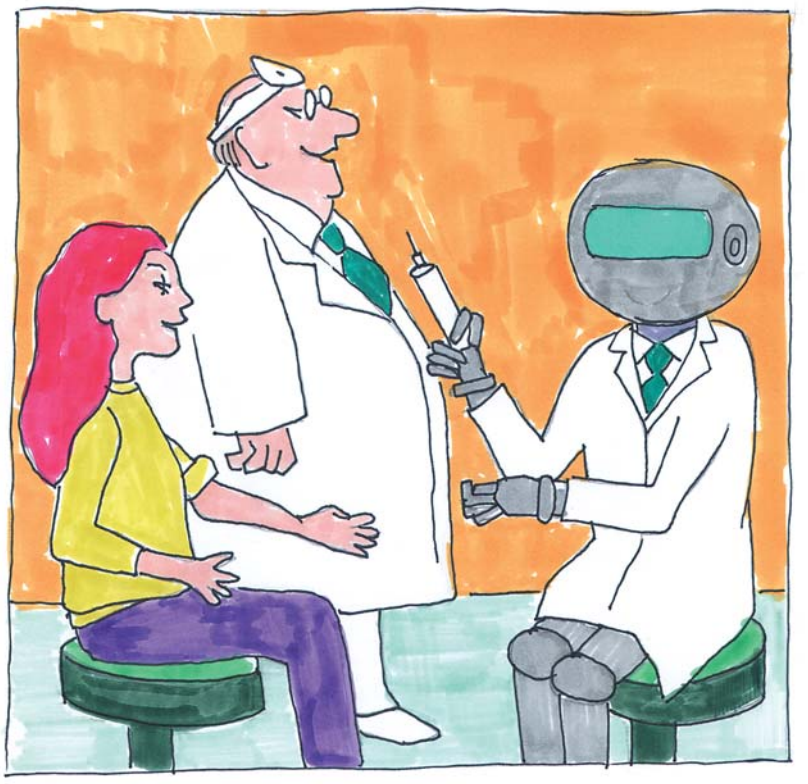


ILLUSTRATION: LINDA WEISS

"The analytics and the statistics on the data – that's something we know how to do, but we've just never really been able to access the data before because it's been locked away, and there's been no efficient way to get that data out and make it available to the statisticians and analysts," said Petch.

Though he's careful to avoid the 'hype' around the promise of what AI can deliver, Petch said the overall ambition is to better understand the cancer clinic's patient population so that the hospital can move towards a personalized care model, and ultimately make quality improvements. One possible deliverable is a learning health system dashboard utility that would enable treating clinicians to access real-world evidence about similar patient journeys within HHS, as well as recommendations based on leading-edge research or clinical trials, when deciding on the best course of treatment for the patient in front of them.

"What's unique about this is that a clinician can get a picture of their complete practice, and get a profile of their practice over all of the patients they've treated over many years, as well as the patients that their colleagues have treated, to maybe see patterns that we haven't seen before," said Petch. The approach also supports the hospital's mission to address health equity, because it analyses outcomes for entire patient populations regardless of socioeconomic status or ethnicity, removing the bias often associated with clinical trials, he added.

As work on the learning health system moves forward, the next step is to validate that the information generated by the AI model matches the information in the actual patient records. Two leading breast cancers experts, independent of the collaboration, are currently comparing key patient attributes such as histology, stage, estrogen receptor or type of surgery, and the machine learning algorithms will be refined as needed, until the match is 95 per cent or higher, explained Levine.

Another Canadian team working to 'unlock' the benefit of digital health data involves the University of Alberta Faculty of Medicine and Dentistry, Alberta Health Services (AHS) and Indianapolis-based Pinnacle Solutions Inc., a long-time SAS reseller that entered the Canadian analytics market in 2019. This past summer, the faculty launched the Data Analytics Research Core (DARC), a secure high-performance computing and on-premise data storage environment it built in partnership with Pinnacle Solutions to facilitate health data sharing between AHS and faculty researchers.

The goal is to grow the university's capacity to perform big data analysis and AI, advance e-health innovations such as personalized care, and provide student training in health data analytics. At the same time, DARC, which is supported with funding from the AHS Chair in Health Informatics Research, is also available to data analysts funded by the Alberta Strategy for Patient Oriented Research Support Unit who are invested in building a provincial learning health system.

"As medicine really becomes a data science, we're going to need to train a next generation of clinicians who know data, as well as data scientists who know clinical medicine," said vice-dean of research Lawrence Richer, a professor in the faculty's department of pediatrics who led the project. "DARC provides an environment where that can start to happen."

Historically, if a faculty researcher wanted to work with sensitive health data, they would make an individual request to AHS, the provincial custodian of patient information, and agree to work within specified security parameters. Richer found that as more requests were being made, and the sensitivity of the data increased, the custodian's willingness to share decreased. At the same time, researchers interested in applying AI and machine learning require access to much higher computer capacity than is typically available to them in a small server or desktop environment. DARC solves both challenges, he said.

Architected by Pinnacle Solutions, the integrated platform sits behind the AHS firewall at a local hospi-

tal, where it shares the hospital's network infrastructure and security protocols. In addition to featuring SAS Viya, a visual AI, analytic and data management tool that makes data analysis as easy as 'dragging and dropping,' it also supports open-source software and other free tools popular among students. The benefit is that both 'clickers and coders' are supported, said Richer.

"Not everyone can be that expert coder, and we can't continuously hire that coder every time we want access to a data set," he said.

Richer experienced the platform's ease of use firsthand when he decided to test a model he had previously requested from a data analyst to predict which children arriving in the emergency department are best served by brain imaging. "What we know is many kids present to emergency with worrisome symptoms, but only a small fraction actually have a worrisome disorder like a stroke, brain bleed or brain tumour," he said. "My hope was that we could build an algorithm to take clinical features and then give the point-of-care clinician a risk score of 'should I, or should I not' do a brain scan."

When DARC went live, Richer was able to test six different iterations of the model in one hour, even though he had never used SAS Viya prior. "I didn't need to wait for an analyst to tell me which model works best. I already have an idea of which is best – I took that as proof that we've done the right thing here," said Richer.

As of October 2021, roughly 60 users had been granted access to DARC, and Richer expects the number to grow. Approximately one-quarter of the faculty's 750 members are involved in some aspect of health data research.

One example is a big data initiative led by Dr. Daniel Baumgart, professor and director of the university's Division of Gastroenterology, who is working in partnership with Crohn's and Colitis Canada. The project aims to use DARC to deliver personalized therapies to Canadians living with inflammatory bowel disease (IBD), and is currently analysing health data from 60,000 Albertans who live with the disease to identify patterns in how they're doing over the long term and what contributes to their outcomes.

The hope is that the AI models will be able to predict which medication will be most effective and at what dose, who is more likely to experience complications related to IBD, and who is at greater risk for future hospitalizations. With AHS recently transferring terabytes of diagnostic imaging data to DARC – representing a first for researchers – the researchers will also work to refine diagnosis with imaging techniques, to assist in more precisely detecting the disease.

"Right now we're limiting access to DARC. We have a select number of teams and the demand is growing," said Richer. "I don't want to sit with a big white elephant that I can't sustain over time, but at the same time, I want to maintain what the core needs are for our core researchers who are truly innovating in the health space."

A third collaboration working to advance the concept of a learning health system in Canada is the new 'junior-senior' Research Chair in Digital Health announced by the Université de Sherbrooke in Quebec and funded by the Ministère de l'Économie et de l'Innovation (MEI). Co-directed by professor Anita Burgun, a French expert in biomedical informatics with ties to the University of Paris, and Christina Khnaisser, a health informatics researcher at Sherbrooke, the chair is overseeing an ambitious research program based on a vast network of France-Quebec collaborations including partnerships between pediatric hospitals and research centres.

The program is using a digital platform called PARS3, developed at the university by the Interdisciplinary Research Group in Health Informatics (GRIIS), to access health data in situ, meaning it doesn't have to be moved to a shared location, alleviating issues related to privacy. The goal is to build a system that can "securely and ethically analyze the data that accumulates during the patient-care trajectory," said Burgun, as they work to better understand, diagnose and treat rare diseases.

For example, medical teams will be able to securely analyze clinical records, medical images and physiological information as it is collected throughout patients' daily lives. Doctors will then be able to compare medical profiles in order to speed up diagnostic decisions and optimize treatment.

Oncoustics AI democratizes diagnostics, beginning with liver disease

TORONTO – Liver diseases are one of the fastest growing causes of morbidity and mortality in the world. Over 2 billion people globally are living with or are at risk of liver disease, and as this disease is mostly asymptomatic until very advanced stages, most don't even know it.

This surge in disease is being accelerated by the alarming rise of the obesity epidemic and type 2 diabetes, which can both cause non-alcoholic fatty liver disease (NAFLD) and its most advanced and dangerous form, non-alcoholic steatohepatitis, or NASH.

While traditional approaches to screen for liver disease require referrals for high end imaging or highly invasive biopsy, Oncoustics, a Toronto-based AI diagnostics company, has developed a better way to diagnose and catch liver disease early – when treatment options are broader and chances for reversal and full remission are best.

Oncoustics, founded in 2018 and funded by the Creative Destruction Lab, is creating and deploying multiple advanced AI solutions based on ultrasound for low cost, non-invasive surveillance, diagnostics, and treatment monitoring of diseases with high unmet clinical need.

Unlike other players in the space, they are not doing image recognition. Instead, they apply AI to raw sound signals from readily available handheld ultrasound devices to rapidly differentiate healthy from diseased tissues.

There's a wealth of information in these raw signals and their patented approach reveals novel biomarkers that can be aligned with existing standards and categorization systems. Oncoustics is a hardware agnostic, software only solution, but their enhanced value comes via low-cost point-of-care ultrasound that are now coming onto the market.

These systems that now cost under $5,000 are exciting, but they're limited by poor image quality and lack of medical applications. But the Oncoustics approach doesn't require images and their quantified systems don't require expert sonographers or radiologists either.

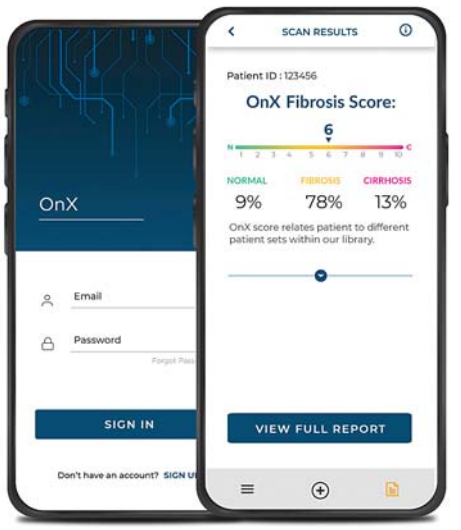
The approach at Oncoustics makes the expensive and difficult process of diagnosing liver disease seamless, painless and done in five minutes – right at the point-of-care.

"The idea came out of my PhD work at the Sunnybrook Research Institute in Toronto. Part of my work looked at ultrasound raw data and using statistical approaches of extracting parameters related to tumor cell death or tumor response to different cancer therapies," said Ahmed El Kaffas, PhD and a founder of Oncoustics. "Playing around with the technology, we saw a lot of potential for prevention and early detection of diseases as well, which we soon narrowed down to the liver market as a first target for our startup; liver disease is a major global health problem."

Their first product, the OnX Liver Fibrosis Categorization Solution, has now achieved over 95 percent AUROC compared to big and expensive systems found in hospitals like shear wave elastography and transient elastography and they are beginning their regulatory filings.

Locally in Toronto, Oncoustics is beginning deeper integration and data collection work with hepatologists at University Health Network (UHN), the largest health research organization in North America.

With this and other clinical partnerships in the USA and in Asia, they are looking to go beyond replacing existing imaging and elastography devices and are aiming at replacing painful and invasive biopsies and to build an entire pipeline of solutions for the liver and beyond.



Oncoustics has also gotten the attention of provider networks, pharmaceutical companies and industry organizations, and recently announced that they were selected by Mayo Clinic's Innovation Exchange program and they are moving forward on a research program with Roche Diagnostics as well.

"Liver disease disproportionately affects people of color, lower socio-economic status and native peoples, and these same people are less likely to have access to expert clinicians and the high-end diagnostics tests that may be available," said Beth Rogozinski, CEO of Oncoustics. "Our approach democratizes access to early diagnosis by making it much less expensive, less painful and invasive, and readily available at the point-of-care."

These diagnostic tests, which will be easier to order and perform than a blood test, are gaining the interest of clinicians as well. Primary care physician Matthew Sakumoto, MD at UCSF added, "As a primary care physician, I love that the OnX would allow me to screen and counsel the patient within a single encounter." This promise of AI and of Oncoustics to decentralize and democratize healthcare, are exactly what the doctor ordered.

Vector demonstrates quick success in bringing AI into clinical usage

BY JONATHAN WOODS

Undetected patient deterioration is a major reason for unplanned ICU admissions, which are serious adverse events correlated with higher patient mortality and morbidity. Early warning systems exist, but they're reactive; if an alarm sounds, it means deterioration is already underway.

St. Michael's Hospital of Unity Health Toronto took a proactive approach to reducing unplanned ICU transfers. Instead of spotting deterioration early, they're using artificial intelligence (AI) to predict it. They do this using CHARTwatch, an AI system trained on 10 years' worth of hospital encounters in order to anticipate patient decline and signal the need for early intervention care.

During its pilot in the hospital's General Internal Medicine unit, CHARTwatch provided a near 1.5-day time interval between alarm and event, a margin of safety that translated into a 20 percent reduction in mortality among high-risk patients according to early results. The system is now in regular use in the unit.

CHARTwatch is a Pathfinder Project, one of a series of health AI pilots led by the Vector Institute for Artificial Intelligence and Ontario health organizations. Pathfinder Projects are small-scale implementations designed to turn promising AI research into clinical benefits. These pilots create pathways for AI uptake by addressing known adoption challenges in healthcare settings and by bridging the gap between AI research funding from the federal Pan-Canadian AI Strategy and AI application in a provincial healthcare system.

"Low acceptance of machine-learn[ing] solutions by clinician users, and uncertainty about how to evaluate them" are key reasons for slow AI uptake in healthcare, according to Implementing Machine Learning in Medicine, a recent paper published in the Canadian Medical Association Journal. The paper reads: "One common barrier to the adoption of machine-learn[ing] technology is whether clinicians trust the model's output." When real health outcomes are on the line, concerns about AI model robustness, complexity, and opacity create trepidation.

Pathfinder Projects are designed to build the trust required for AI acceptance. This is done through a focus on continuous learning, close work with the institutions implementing the systems, and applications that complement, rather than replace, human judgment.

This is exemplified by another Vector Pathfinder Project, an AI update to Coral Review. Coral Review is an existing tool, developed by the University Health Network (UHN), that enables imaging-related peer review and learning.

The project – a collaboration between Vector, UHN , and the KIMIA Lab at the University of Waterloo – involves adding an AI element to the tool: the ability to identify X-ray images that include pneumothorax, pinpoint abnormalities within them, and then search through thousands of historical images to identify others that share characteristics.

The project has the potential to speed up X-ray review and reduce time to treatment for patients, but, importantly, it's also designed to instill trust. A paper on Coral Review describes how the upgrade "enable[s] a virtual 'second opinion' for diagnostic purposes and provide[s] computerized explanations for the decision support."

Pathfinder Projects are small-scale implementations designed to turn promising AI research into clinical benefits.

The model supports physician decisions. Physicians aren't asked to defer judgment when patient health is at stake and they can get a sense of how the model comes to its conclusions. At this point in the pilot, the search function has produced an 80 to 90 percent accuracy rate. The detection function – the ability to pinpoint abnormalities – is currently being tested.

These pilots and their focus on trust align with the concept of Responsible AI, a set of principles and practices that aim to ensure AI serves, and doesn't harm, its stakeholders. Because of AI's novelty, complexity, and rapid change, standards for managing fairness, risks, and trade-offs between performance and transparency are still unsettled.

Pathfinders' small-scale deployments help fill in the picture about these concerns on a case-by-case basis, clarifying each model's role in a clinical process and growing acceptance.

Pathfinder Projects also highlight the role that the Vector Institute has in connecting federal funding for advanced AI research with practical implementation opportunities in Ontario organizations. "Health innovation in Canada is split," says Roxana Sultan, vice president of Health at Vector. "While most fundamental health research is funded federally, the deployment of health AI in practice happens provincially in the health system."

While Pathfinder Projects receive funding from the Ontario government, "many of the researchers driving these projects are funded by CIFAR Canada AI Chairs," Sultan says. CIFAR Canada AI Chairs are appointments funded through the federal government's Pan Canadian AI Strategy. "Building that bridge between research and its implementation at actual sites is the role that Vector and Pathfinder Projects are playing," says Sultan.

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Doctor and founder offers hospitals advice on achieving ROI with AI

TORONTO – In one of the latest examples of artificial intelligence (AI) and machine learning (ML) leading to impressive gains, a number of hospitals across Canada have deployed Semantic Health's AI-powered medical coding and data quality auditing software, which uses AI to improve the efficiency of manual coding, abstracting, and clinical documentation improvement (CDI) processes. Hospitals are reporting initial efficiency gains of up to 25 per cent, and expect this number to increase over time as Semantic Health's engine continues to learn how the process is completed at each site.

As more Canadian hospitals consider adopting AI solutions, Dr. Nicola Sahar, CEO at Semantic Health, suggests that a successful implementation starts by asking, "who are we trying to help and can AI address their challenges?" Some problems do not need to be solved with AI. Problems that are inherently data-driven or involve large amounts of data, however, can be solved more efficiently and accurately with AI.

There are three primary types of AI solutions for health systems:

- clinical facing solutions that help improve care delivery;
- operational solutions that help improve hospital management and decision making;
- and financial or administrative solutions, which support coding, abstracting, and data quality improvement processes.

For Dr. Sahar, administrative solutions are an attractive place for Canadian hospitals to start with AI because, "the departments in charge of coding and auditing usually have all the data – structured or unstructured – flowing through them, and are currently manually processing all of the data."

One of the challenges with AI adoption at hospitals is that it often has an air of mystery around it about how it works. At its heart, AI is the process by which we can teach computers to learn insights from data, and to make predictions about that data. A common example of the application of AI is the prediction of the length of stay for a particular patient. In that case, the AI can be "taught" to consider various clinical data points, including the patient's clinical notes and medical issues, to generate an accurate prediction for the patient's length of stay. It does this by analyzing thousands, and sometimes millions, of previous examples of patient data. As the AI sees more examples of patient data, and the corresponding length of stay for that patient, it gradually learns what to pay attention to in the data in order to make a more accurate prediction of the patient's length of stay.

With their ability to continuously learn from clinical data, AI systems can deliver measurable and continuously improving results for hospitals. But, according to Dr. Sahar, the biggest factor for success in implementing AI is understanding the type and volume of data to use.

If a hospital has just implemented an EMR, for example, now would be the perfect time to explore AI use cases that can be built on top of digitized EMR data streams.

However, even if a hospital does not have a fully digitized data ecosystem, an AI use case can often be framed in a way that can provide a solution with less data. In these cases, it is important to partner with experts and vendors in AI. "There will always be pockets of areas where you can start. It all begins by focusing on the user and the use case," Dr. Sahar adds.

As health systems seek to adopt AI, Dr. Sahar advises leaders to start with problematic processes that would significantly benefit from increased efficiency or accuracy. "A place where processes are slow and manual, and results are not fully accurate or reliable, is a very good starting point. These are the areas where you will see the best results on team operations and return on investment."

"In Semantic Health's case, we have found that when it comes to coding, auditing, and data quality, there is a lot of room for AI to help existing processes." Semantic Health's product supports coding and auditing teams by predicting the most relevant medical codes within a record, and auditing already assigned codes to ensure that they are accurate. "That is really transformational because the coders and auditors we help have to read tens, if not hundreds, of pages to find key information about the patient. The AI engine can do the heavy lifting and direct their attention where needed."

Dr. Nicola Sahar

The impact of investing in foundational AI use cases can be significant. With Semantic Health, by improving the speed and accuracy of manual coding processes, hospitals also build a layer of insight on top of unstructured data. These insights can be used to do other things, like provide feedback on operations, generate analytics, help with decision support, and future-proof coding and auditing workflows. As a result, in the long term, the software facilitates more AI use cases, such as clinical decision support, clinical documentation improvement, and facilitating access for researchers to real-world evidence generation.

It is also important to invest in AI systems that are designed for clinical data streams. Semantic Health's approach, for example, uses a model that was trained on real clinical data, and is uniquely designed to understand the nuances of clinical text.

"With Semantic Health's approach," Dr. Sahar adds, "it is easier to learn how patient populations differ at different hospitals, how different treatments and conditions are being referred to in a given text, and to more effectively identify the information coders needed to make them more accurate."

To learn more about AI for healthcare or Semantic Health's product, please visit their website at www.semantichealth.ai

NYGH accelerates its progress in e-referral

CONTINUED FROM PAGE 16

review patient referrals for specialist services and programs. If more information is needed before moving ahead with a referral, they can communicate with the senders, ultimately improving the process and patient experience.

"The eReferral platform is an easy-to-use system that integrates into primary care office electronic medical records (EMR)," said Dr. Ronik Kanani, chief of Paediatrics, NYGH. "It is a convenient way to send referrals to our specialists in the hospital and allows us to email and communicate directly with families. The long-term goal is to eliminate the need for faxing paper referrals to our clinic and to fully integrate the system into our hospital EMR. We often have incomplete information on paper referrals and they are sometimes illegible. If we have a more complete referral form, we can triage the referral in a more efficient way."

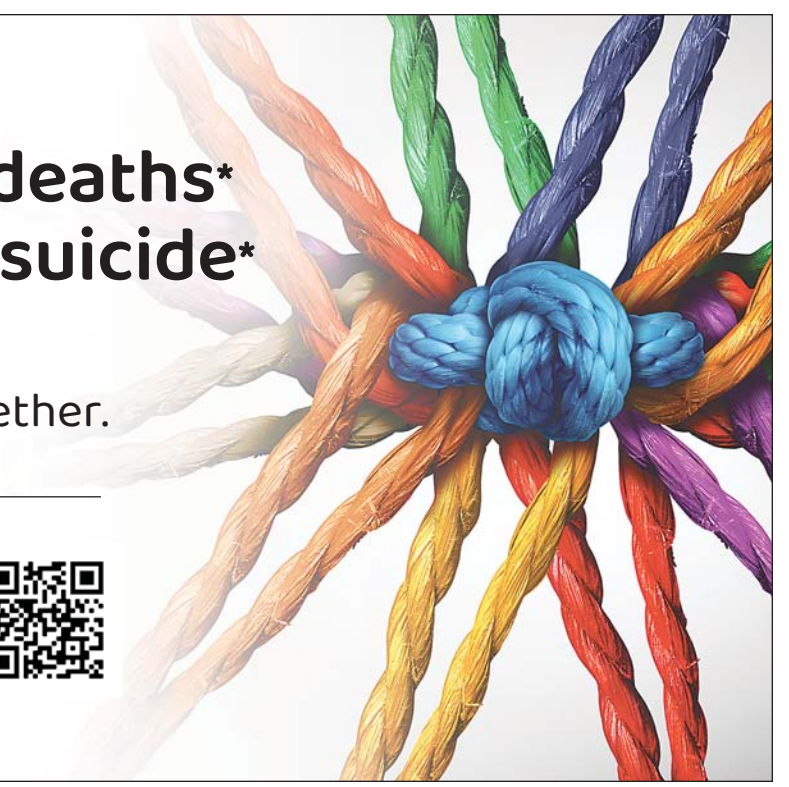
The shift from fax-based and phone-based referrals to a digital system has significant benefits for providers and patients alike; expanded access to specialists, faster referrals, better communication and information sharing, and the overall ability to track and support patients throughout their care journey.

Currently, NYGH patients with a Fit positive test who require a colonoscopy, those referred to the Complex Centre for Diabetes Care (CCDC), and paediatrics patients are benefiting from the platform. Soon Paediatric and Adult Mental Health, Diagnostic Imaging, and other high-volume programs will offer digital referrals through this initiative.

"The eReferral process allows patients and families to follow along as various specialists are contacted and appointments scheduled. The communications are far superior and timely, reducing stress, eliminating the need for phone calls and follow ups," said Bruce LaRue, Patient and Family advisor. "We are hoping to implement text messaging as well as email notifications as we progress through implementation."

By using eReferral, patients, families and caregivers are better informed and supported throughout the care process.

"COVID has been incredibly difficult for so many people while also showing us that we can work quickly in healthcare to respond to the needs of patients, their families and healthcare providers. This includes pushing the health system closer to where it should be in terms of providing more digital options," says Duska Kennedy, chief digital officer, NYGH. "eReferral is one such gain and another step in our commitment to provide patients with digital health tools that help empower them around tracking and monitoring information that supports their health."



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

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

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

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

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

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

The XERO/Microsoft Teams app can save valuable time over the course of a week, month or year. Agfa HealthCare estimates that with a time saving of 10 minutes per consult, an average hospital could save 75

days of productive time per year. The app can also be life-saving, if a patient has COVID-19 and needs to be placed in quarantine before infecting someone else.

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

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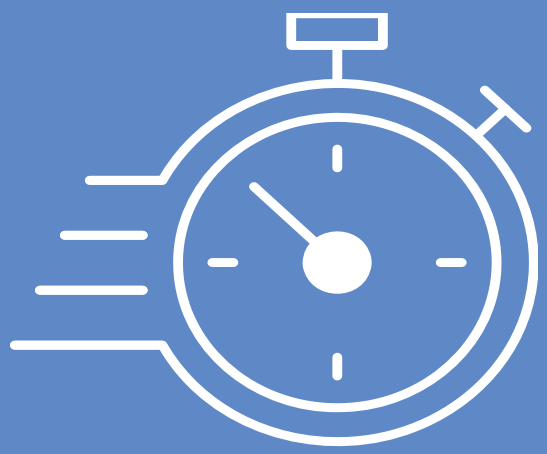

Intelligent Workflows

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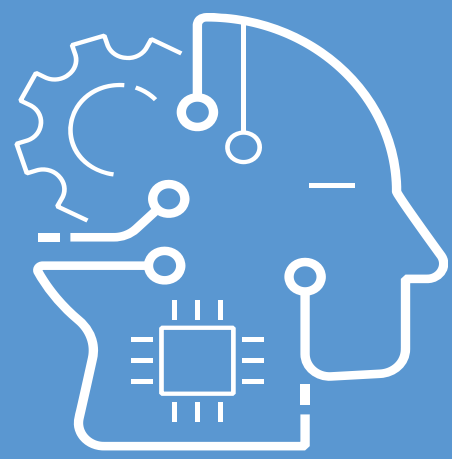
- Helps enable fast report turn-around times



AI Integration

- Helps enhance productivity and diagnostic accuracy[1]
- Future-proof your investment

1 – Via integration with GE Healthcare or 3rd party AI applications.