



CANADIAN Healthcare Technology

CANADA'S MAGAZINE FOR MANAGERS AND USERS OF INFORMATION SYSTEMS IN HEALTHCARE | VOL. 26, NO. 1 | FEBRUARY 2021

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e-VOLVE improves EMRs

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CANT-WAIT

An AI-powered solution for reducing MR waitlists in BC's lower mainland is now being tested. The solution was created by a group that includes the University of British Columbia, Amazon Web Services, radiologists, and SapienML.com

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PHOTO: COURTESY OF CANON MEDICAL

Moving AI into medical imaging

Diagnostic imaging companies have been steadily integrating Artificial Intelligence into their solutions. A case in point is Canon Medical, which is speeding up diagnostic imaging by adding AI reconstruction across its product line. We report on the demand for new solutions from radiologists, and the progress being made by Canon and other vendors in our Report on Medical Imaging. **SEE STORY ON PAGE 16**

Partnership brings virtual care to Indigenous communities

BY JERRY ZEIDENBERG

Indigenous citizens in Canada have a long history of being underserved by the healthcare system – often living in remote locations, they must frequently travel to get proper care. Even then, the attention they receive may be inappropriate or culturally insensitive, as exemplified by the recent case of Joyce Echaquan, a 37-year-old Atikamekw woman who died in a Quebec hospital after taking a video of staff insulting her.

Later, Yvonne Boyer, a Métis lawyer and Canadian senator told the Canadian Press, “For every Joyce Echaquan that comes forward, there’s a hundred that have not been heard.”

What’s more, because of the distances

that must be travelled, many Indigenous people who need attention simply don’t go – and instead experience a level of health well below that of other Canadians.

Now, an Indigenous organization called Saa Dene has partnered with Canadian telehealth leader Maple, creating a new corporation that

Maple Maskawáhtik plans to bring virtual care to indigenous and rural patients across Canada.

will bring more virtual care right into the homes, communities and workplaces of Indigenous people. Called Maple Maskawáhtik, the partnership was first announced late last year and started providing services to a First Nations community in Alberta in February.

“We can treat a large number of people right across the country,” said Dr. Brett Belchetz, CEO and co-founder of Toronto-based Maple. “In Alberta, we have access to hundreds of practitioners, including mental health specialists, who will be available to treat Indigenous patients on an equal basis. We can bring high-level care to Indigenous patients that is otherwise only available in urban centres like downtown Calgary, Edmonton or Toronto.”

Dr. Belchetz noted that because Maple has been scaling up over the past few years, it is already serving over 2 million patients across the country and has many doctors ready to take calls within minutes.

Not only has Maple developed a platform that enables patients to access a doctor

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Partnership will bring quality virtual care to Indigenous communities

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quickly; afterwards, the doctor can use the system to arrange lab tests or the delivery of prescribed medications. Maple has a close relationship with Shoppers Drug Mart – Canada's largest pharmacy chain – and has links to drug stores across the country that can fill prescriptions for patients in remote communities.

Jim Boucher, former Chief of the Fort McKay First Nation and founder of the Saa Dene Group, said that Health Canada, along with the support of Indigenous Services Canada, has a network of nursing stations and facilities throughout communities that can provide lab tests and dispense medications. Maple Maskawáhtik will be working with these providers, too, to optimize care for patients.

Chief Boucher spoke to us in January from Fort McKay, which is near Fort McMurray – the heart of the Alberta oil sands. (When we chatted, he noted that it was a balmy 15-degrees below zero outside his window.) Boucher launched Saa Dene Group in 2020, and it already consists of eight companies, including Maple

Maskawáhtik. The others include firms in a variety of sectors such as oil and gas, mining, renewable energy services, education, engineering, digital, and technological innovation.

Boucher commented that healthcare services are currently inadequate in First Nations communities throughout Canada, including the Fort McMurray area. "There's a doctor shortage here, and we have trouble recruiting doctors," he said. Maple Maskawáhtik could provide the region with good quality medical care, he asserted.

"Telehealth isn't new to First Nations, but in the past, it hasn't met the service needs of communities," said Jauvonne Kitto, CEO of Saa Dene Group. "The services provided offered a small network and very little mental healthcare supports."

She explained that it isn't much help to a patient if a practitioner is only available in 2-4 weeks. In contrast, Maple Maskawáhtik will be providing "on-demand care", with less than a couple minute waiting period, 24/7, 365 days a year.

"The Maple Maskawáhtik team has made it a priority to provide culturally appropriate training to the care providers, led



Jauvonne Kitto



Jim Boucher



Dr. Brett Belchetz

by the appropriate stakeholders," said Kitto. "Maple has agreed to make it part of their strategy." She noted that this is unique among groups providing care in Canada.

Dr. Belchetz noted, moreover, "that Indigenous people are not one homogeneous group. There are many, many groups with different cultural practices and styles of leadership." Maple will be taking this into consideration, he said.

Mental health is a major area of care – and currently a huge gap in care for Indigenous peoples – that will be given spe-

cial attention by the venture. According to a 2020 Statistics Canada report, six in ten Indigenous people report that their mental health has worsened since the onset of physical distancing, due to the COVID-19 crisis.

For its part, Saa Dene has ties to many Indigenous groups across Canada and will help build the Maple Maskawáhtik virtual visit service in these communities.

Moreover, the effort won't be limited to Indigenous groups. The idea is to also promote economic developments for Indigenous companies, including Saa Dene Group and others. These companies will work with Toronto-based Maple to extend virtual care into Indigenous and non-Indigenous communities across Canada.

Dr. Belchetz said at the moment, the biggest hurdle isn't technological, as the company has the platform to bring services anywhere, anytime. As well, some form of Internet is available in most communities.

Instead, the main issue is a matter of getting the word out to patients that the service is available.

Funding in some cases is also a roadblock. While most provinces have provided funding codes for virtual visits to the practitioner, First Nations reserves fall under the jurisdiction of the federal government. On this front, the federal government is still playing catch-up, and in many jurisdictions Ottawa has yet to provide adequate support to services providers.

In the case of the Alberta Indigenous communities directly working with Maple Maskawáhtik, the communities have seen value in a more collaborative way of delivering and receiving care, said Kitto.

For its part, Saa Dene Group took the initiative in contacting Maple to jointly develop better virtual care in remote and rural communities.

"We did our research," said Kitto. "We looked at who offers solutions for the entire continuum of virtual care. A Canadian company called Maple stood out, and we reached out to them."

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CANADIAN Healthcare Technology

CANADA'S MAGAZINE FOR MANAGERS AND USERS OF INFORMATION TECHNOLOGY IN HEALTHCARE
Volume 26, Number 1 February 2021

Address all correspondence to Canadian Healthcare Technology, 1118 Centre Street, Suite 204, Thornhill ON L4J 7R9 Canada. Telephone: (905) 709-2330. Fax: (905) 709-2258. Internet: www.canhealth.com. E-mail: info2@canhealth.com. Canadian Healthcare Technology will publish eight issues in 2021. Feature schedule and advertising kits available upon request. Canadian Healthcare Technology is sent free of charge to physicians and managers in hospitals, clinics and nursing homes. All others: \$67.80 per year (\$60 + \$7.80 HST). Registration number 899059430 RT. ©2021 by Canadian Healthcare Technology. The content of Canadian Healthcare Technology is subject to copyright. Reproduction in whole or in part without prior written permission is strictly prohibited.

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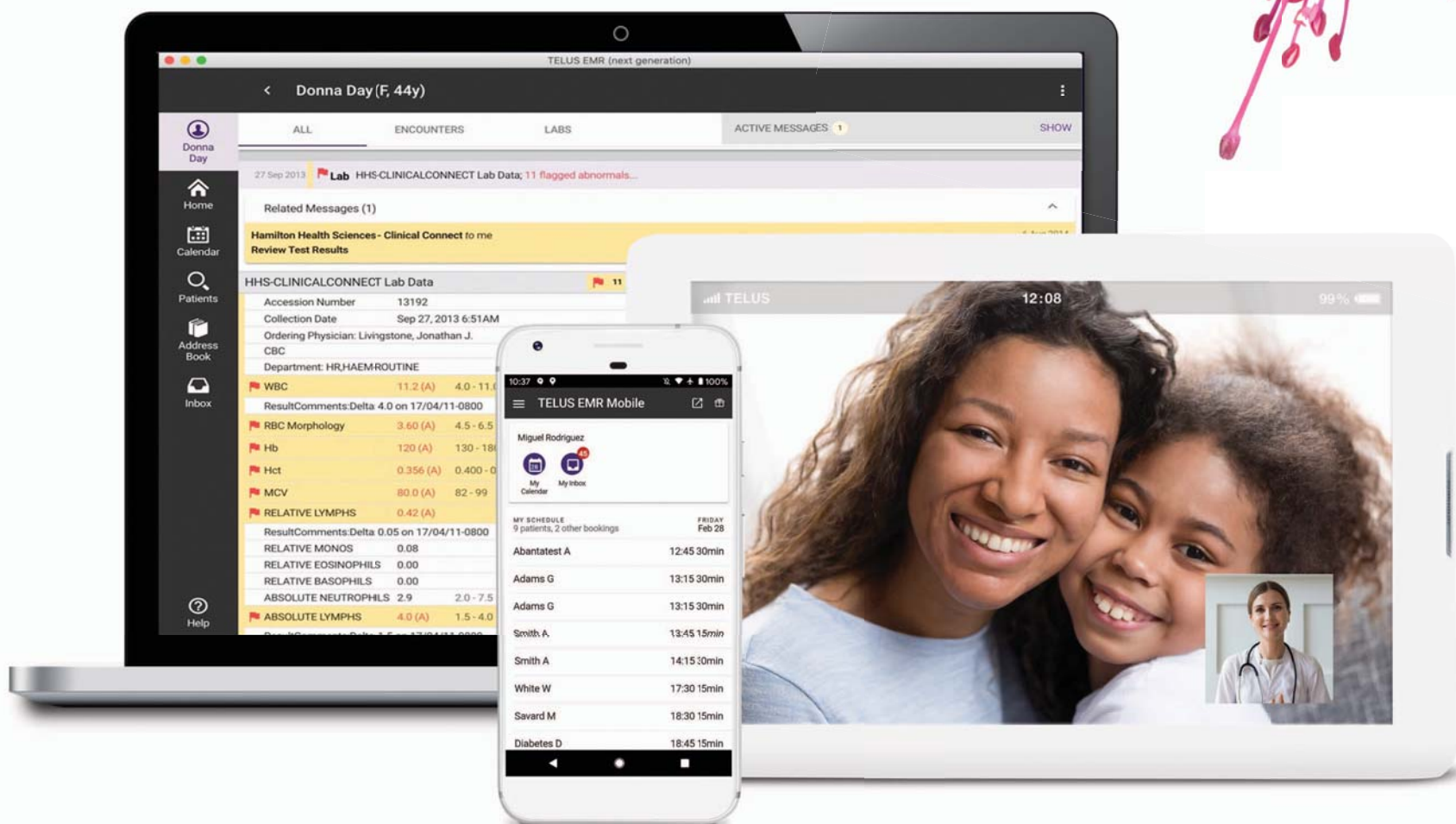
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e-VOLVE modernizes electronic records at Southwest Ontario hospitals

BY NORM TOLLINSKY

Four hospitals in Southwestern Ontario are well on their way toward completing a transition to a region-wide, state-of-the-art hospital information system (HIS). Erie Shores Healthcare in Leamington went live with Cerner Corporation's Millennium HIS September 27th and the Chatham-Kent Health Alliance and Hôtel-Dieu Grace Healthcare in Windsor flipped the switch November 1. Windsor Regional Hospital is currently scheduled to go live in April.

Once Millennium is fully rolled out, "the past history of patients will follow them regardless of which hospital they go to in the region," said Hôtel-Dieu Grace Healthcare's CIO, Dr. Vince Ruisi.

Accessing information about patients transferred from another hospital in the Windsor-Essex region was problematic in the past.

"Before Millennium, we had a combination of a few different systems," said Dr. Ruisi. "We had SolCom, which was essentially a PDF viewing software. We also had McKesson and a separate PACS viewer, so there were times when we would have to enter three different programs to get all the information we were looking for."

Much of the historical information was hand-written and difficult to decipher, added Dr. Ruisi, noting, "It could do more harm than good."

The four healthcare organizations joined forces through the e-VOLVE Program, an initiative of their TransForm Shared Service Organization to manage the transition, relying on the Millennium HIS Canadian build pioneered at Kitchener-Waterloo's Grand River Hospital.

Completing the transition in the midst of the COVID-19 pandemic added a bit of a wrinkle to the project, "forcing us to think differently about how we go about

an implementation," noted Cerner Canada president Jim Shave.

Faced with restrictions on cross-border travel and requirements for quarantines, Cerner and the participating hospitals had to rely on Microsoft Teams for virtual meetings and consults.

"A year and a half ago, we would have had dozens of people on site for a go-live, but we all realized that wasn't possible," said Shave. "We just honed our skills in terms of being able to educate remotely and were all pleas-

antly available, so it positions our healthcare providers to deliver the best possible care," said Barb Colaizzi, technology transformation manager and e-VOLVE site lead for Erie Shores Healthcare.

Dr. Luther Heys, chief medical information officer at Erie Shores notes that when patients are seen in the ER in Leamington and then transfer to Windsor, all of their information is there when they arrive.

Prior to the transition, said Colaizzi, we had to make copies of documents and

number of a patient's family member the other day, so I messaged the nurse and the next time I opened the chart, the number was there," said Dr. Ruisi. "They can also leave me messages if a patient has issues overnight. Previously, I might get an unsigned note and not know who to go to for more information. Now, everything is signed off and documented."

Doctors are also able to see all of the documentation from the allied healthcare professionals, including physiotherapists, occupational therapists, speech language therapists and dietitians.

"It's easy to find everything you're looking for," said Dr. Ruisi. "The layout is very user-friendly. I can even see the times that medications were administered. It's making my rounds faster than ever."

And whenever a new medication is ordered, the system automatically performs a real-time check for adverse reactions.

Dr. Ruisi, a family physician and hospitalist when he's not acting as the hospital's CIO, also likes the Millennium functionality that auto-populates a patient's health issues into his notes.

"When I'm ready to document, I have all of the issues that have already been identified as problems to be addressed, so my notes are much more complete, compared to previously, when I had to remember these things. Millennium does so much extra work for us."

Another major benefit for physicians, said Dr. Heys, is that the HIS can now be accessed remotely from home. "Before, we had some access, but it was only partial and not in real-time."

The integration of Dragon NaturallySpeaking software is another huge improvement. Prior to the transition to Millennium, doctors used a back-end transcription service that could take days for the notes to appear in the chart.

"Now, everything is up front. We have

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Dr. Vince Ruisi, CIO, Hôtel-Dieu Grace Healthcare



Jim Shave, President, Cerner Canada

antly surprised about how smoothly it went. When Erie Shores went live, it was almost anti-climactic.

Impressed by the efficiency and success of virtual engagements, "going forward, we will be working differently than we did two years ago," Shave predicted.

For go-live training at Hôtel Dieu Grace, the e-VOLVE team operated a command centre and had super users out on the floor providing healthcare staff with "at elbow support."

The new HIS boosts efficiency and enhances patient safety.

"The patient's medical history and the latest medical information are easily and

either fax them or send them along with the patient.

Nurses are now charting electronically, "so instead of having to track down a chart, I can see all the vitals and all the labs in one place, making my life quite a bit easier," said Dr. Ruisi. "Before, I would have to flip to the bedside chart if I wanted to find their meds and their vitals, then go to their regular chart to find out their blood glucose results, so it was very inconvenient."

Doctors also like Millennium's communication functionality, which allows them to message nurses with questions for a specific patient.

"For example, I wanted the phone

Re-thinking of processes has doubled the capacity of cardiac unit

Medtronic Integrated Health Solutions (IHS) team recently worked with Southlake Regional Health Centre's Regional Cardiac Care Program, in Newmarket, Ont., to devise solutions to optimize resources and improve patient care.

Southlake runs a leading-edge regional cardiac program in Ontario, and it was endeavouring to accommodate the growing needs of the community. In particular, its Cardiac Short Stay Unit (CSSU) was faced with capacity issues and bottlenecks in its workflow.

The partnership with IHS gave Southlake access to optimization experts with extensive experience assisting hospitals and healthcare organizations in the improvement of their efficiency, resource utilization and patient flow. Together, they reviewed existing processes to improve access for patients – in this case, the changes made to admission and recovery processes

doubled the capacity of the CSSU.

Sanaz Ghazi, IHS project manager, said, "we conducted time studies to clearly understand each step of CSSU's care delivery and identify areas for improvement, then brainstormed with key stakeholders, such as the business and quality manager, Cath Lab manager and CSSU charge nurse, to come up with smart and sustainable solutions."

An IHS-led workshop revealed that procedure cancellations and service delays within the CSSU could be avoided by adjusting the workflow. The implementation of a tailored IHS solution increased recovery capacity and accommodated the increase in procedural volume.

"CSSU staff remained open-minded towards implementing positive change and the IHS team made sure to come up with a plan that wasn't just written on paper, but actually followed through," noted Jessie Boogaard, business and quality manager of the Southlake

Regional Cardiac Care Program.

As a result, the CSSU recovered a higher number of patients without making changes to the existing physical space, budget and resources.

IHS successfully developed and facilitated implementation of solutions for innovative care delivery. A year

The team conducted studies to understand each step of CSSU's care delivery and to identify improvements.

after Southlake implemented the recommended changes, the CSSU has not had to cancel a single procedure because of recovery capacity issues.

Staff identified concerns about their heavy workloads. By job shadowing staff in the CSSU and in the procedural area, the IHS team carried out a workflow

analysis to identify opportunities to streamline operations.

Tasks not essential for patient safety, patient and staff satisfaction nor required for documentation purposes, were removed from the workflow.

Farbod Abolhassani, Data Analyst on the IHS team, explained that to bring staff on board with the proposed changes, "we built a 3D graphic simulation using raw hospital data. It looked exactly like the department and was essential in engaging Southlake staff in our efforts."

This partnership highlighted that the success of facilitated change is dependent on open and collaborative relationships and an in-depth understanding of objectives. The transparency, trust and teamwork demonstrated in the partnership between Medtronic IHS and the Cardiac Short Stay Unit resulted in an optimized workflow with superior outcomes – giving staff more confidence and leaving patients more satisfied.



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Public/private cooperation sped up response to COVID-19 in Quebec

BY DR. MICHAEL KALIN
AND DR. CHRISTINE FLORAKAS

In March 2020, with the “first wave” rapidly approaching, Regional Departments of General Medicine (DRMG) across Quebec were presented with an urgent, daunting task: to redesign the primary health care network to meet the impending tsunami of COVID cases.

Faced with limited personal protective equipment (PPE) supplies, chronic physician shortages combined with desperate re-deployments to hospital wards, intermediate residences and long-term care facilities, and a large non-registered population (up to 40% of residents do not have a family physician in some regions), DRMGs had to navigate a fragile system still reeling from the previous government’s radical overhaul of health administration and delivery.

In a matter of days, DRMGs, on mandate from the Ministry of Health, needed to coordinate efforts with regional integrated university health and social services centres (CIUSSSs), Family Medicine Groups (GMFs), “Super-clinics” and “independent” medical practices to adopt a population-based approach in place of patient-rostering while respecting public health restrictions and the need to limit movement between regions.

The first crucial piece to the puzzle was quickly delivered by successful negotiations between the Quebec Federation of General Practitioners (FMOQ) and the Quebec Medical Insurance Office (RAMQ): full support of and funding for telemedicine.

Family doctors, irrespective of age, health or location, and despite the lack of PPE, could remain open virtually.

The second necessary step was the universal and rapid integration of Quebec’s “Medical Appointment Scheduler” (RVSQ),

Within one week, the facility had to be planned, built, equipped and staffed, complete with a working EMR.

the fledgling Quebec scheduling program that had been desperately trying to gain ground on its more established private competitors for years.

Instantly, Quebecers gained access and were virtually linked to any available doctor anywhere in Quebec. For a province commonly criticized for acting too little and too late, Quebec surged to the forefront of pandemic care by embracing telemedicine in all of its forms.

With PPE shortages, and the CIUSSSs monopolizing the procurement of essential supplies like medical masks, gowns and face shields, the DRMGs moved quickly to designate “Cold” and “Hot” zones where resources could be centralized and prioritized.

The Centre-West CIUSSS in Montreal was left with a challenging dilemma: two of its largest “Super-clinics” had already volunteered to become referral hubs for “Cold” cases, but a “Hot” zone was not readily available.

Given the delicate task of assessing and treating COVID patients, and the lack of un-



The new joint CDD/CDE COVID-19 testing and evaluation centre across from the Emergency Department at the Jewish General Hospital in Montreal in November 2020.

derstanding of the virus itself, clinics located in commercial centres or in older, poorly ventilated buildings were automatically excluded for fear of catastrophic spread.

The decision was made to erect open tents adjacent to an outdoor, drive-through testing centre in a mall parking lot while constructing a more permanent trailer complex with enhanced infection control and protection measures in front of the Jewish General Hospital in the diverse Côte-des-Neiges neighbourhood.

Within one week, the facility had to be planned, built, equipped and staffed. While the facility would be built by the CIUSSS, medical staffing relied completely on the recruitment and voluntary redeployment of local physicians. Equally pressing was the challenge of setting up and training the new hastily assembled team on an electronic medical record while linking this pop-up clinic to Quebec’s Health record database (DSQ).

With the immediate and complete support of the Charron-Drolet family, Info-Data Logiciels’s Ofys, one of the few approved homologated EMRs in Quebec, was deployed at the newly designated COVID evaluation centre (CDE).

Already a prominent provider in the Montreal area, including several of the Centre-West CIUSSS clinics, Ofys was modified and disseminated to meet its new evolving mandate. Bilingual modules were developed, forms created and intensive training provided.

Within days, a fully functional “Hot” clinic was up and running at capacity: built, stocked and equipped by the CIUSSS, staffed by the GMFs, jointly administered, and completely integrated with Quebec call centres and online booking.

A process that normally takes months, with piles of paperwork and bureaucratic

delays, requiring the collaboration and collective vision of no less than four different entities representing both public and private agendas, rose to the challenge and created a solution in less than the time normally needed to book and see a family doctor in the province.

Now, the CDE Centre-Ouest Montreal has moved again to an even larger facility, and remains the only “Hot” clinic in the region. It continues to assess children, obstetrics and adults, and receives referrals from more than forty surrounding clinics.

It has been staffed by over 50 different clinicians from over a dozen different clin-

ics including nine nurse practitioners and two dermatologists and is involved in four research projects.

Corridors of care are established with nearby pediatric and adult hospitals, with two-way directional consults. Using an improved RVSQ, local clinics not only help staff the CDE but schedule it by offering real-time referrals to patients receiving virtual appointments. CDE medical staff support the 8-1-1 call centre and offer expertise through telemedicine services.

Recognizing this amicable trend, the government recently adopted a new HUB model where Quebec’s Medical Appointment Scheduler would embrace privately developed booking platforms such as Sofy, the on-line scheduler for Ofys. At a time when the Centre-West CIUSSS was hit by a cyber-attack, redundant and external systems maintained the CDE at full capacity without any disruption to patient care.

In a time of considerable uncertainty and disruption to the fragile healthcare network, the CDE experience created a new, innovative model of organization and delivery of services: government mandated, regionally organized, built and supplied, while privately staffed and managed.

It’s a regional response with collaborative “buy-in” and voluntary staffing replacing the privately-owned, territorial silos of care that severely limited access and care for decades. And hopefully, a better model for the post-pandemic delivery and organization of healthcare.

Dr. Michael Kalin is Director, Clinique désignée d’évaluation COVID-19 (CDE) Centre-Ouest Montreal. Dr. Christine Florakas is Chief, Department of Family Medicine CIUSSS Centre Ouest de L’Île de Montreal.



Dr. Michael Kalin, CDE Director. Hail and rain were some of the elements encountered at the pop-up “Hot” clinic in the parking lot of the Cavendish Mall in Cote Saint Luc in April 2020

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

New solution streamlines communication among radiologists and other clinicians, improving collaboration.

BY NORM TOLLINSKY

The groundbreaking integration of Agfa HealthCare's XERO™ viewer with Microsoft Teams is being marketed to hospitals in Canada and around the world following a successful pilot at the Princess Alexandra Hospital in Harlow, England.

Developed at Agfa HealthCare's global development centre in Waterloo, Ontario, the integration allows doctors to share diagnostic images from XERO viewer and consult with specialists in real time on their smartphones, tablets or desktops.

The integration with Microsoft Teams leverages the collaboration functionality in the robust XERO viewer, according to Paul Lipton, Agfa's global solutions manager, strategic integrations and enterprise viewing, whose Waterloo-based team conceived and developed the XERO viewer.

Doctors aren't using the XERO viewer all day, so its collaboration functionality isn't always available, he explained. Microsoft Teams, on the other hand, is accessible anywhere, anytime on mobile devices and desktops.

"When we think about how people share information, it's really important that we use a channel that everyone else is using," said Lipton. "Given that the entire National Health Service in the U.K. has adopted Teams, it makes no sense for every individual piece of software to have its own communication platform. That just leads to notification fatigue. To prevent it, you need to be able to get all of your notifications in one place."

Mike Benol, Agfa's vice-president, strategic partnerships, describes the integration as "location ag-

The groundbreaking integration solution was created in Canada at Agfa HealthCare's global development centre, in Waterloo, Ontario.

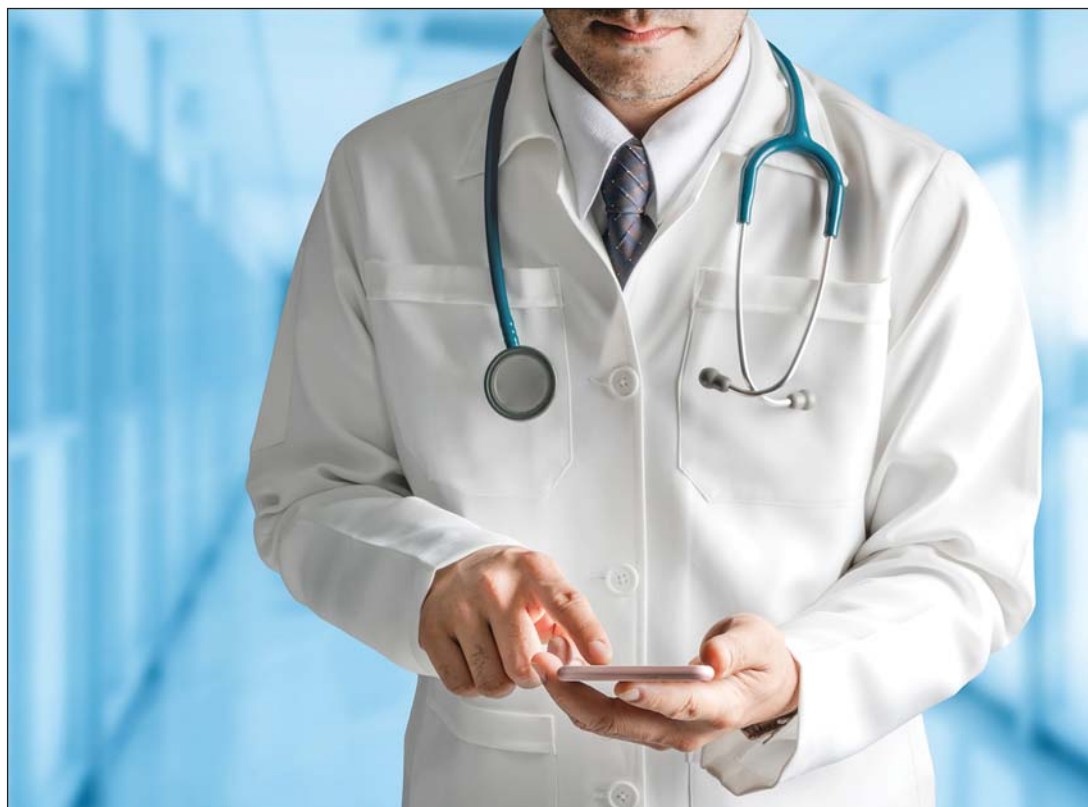
nostic." It's no longer necessary for a physician requiring a consult to go looking for a specialist. The image is instantly shared through Microsoft Teams by simply clicking on a button within the XERO viewer and selecting a pre-defined channel, or team, of experts.

"The integration eliminates the scenario of having to track down a colleague in a large hospital, speak to them, ask them to log in to the viewer, then review it and respond," explains Benol.

"I worked on the integration over a week in late November 2019 and demonstrated a proof of concept at the Radiology Society of North America's annual meeting the following month," recalled Lipton. "We were just starting to think about developing it as a product, then COVID hit."

Recognizing the value of offering its customers a tool that could speed consults when hospitals are deluged with COVID patients, Agfa accelerated the development of the integration and offered it to Princess Alexandra Hospital in April.

"That month alone they had 160 COVID-19



deaths, unfortunately" recalled Peter Wilkop, Agfa's senior product marketing manager, enterprise imaging.

A COVID button was added to the navigation bar in the XERO viewer and programmed to transmit the image to a "channel" of predetermined specialists, including pulmonologists and infectious disease experts. As doctors began using the integration, channels were added for critical care and cardiology specialists. Other channels for ophthalmology, dermatology, and vascular cases are also being contemplated.

The critical care channel, for example, is used when a patient's condition is worsening and an attending physician needs to consult quickly with critical care specialists to decide on a transfer to the ICU.

"We calculate that if we could save 10 minutes per consult, over the period of a year that could translate into a saving of 75 days or 2.5 man months," said Wilkop. "It could even be life-saving if the patient

has COVID-19 and is placed in quarantine before infecting someone else."

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.

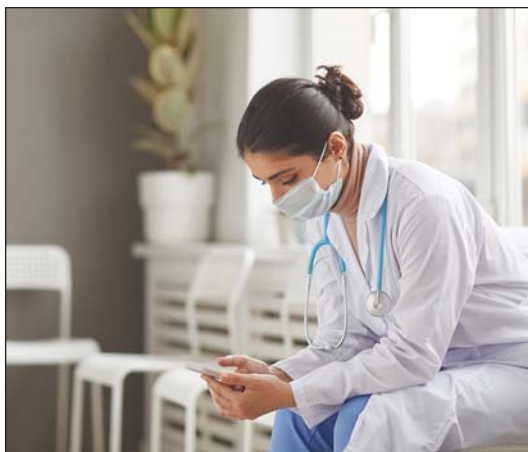
Physicians participating in a consult can view the images and communicate with each other using audio, video and chat. Also available is a markup tool allowing them to interact with the images using their cursor and share the markups in real-time.

"The XERO viewer is used in Alberta, Manitoba, Ontario, Nova Scotia, New Brunswick, PEI and parts of British Columbia and Quebec," added Lisa Shoniker, Canadian regional vice president of sales. "That's why the integration is so powerful for Canada."

It's a good example of the innovation in healthcare that has been triggered by the pandemic, said Microsoft's Andrew Graley, senior industry manager for healthcare.

"Some of our customers in healthcare are seeing three, four, or five years worth of transformation happening in a matter of months. Teams is revolutionizing the way we're collaborating. It brings everything together that you'd expect in a collaboration tool. It helps organizations empower their users to get the right information to the right people at the right time in a secure environment."

Agfa HealthCare is initially marketing the integration to its Canadian XERO viewer customers currently using Microsoft Teams. Installation is via a plug-in, with no downtime or interruption to viewer use. "Our customers," said Shoniker, "value the ability to speed patient care through rapid sharing of information, thanks to a simple but powerful plug-in."



CANT-WAIT uses artificial intelligence to reduce MRI wait times

VANCOUVER — The University of British Columbia Cloud Innovation Centre (UBC CIC) in November launched its CANT-WAIT project, which uses machine learning and natural language processing to better manage requisitions for MRI exams.

The tool was developed in partnership with the Lower Mainland Medical Imaging Program in British Columbia with the goal of predicting the priority of the patient and to identify any indications for contrast-enhanced imaging. The vision is to use the tool to match MRI requisitions with regional waitlist information, in an automated way, and to direct patients to sites with the shortest waitlist for the indicated priority, resulting in reduced wait times.

The AI system has been designed to help transform paper-based requisition workflows and to support the automation of a centralized requisition distribution model.

In the Lower Mainland of BC, non-urgent outpatient MRI requisitions are received at a centralized distribution office. Traditionally, ordering providers would send imaging requisitions to a site of their own choosing. This unorganized approach can lead to a concentration of requisitions at some sites, causing disparate wait times.

Patients across British Columbia and in other Canadian provinces can wait weeks or months for an MRI scan. The CANT-WAIT technology is designed to support getting patients to their exams in the shortest time possible.

“It’s an ongoing battle to meet wait list targets when requisitions don’t receive a priority until after they are received at a site,” said Dr. William Parker, radiology resident at the University of British Columbia and founder of SapienML.com, a company specializing in creating solutions using Big Data. “It’s a massive task, but with Canadian Association of Radiologist (CAR) guidelines, and a large volume of requisitions, this project can have a transformative and scalable impact on the triaging process, saving time, resources and money.”

As an answer to the problem, the UBC CIC, in partnership with SapienML, radiologists at Vancouver General Hospital and St. Paul’s Hospital, Vancouver Coastal Health and Provincial Health Services Authority devised an AI system that can predict a requisition’s priority and whether there is an indication for contrast.

Using machine learning, they can process the massive amount of incoming requisitions and analyze the information that they contain, leading to an output that could be used in an algorithm to enhance requisition management in a single or multi-site health region.

The solution, powered by Amazon Web Services (AWS), was built by students at the UBC CIC, which officially opened at the beginning of 2020. The only centre of its kind in Canada, and one of just 12 around the world, UBC’s CIC is connecting top university researchers, companies and experts at AWS to create new solutions to difficult problems that impact health and wellbeing.

To stream patients needing MRIs to centres with the best availability, Dr. Parker said that SapienML and its partners de-

vised an algorithm that first figures out the priority level for each patient. The CAR Priority classification system is used in BC to triage Medical Imaging requisitions.

It is assisted in this work by natural language processing, as ordering providers will often jot in notes as free text in the requisition. The system is able to interpret the free text and differentiate between acute and chronic injuries.

For example, a patient in pain whose knee popped a day ago and can’t walk needs an exam sooner than one who has experienced chronic knee pain for many months. “We need to decide, based on probabilities, that one patient will probably need immediate surgery and the other one can probably wait a little longer,” said Dr. Parker.

tured data – and Amazon Comprehend Medical, to extract complex medical information from unstructured text.

SapienML made use of its own data extraction software, called, DataRig and SapienSecure to extract all of the MRI requisitions efficiently and to remove the DICOM data, leaving only the requisition to be transcribed by the clerks. The software was also used to evenly distribute the requisitions by body parts and scan types.

The actual process of building the algorithm took about three months. Well before this stage, however, AWS and the UBC CIC brought together all the stakeholders in the project, to gain agreement on the project and begin the flow of ideas.

“The whole process took about six

Dr. Parker explained that pulmonary tests involve assessing a patient’s day-to-day function, lung capacity and other tests, as well as tests of the efficiency of the lung at taking in oxygen and releasing carbon dioxide and other molecules from the body.

Even though these tests are needed and are the gold standard, the exams are often unpleasant for patients. “They can be an exhausting, annoying experience,” commented Dr. Parker.

On the other hand, CT scans are simple to administer, and could provide similar info. “The patient just lies on a table,” said Dr. Parker. “It’s easier.”

Despite the appearance of vaccines to combat COVID-19, Dr. Parker said it will take some time to eradicate the virus.



Radiologists Dr. William Parker (left) and Dr. Savvas Nicolaou are on the SapienML team, which is spearheading the work on the CANT-WAIT and L3-Net projects.

The algorithm accounts for many details written on the requisition by the ordering provider, including age, whether the patient is pregnant, if it’s a follow-up visit, whether the patient has claustrophobia, allergies, and other factors.

SapienML and its team will look to re-

months,” said Coral Kennett, digital innovation lead at AWS. She noted that AWS has a methodology for helping teams produce solutions quickly. “The idea is to move fast, in an iterative way,” she said.

Vancouver Coastal Health and SapienML are involved in a second project at the UBC CIC that is also showing great promise. Called L3-Net, it’s an AI-based model that analyzes CT scans of the lung to determine the presence of COVID-19 disease and to assess how severe a case the patient has.

The SapienML team (which is also led by Dr. Savvas Nicolaou and engineer Brian Lee) observed that COVID-19 is a respiratory disease that has a huge impact on the lungs of patients, and that the damage is often long-term.

The AI analysis is a potential adjunct to pulmonary function testing, as not all geographical regions – especially remote areas – have ready access to all tests. “But CT scanners are quite ubiquitous, and you can send the exams to radiologists using telemedicine,” said Dr. Parker.

Patients who survive COVID-19 but experience damage to their lungs often consult afterwards with respirologists. As another facet to the project, the UBC CIC is now working with respirologists at St. Paul’s Hospital, in Vancouver, to correlate COVID-19 findings with various forms of lung damage and deficiencies.

“COVID-19 isn’t going anywhere,” he said. “It will be here our whole lives.”

He noted, “We will also be helping patients dealing with the after-effects of the virus, such as reduced lung function.”

For its part, L3-NET was devised in Vancouver using over 3,000 CT studies from patients around the world. It was a large project, involving 50 or more people at the university, from AWS, and from the Vancouver General Hospital, Vancouver Imaging (a large group of radiologists), Xtract.ai, Element AI, and md.ai.

The first step involved collecting the data – namely, the CT scans. The next stage revolved around labelling the sets, which is an intensive exercise involving skilled personnel. “We worked with radiologists from Vancouver General Hospital and the UBC medical students,” said Kennett. “Labelling takes a high degree of medical expertise.”

The annotations are broken into three categories:

- Lung segmentation
- Opacity segmentation and classification
- COVID-19 classification (such as probable, indeterminate, non-COVID-19)

The project is now in its second version, Dr. Parker said, as improvements were made to the first. The code has been made freely available on Github, and researchers and clinicians can even upload CT scans for analysis on the UBC CIC website.

The UBC Cloud Innovation Centre, in partnership with SapienML.com, is also making use of solutions from AWS.

fine the model further, continually improving it. “Once it’s perfected, we’ll roll it out to other places too,” said Dr. Parker.

Not only can it be used for MRI exams, but Dr. Parker believes that CANT-WAIT could be modified for use with other modalities, such as CT and ultrasound. These modalities also have published prioritization guidelines that could be applied by the tool. It might also have the potential to reduce waitlists for surgical patients, another bottleneck in British Columbia and across Canada.

To create CANT-WAIT, the UBC CIC used natural language processing services from AWS, Amazon Comprehend – which uses machine learning to uncover the insights and relationships in the unstruc-

Corolar Virtual Care helps create and manage virtual clinics

Each clinic can be customized to accommodate communication via audio only or both audio and video.

Toronto-based Dapasoft Inc. is one of many healthcare IT providers that have refocused their product development roadmap in response to the urgent needs of Canadian hospitals struggling to cope with the COVID-19 pandemic.

"In early January 2020 with COVID-19 happening, our customers began asking us to develop a solution for virtual care clinics," said Jijesh Devan, Dapasoft's senior director for marketing and business development.

With social distancing a priority in the midst of a raging pandemic, hospitals were quick to realize the importance of minimizing the number of patients in crowded waiting rooms and doctors' offices. Responding to the urgent need for an elegant solution capable of enabling virtual clinics, Dapasoft released its Corolar Virtual Care app in July.

"We have seen tremendous traction for Corolar Virtual Care," noted Devan. "Six large health systems have already signed up for it – two in Ontario, several in the Maritimes and one in British Columbia."

A Microsoft partner and winner of Microsoft Application Innovation IMPACT Awards in 2019 and 2020, Dapasoft built Corolar Virtual Care on top of the Microsoft Teams platform, which an increasing number of hospitals have access to as part of their Office 365 licenses.

Capable of enabling multiple clinics for both virtual walk-in and scheduled appointments, Corolar Virtual Care manages the entire process from registration and triaging to physician consultation. Each clinic can be customized to accommodate communication via audio only or both audio and video.

The app was designed to maximize clinician efficiency, said Devan. For example, "We don't ask the hospital to change its current method of patient registration and scheduling. All of the scheduling and registration happens in their EHR, whether it's Meditech, Cerner or EPIC. We then pull that data using our integration capabilities into Corolar Virtual Care."

"There's no need to register patients in one system and then create a meeting in another system. We eliminate a lot of that inefficiency."

For scheduled appointments, the app delivers customized notifications, reminders and confirmations to patients using their preferred means of communication – telephone, email or SMS – to minimize no-shows.

Hospital staff log in to the app, select a clinic to which they're assigned and are able to see the list of patients in the virtual lobby. Clinicians seeing patients through the app are even able to connect from home if they're in quarantine themselves.

Patients can log in to Microsoft Teams on their computers or notebooks using a browser, or on their smartphones by downloading the Teams app.

They can be presented with a clinic-specific intake form to fill out following which they wait in the lobby until they are ready to be seen. If a patient steps away from his or her computer or notebook while waiting in the lobby, hospital staff can summon them via SMS or telephone when a nurse or doctor is ready to see them.

During the Teams encounter, clinicians are able to dial in third parties, including specialists or inter-



Winner of Microsoft Application Innovation IMPACT Awards in 2019 and 2020, Dapasoft built Corolar Virtual Care on top of the Microsoft Teams platform.

preters as required, said Devan. Upon termination of the encounter, patient intake forms and clinician notes are pushed back into the EHR.

Corolar Virtual Care is not only ideal for COVID-19 assessment clinics, but also for pre-op, pre-op, nephrology and even physiotherapy clinics, each of which can be set up with a customized care pathway.

Deployment is simple and straightforward taking as little as a few weeks, claims Devan.

Interest in Dapasoft's Corolar Virtual Care app is consistent with the pandemic-driven global appeal of virtual care. A Gartner study, for example, estimates

that only one percent of care was delivered virtually in the U.S. prior to COVID-19. Now, it's 15 percent and, by the end of 2021, it's expected to account for between 30 and 35 percent of healthcare visits.

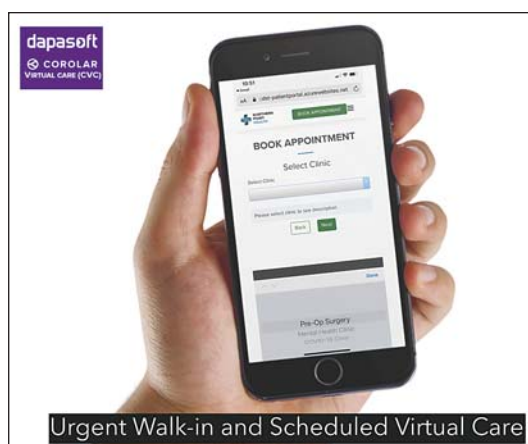
Founded in 1997 by Stephen Chan, Wayne Thomas and Michael Lonsway, Dapasoft has 18 years of experience delivering healthcare IT solutions using Microsoft technologies. Its offerings for acute care customers include Corolar Cloud, an Integration Platform as a Service using Microsoft Azure.

Another Microsoft Teams app, Corolar ConnectedCare, was in the process of being piloted when COVID-19 forced Dapasoft to prioritize its virtual care solution. It was driven by the introduction of Ontario Health Teams, regional groupings of healthcare services intended to streamline care coordination. A secure, clinician-to-clinician collaboration solution, ConnectedCare allows authorized multidisciplinary healthcare teams to view patient records from hospital information systems in a Teams environment.

"So, much as you'd collaborate around an Excel file or a Word doc in Teams, you can collaborate around patient records and do care co-ordination," said Devan.

Accessible via mobile devices, desktops and secure browsers, Corolar ConnectedCare streamlines patient handoffs from acute care to other healthcare services and permits access to patient records that would otherwise be locked up in a hospital information system.

Dapasoft will continue to prioritize its virtual care solution in the near term, but post COVID, the company expects hospitals to once again be free to take advantage of the full power of Microsoft Teams and its ConnectedCare solution.



Urgent Walk-in and Scheduled Virtual Care

Canadian technology reduces pressure injuries in bedridden patients

BY ARIELLE RICKETTS

Pressure injuries, also known as pressure ulcers or bed sores, pose a significant challenge for the Canadian healthcare system, particularly among older adults and people living with dementia. Thousands of Canadians are diagnosed with the painful condition each year, and while preventable, pressure injuries can be fatal.

A 2003 report funded by the Canadian Association of Wound Care found that 26 percent of patients across all healthcare institutions had a pressure injury. The problem can lead to infection and even death. Studies in the United States have found that 60,000 deaths per year are associated with pressure injuries, with a cost of \$11.6 billion annually in medical management.

New technology from Canadian startup Rehabtronics is working to change that. They've developed an attachable electric stimulation device designed to prevent pressure injuries in at-risk patients. The device is powered by algorithms that trigger muscle contractions in the body, increasing the oxygenation and blood circulation needed to keep skin healthy and ward off sores. Designed with intuitive features, the device is adaptable and easy to use across multiple care settings, such as hospitals and long-term care facilities, as well as in homes.

"This technology has the ability to significantly reduce bed sores for a diverse population," says Rehabtronics CEO, Rahul Samant. "This is especially true among the elderly and those living with dementia, where the vast majority of pressure injuries occur."

For its part, Rehabtronics is a spinoff of the University of Alberta's Neuroscience and Mental Health Institute. It was started to bring state-of-the-art neural interfacing and neural rehabilitation technologies into clinical practice. Its first product, the ReJoyce was among the first products to

bring gaming and computer-based functional assessment to the world. It followed up with the ReTouch, the world's first touchscreen-based rehabilitation for cognitive, visual, and motor rehabilitation. ReGrasp is a neural prosthetic that restores grasping function (opening and closing the hand). Its products are used by over 500 clinics around the world.

Now, its patented Intermittent Electrical Stimulation (IES) technology uses a

habtronics was one of the six finalists selected to enter this program.

Frailty, illness, and the onset of cognitive conditions, such as dementia can limit mobility in older adults. As a result, the body may lose its ability to build up protective muscle tissue needed to prevent the development of pressure injuries. Additional factors related to aging, such as the natural thinning of the skin, appetite loss, and incontinence can heighten the risk of



proprietary electrical stimulation protocol to increase and maintain tissue oxygenation – a key factor in the formation of pressure injuries. Animal studies have shown that IES reduces injury volume by 80 percent. Human studies have demonstrated that IES increases tissue oxygenation by as much as 28 percent and maintains tissue oxygenation at 20 percent above baseline.

In August 2020, the Centre for Aging + Brain Health Innovation (CABHI) launched the second cohort of its MC² Market Readiness Program, designed to connect agtech startups with the Silicon Valley ecosystem. Canadian startup Re-

pressure injuries developing across vulnerable areas in the body.

Respiratory conditions, like those brought on by COVID-19, amplify these risk factors.

"COVID-19 patients are at an increased risk of bed sores because they already have low oxygen levels due to respiratory distress," Samant explains. "That's why we're working to get our device into intensive care units as quickly as possible."

Rehabtronics' budding partnerships with international healthcare organizations, such as the Cleveland Clinic in the United States, will help them accomplish this goal. The company also hopes to ex-

pand its impact with the network of experts and advisors they'll have access to as part of CABHI's MC² Market Readiness program, launched in partnership with National Bank.

MC² Market Readiness provides health tech companies with direct access to the Silicon Valley ecosystem and entry into Berkeley SkyDeck's accelerator program. CABHI also provides successful applicants with an investment of up to CAD\$150,000 towards achieving a key business milestone and raising Seed or Series A funding.

"We've already met two of our advisors from the program and they've been fantastic," says Samant. "They've been instrumental in immediately helping us see the path forward and how to address particular challenges that we're facing as a startup."

Having access to global markets through the Silicon Valley network helps startups like Rehabtronics grow, scale, and market their life-saving solutions.

"When I saw first-hand the impact bed sores have on patients, how quickly it can progress, and the catastrophic outcomes it can have, I got really passionate about the issue," Samant says of Rehabtronics' motivation behind developing the device.

With the development and market launch of their electric stimulator, Rehabtronics hopes to improve the lives of older adults by helping them feel empowered about aging in their setting of choice, without the risk of developing fatal pressure injuries.

"One of our visions is for seniors to remain independent at home – and that's where all healthcare should move towards. If we can help the cause here in any way, then that's what we're going to do."

Visit cabhi.com to learn more about aging and brain health solutions improving the lives of seniors.

Arielle Ricketts, Marketing & Communications Content Specialist, The Centre for Aging + Brain Health Innovation

Primary care clinic uses CHIME to improve patient, staff communication

BY NEIL ZEIDENBERG

Last fall, Toronto Western Family Health Team (TWFHT), a well-established primary care clinic in downtown Toronto, Ontario, moved to its new address across the street from UHN's Toronto Western Hospital.

With a roster of 18,000 patients – of which they see 1,000 per week – 24 staff physicians, 32 residents and many support staff, the extra square footage would give them some much needed breathing room.

"Our practice is growing, and we really needed the additional space," said Sandra Palmer, Quality Improvement Decision Support Specialist. "The new clinic is double the size of the old location and our patient rooms are the size of two clinic rooms in length."

However, with such an expansive footprint, patient and staff communication

at the new location was going to be a challenge. "Due to the size and shape of the new offices, the hallways are very long and narrow so it's not feasible to move patients efficiently from one end of the clinic (waiting room) to clinic rooms at the other end of the office," said Palmer.

As a solution TWFHT selected CHIME (chimeclinic.com), a fully customized solution designed to improve the overall operational efficiency of a clinic making better use of staff and reducing operating costs. "Lowering costs wasn't one of our immediate goals – our aim was to improve staff and patient communication and make better use of our staff and clinic rooms," said Palmer.

Palmer talked about the advantage of patient communication before and after the appointment. "Knowing the matter of the appointment in advance, e.g. immunization, allows us to prepare and

assign the patient to a nurse-only clinic room as well as prepare the housekeeping team for cleaning after completion of the appointment. CHIME helps us make more effective use of the members of our healthcare team."

CHIME helps improve communication by sending notifications

The CHIME system makes use of an intuitive, AI-powered patient check-in kiosk, and other technologies.

directly to staff and clinicians on their mobile devices, or smartwatches. It's also simple to use. "CHIME is like having a virtual team of AI staff," said Keith Chung, co-Founder of CHIME.

More specifically, you get: an AI-powered reception kiosk; an AI patient es-

cort (wayfinding) to an exam room; an AI-virtual assistant for assistance with tasks; and a staff-AI dispatcher helping to direct staff/clinicians to a specific exam room.

The CHIME system is comprised of:

- An intuitive AI-powered patient check-in kiosk;

- An easy to use central dashboard;
- A waiting room screen for patient wayfinding; and

- Tablets mounted outside each exam room notifying the doctor who and where the next patient is, and the nature of the consult.

"Our company partners with industry leaders like RBC, TELUS Health, Dr. Bill, Maple and WELL Health ensuring a clinic has the systems available to run as efficiently as possible," said Chung. "The digital platform (TELUS Health Exchange) enables collaboration and

CONTINUED ON PAGE 22



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CANADIAN
Healthcare Technology

Virtual-care innovations benefit patients needing perinatal mental health care

The Mount Sinai Hospital Perinatal Mental Health Program meets an urgent need.

BY DR. ARIEL DALFEN

The Mount Sinai Hospital Perinatal Mental Health Program is a specialized program that offers psychiatric care to women struggling with mental health issues as they plan pregnancy, during pregnancy and up to one year postpartum. We launched a telemedicine program in 2014 to address some of the barriers to psychiatric care in this vulnerable population around Ontario. To our knowledge, this is the first of its kind telemedicine mental health program to address the needs of the Ontario perinatal population. Women can be seen virtually for a psychiatric assessment around medication and treatment planning during pregnancy and while nursing.

This telehealth program meets an urgent need, since perinatal depression and anxiety affect approximately 15%-20% of pregnant women and new mothers but only about 20% of women who are suffering are able to attend and access in person treatments.

Originally, telemedicine by real-time video consultation was used to connect with women in remote areas of the province who could not otherwise access specialized psychiatric care. In 2014, telemedicine program physicians saw 46 new patients, and there were 186 video appointments completed.

Over the years, all of our mental healthcare providers transitioned to using telemedicine and slowly adapted to providing virtual care, when needed and when appropriate, for a given patient. Patients were highly satisfied with this service and realized significant savings in cost and time, as well as not requiring time off work, or childcare to attend an appointment.

As a result, our team's use of telemedicine grew and it was incorporated into our usual care, such that providers alternated between video and in-person visits throughout the day. Decisions to use video visits were made jointly between patients and their mental healthcare providers. In 2019, our clinicians provided about 200 new patient consultations via telemedicine and over 1,400 video appointments to patients around Ontario.

When the COVID-19 pandemic began to impact Canada in mid-March 2020, and in person hospital visits were limited, our team was well positioned to transition to near fully virtual care. New patient assessments, as well as individual and group therapies rapidly transitioned to being virtual, within days. Between March and July of 2020, approximately 250 new patient consults were done via telemedicine and there were over 2,150 video appointments completed by mental health care providers, including psychiatrists, social workers and nursing staff.

Group therapies were also quickly converted to virtual care. Enrollment for these groups almost doubled from about 15 participants pre-COVID to approximately 30 participants on virtual platforms.

In addition to clinical services, our team has developed and studied mobile health innovations to address the needs of the perinatal population. Some examples include:

- **Text Messaging for Screening and Informing new mothers about mental health issues:** We designed a text messaging program to screen and educate new mothers around postpartum depression. Screening in

this population has been traditionally challenging since it is hard for women to attend in person appointments in the early days postpartum, when they are particularly vulnerable to developing mental health issues.

We recruited 937 patients from an obstetrics clinic and sent them a two-question screening questionnaire and essential information about postpartum mental health using SMS text messaging for 12 weeks postpartum. Results of this study showed that the two-question screening text message was able to detect postpartum depression, and that study participants found that the information was useful and helped them identify and understand mental health symptoms and access to resources.

The results of this study were published in the journal *Psychiatric Services*. This pilot project demonstrated that simple and widely used text messages can be helpful in identifying mental health symptoms as well as educating patient populations that would otherwise be hard to reach, with potentially negative consequences.

• **MOVIN – Maternal Mental Health of Ontario Virtual Intervention Network:** Patients with mental health symptoms face challenges finding appropriate care. Even with the expanded availability of virtual care options during COVID-19, patients are not often matched with the type of care that they require to adequately address their suffering. Not everyone can be treated with self-directed online therapy tools, but some people may need just that.

Similarly, not everyone needs a psychiatrist, but some do. Since only mental health services in Ontario that are provided by an MD (either a psychiatrist or another MD trained in mental healthcare) are covered by the government, many patients end up being referred to a psychiatrist when they may not require this type of care.

As a result, psychiatric care is hard to access, wait times can be long, and other useful services that may

be able to adequately address a patient's symptoms, are underutilized.

We have developed MOVIN (The Maternal Mental Health of Ontario Virtual Intervention Network) to design and evaluate a stepped care model, to enable patients to access suitable evidence-based mental health care.

Our group of collaborators at Sinai Health and Women's College Hospital is developing what we believe to be the first of its kind online and mobile-accessible platform that can screen pregnant women and new mothers, offer care coordination, and then direct women to suitable types of psychiatric care (both asynchronous online, and synchronous virtual care) based on their level of symptomatology.

During 2021, we will launch a pilot study to evaluate this platform and its effectiveness in addressing the needs of perinatal women struggling with mental health issues.

MOVIN will have the capability to repeatedly screen pregnant women and new mothers struggling with mental illness. Women with mild symptomatology will be able to register for symptom monitoring, and they can access specific perinatal related resources. Those with moderate to severe symptoms will be offered personalized care coordination by an experienced healthcare provider and subsequent direction to suitable types of mental healthcare, which may include online information, virtual psychotherapy or access to medication consultation or psychiatric care, to treat their particular symptoms.

Not only will we be evaluating symptom score reduction, but we will be evaluating the patient experience using this platform in order to gain a more detailed understanding of which components are appealing and easy to navigate, as well as effective treatment modalities.

Our goal is to develop an evidence-based, virtual stepped care model that can be replicated in other areas of mental health and medicine that will enhance access to care, and alignment of mental health services with patient needs.

What are the potential pitfalls of virtual care?

Similar to in-person care, virtual care may not be



Dr. Ariel Dalfen



Public/private collaboration is changing the healthcare landscape

BY MICHAEL GREEN

suitable for all people requiring mental healthcare. In some situations, patients with more severe psychiatric symptoms may be unable to organize or to tolerate virtual care meetings. Also, patients may be opting out of care even before attempting to connect virtually, since they don't perceive that virtual care will be helpful or useful for them.

Patients may not have access to technology or internet service to connect virtually. When we were developing our studies and clinical programs, our team was concerned that patients may not have access to either mobile phones, internet connectivity, or another device from which they could conduct a telemedicine appointment. We purchased devices, such as cell phones, tablets, and laptop computers to loan to study participants and patients to address this situation. However, it is interesting to note that there were no requests to utilize such devices during our studies or programs despite the offering.

Finally, patients may be unable to attend a virtual care appointment if they do not have a private space in which to meet. At times, there may also be technological failures or challenges to virtual care, on both the patient and provider side. This may require switching to other forms of virtual care, including telephone calls, where possible.

Other barriers include clinician-based resistance to change their practice patterns. In our clinical program, there was significant change management required to encourage clinicians to embrace virtual care. Clinicians were concerned that they would not be able to provide high quality, safe, and effective psychiatric care if it were not offered in person. However, over time, multiple demonstrations, and with accessible technological support, clinicians were able to transition to virtual care and in fact embraced it.

Financially, virtual care services have been valuable to fee-for-service mental health providers since they can reduce payment losses due to late cancellations or no-shows, as patients have more flexibility.

The mental healthcare system in Canada was already strained prior to the pandemic. COVID-19 seems to have led to increasing rates of psychiatric distress, illness and their adverse outcomes. As patients and providers gain comfort and expertise with virtual care modalities, it will be ideal for these services to develop creatively and carefully to address the enormous need for mental health treatment, and to be maintained in the future. Systemic support, from the hospital level to government levels, in developing, adopting, integrating and sustaining virtual care modalities will also be essential. And continued research and funding opportunities to support evidence-based service development and implementation will facilitate the growth of innovation in virtual mental healthcare and ultimately improve the mental health of all Canadians.

Dr. Ariel Dalfen is a Psychiatrist and Head of the Perinatal Mental Health Program and the Perinatal Telemedicine Program, at Mount Sinai Hospital and Assistant Professor, Department of Psychiatry, University of Toronto.

The rapid shift to virtual care during the COVID-19 pandemic was enabled by excellent collaboration among all healthcare stakeholders, including the private sector. As our health system continues to evolve, the private sector will play a key role in helping make the delivery of care more accessible and efficient, while improving the quality of care for patients.

A few months before the pandemic began, Canada Health Infoway (Infoway) brought together eight industry leaders who have been working to improve the quality of care for patients using digital health technologies.

This group, which we call the Infoway Alliance, includes Accenture, Cerner Canada, LifeLabs, Orion Health, RGAX, Roche Canada, Teladoc Health and TELUS Health. In upcoming issues of this magazine, six of these innovative companies will share how they are contributing to the changing landscape of Canadian healthcare. I know you will find their stories very interesting, and I hope they will spark interest in collective efforts to continue to make advancements.

This collaboration will be absolutely critical because Canadians have an increased appetite for virtual care and for digital health in general. A recent survey conducted for Infoway as part of a major public consultation, found that seven in 10 Canadians who sought medical care during the pandemic used virtual care, 91 percent were satisfied with the experience,

and 86 percent agreed that virtual care tools can be important alternatives to seeing doctors in-person. Regardless of whether they had used virtual care during the pandemic, 76 percent are willing to use it in the future.

Our research also found that 92 percent of Canadians want technology that makes healthcare as convenient as other aspects of their lives, and 84 percent said they would use technology tools to help manage their health. Of those who have used health technology in the past year, nine in 10 said it saved them time, eight in 10 said they were better able to manage their health, and 53 percent said it helped them avoid an in-person visit.

Eighty-six percent also agreed that technology can solve many of the issues with our healthcare system and 80 percent believe investing in healthcare technology should be a top priority for government.

This growing appetite for virtual care and digital health is very encouraging. It also means we have our work cut out for us. The private sector played a key role in enabling healthcare providers to pivot their practice models and scale virtual care service volumes to unprecedented levels during the pandemic. This teamwork will need to continue to keep the momentum going.



Michael Green

We also need to work together to tackle the lack of interoperability in our health system. We work in silos and many health systems are not connected, so a physician may not be able to access a patient's laboratory results from a hospital or another physician in a timely enough manner.

We need the different systems to talk to each other. The private sector, including members of the Alliance, is working to promote the widespread adoption of standards that will enable the sharing of this information while ensuring privacy and security for patients.

Another area of importance for the Alliance is increasing digital health literacy among Canadians. Our public consultation found that nearly four in 10 Canadians say their level of understanding of their health information and/or their comfort with technology is a barrier to their use of digital health, while nearly six in 10 feel they don't know enough about digital health apps and services.

These are complex issues that will take time to address and working collaboratively will speed up progress. Significant innovation comes from the private sector, so we look forward to continuing to work with the members of the Infoway Alliance and other industry leaders. By harnessing our collective knowledge and expertise, we can give Canadians the digital health tools and services that will help them manage their health and improve health outcomes.

Michael Green is President and CEO of Canada Health Infoway

Psychiatrist embraces digital future of healthcare

Dr. Joie Zeglinski, a psychiatrist treating those suffering from psychological trauma, would welcome more mental health professionals in the Ottawa area. "The need is so great – especially for firefighters, police, military personnel and first responders," she says. "Trauma patients require long-term treatment, and there is simply not enough room in our schedules to care for all of them."

Working from the Ottawa Anxiety and Trauma Clinic, Dr. Zeglinski's own 13-year practice is at capacity. She is continually looking for ways to be more efficient so she can focus on where the need is greatest – her patients.

In 2015, Dr. Zeglinski and a colleague decided to free themselves and their support team from the administrative burden of paper patient files. A grant from OntarioMD made it feasible to switch to an EMR platform. "I felt that eventually we had to go digital, so why not get started? The grant covered the start-up costs, and my colleague and I share the remaining fees," she says.

The transition went smoothly, and the clinic's "fearless" office manager was excited that our patient files would be online. After a few days of training,

things were running like clockwork.

"Accessing information is much faster and easier – I love that I can search for my notes just by typing in a word or the name of a medication," says Dr. Zeglinski. Expanding on the functionality of the EMR, the doctors integrated OLIS, which gives them access to patient lab results, and PrescribeIT, Canada's electronic prescription service. The next add-on was a mobile app that syncs with the clinic's EMR. "I like the portability that it affords me," she says. "I can be at my child's activities and still be connected to my patients, or I can complete patient charts at home."

"With every update, it just gets better," says Dr. Zeglinski. The app has evolved with several upgrades like the note-taking feature, which transfers encounter notes right into a patient's file, and the ability to remotely view and process lab results and initiate next steps in a patient's care. No data is

stored on the device to protect patient confidentiality.

For Dr. Zeglinski, the most appealing feature is the ability to take pictures. "I use expressive modalities in my practice. These could be drawings, paintings or sculptures – which can be difficult to describe in a chart. With the mobile app, I can take a photo and it is immediately uploaded to the patient's file in the EMR."

Being able to use the microphone to dictate notes into patient charts was also a saving grace after Dr. Zeglinski suffered a shoulder injury, which made it difficult for her to type.

Even as an independent psychiatrist, Dr. Zeglinski understands that in her field of practice she needs a strong support system. At the Ottawa Anxiety and Trauma Clinic, mental health professionals aren't just sharing space. "We bounce ideas off each other, and share our stresses and concerns," she says. "We need to be surrounded by colleagues who can support us and help us do our best for our patients."

Her work is further supported by the clinic's EMR and mobile app, which together provide a streamlined, digitized workflow and keep Dr. Zeglinski connected to her patients anytime, anywhere.



Dr. Joie Zeglinski

In an era of rising opioid use, digital solutions are proving their worth

Medication treatments work best when combined with behavioural therapies.

BY DR. SUNNY MALHOTRA

During the pandemic, healthcare providers have seen an increase in depression and anxiety due to social isolation constraints. These conditions have led to substance abuse, contributing to the growing mortality rates during this pandemic. Of these, opioid use disorder has continued to be one of the leading epidemics within the pandemic in the United States. According to the American Medical Association, many U.S states have reported sharp increases in opioid-related deaths since the beginning of the outbreak.

Treatment of opioid use disorder involves pharmacotherapy like buprenorphine, methadone, and naltrexone in combination with counseling and behavioural therapies.

The most common medical pharmacotherapy, according to a recent article published by Wakeman and colleagues in JAMA ("Comparative Effectiveness of Different Treatment Pathways for Opioid Use Disorder"), is buprenorphine, as it is associated with reducing high-cost healthcare services and total healthcare costs.

However, the continuation and maintenance of medications like buprenorphine are dependent on the co-administration of neurobehavioural therapy. Programs that administer both neurobehavioural therapy and buprenorphine are limited in availability and thus fall short of treating opioid use disorder.

Fortunately, digital technological therapies can help by providing help for patients with opioid use disorders who are being treated with buprenorphine. In this way, the combination of digital technology and medication therapy can reach more patients and cut total healthcare costs significantly.

Pear Therapeutics, a leading company in prescription digital therapies, launched reSET-O in 2018, an FDA-cleared prescription digital therapy program designed to provide cognitive-behavioural therapy to patients with opioid use disorder currently on buprenorphine.

The digital therapy consisted of on-demand audio and video lessons that provided reinforcement and

The combination of digital technology and buprenorphine therapy can reach more patients and cut total healthcare costs significantly.

understanding of positive adaptive behaviours, such as motivations for sobriety and skills to manage triggers and prevent relapse. The app also provided rewards for patient engagement with therapy in the forms of badges and gift cards for completing lessons and logging negative urine drug screens.

In 2019, Pear therapeutics conducted a retrospective study in which they evaluated 351 patients' use of healthcare resources for six months before and after reSET-O

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initiation to assess the real-world impact of such therapy on healthcare resource utilization. The results of this study showed a significant decrease in healthcare encounters after six months of reSET-O therapy.

The findings included 1,181 fewer clinical encounter claims, 45 fewer inpatient hospital stays, and 27 fewer emergency department visits.

These results demonstrate that patients retained in treatment are better equipped to avoid exposure and relapse, greatly reducing their risk of overdose and thus decreasing hospital visits and stays. The study found a potential savings of \$750,000 in hospital and emergency department encounters that would have been achieved with this cohort of 351 patients using reSET-O, which would represent a savings of \$2,150 per patient in healthcare service costs.

Prescription digital therapies such as reSET-O can improve the effectiveness of medications in the treatment of opioid-use disorders. When used as a combination approach, prescription digital therapies can increase adherence and maintenance of treatment, thus reducing the risks of relapse and overdose.

Decreasing these risks will result in the reduction of high-cost healthcare services like emergency department encounters, ICU stays, and total healthcare costs. Prescription digital therapies can alleviate the growing mortality from opioid use disorder in today's pandemic. In an environment with scarce medical resources, they provide valuable behavioural therapies in combination with medication to combat relapse. In short, they are providing crucial access to healthcare at the patient's convenience.

Mental health clinic uses technology to treat patients effectively

TORONTO – As more Canadians struggle to cope with the unprecedented impact of living through a global pandemic – with 50 per cent reporting their mental health has worsened as a result of COVID-19, according to the Centre for Addiction and Mental Health (CAMH) – a new, unique high-tech mental health clinic in Toronto is seeing a surge in patients of all ages.

"If you have a predisposition for mental distress, the pandemic may trigger clinical levels of anxiety or depression that require professional intervention," said Dr. Leo Steiner, who opened TMS Clinics of Canada in September to pioneer a groundbreaking, non-invasive treatment that combines cutting-edge brain technology – called Transcranial Magnetic Stimulation (TMS) – with talk therapy to treat depression, along with anxiety, OCD

and other mental health issues.

Since opening its doors, the clinic is busier than expected, treating an equal number of men and women aged 18 to 75 with an impressive success rate. "More than 70 percent of the people we're seeing are experiencing a reduction in intensity of their symptoms, and roughly 60 percent are approaching full remission," Dr. Steiner said.

The clinic's unique approach involves a combination of cutting-edge technology – the world's most advanced TMS machine developed by Israeli scientists and approved by Health Canada that uses magnetic fields to stimulate the brain's nerve cells – with psychotherapy specifically designed to accompany the technology.

Unlike a small number of Ontario hospitals that are using TMS primarily as a research tool, TMS Clinics of Canada is providing a

patient-centric service that combines daily 20-minute TMS treatments together with supportive talk therapy sessions. Most patients report significant improvement after about four weeks of treatment, according to Dr. Steiner, with some

Transcranial Mental Stimulation is combined with talk therapy to treat depression and more.

patients able to wean off their prescribed medication entirely.

How TMS works: TMS works by sending painless electromagnetic pulses to stimulate circuitry in areas of the brain that have decreased activity in people who suffer from mood disturbance. Patients wear a specially designed helmet to carefully map out the precise area

that requires stimulation.

Dr. Steiner explained the game-changing technology solves a prominent "disconnect" in the brain, common in people who suffer from clinical levels of depression and anxiety. Brain imaging studies of these patients reveal underactive connectivity between the rational, planning area of the brain (the pre-frontal cortex) to areas that regulate emotions, motivation and energy. Without adequate connectivity, patients simply don't have the circuitry they need to get well.

"In very broad strokes, it's similar to ballroom dancing," he said. "You have the 'lead' that knows the steps but lacks the passion, and you have the 'follow' that has all the energy, but lacks direction. They clearly need one another to dance. The front part of the brain is the lead, it knows what to do when, and the

CONTINUED ON PAGE 22

AI is steadily becoming a smart assistant for Canadian radiologists

BY DR. DAVID KOFF
AND DR. LUCIANA RIBEIRO

You may remember the famous and definitive statement that Geoff Hinton made on November 24, 2016 at the Machine Learning and Market for Intelligence Conference in Toronto. The renowned Canadian psychologist and computer scientist, considered as the godfather of Artificial Intelligence, Chief Scientific Advisor, Vector Institute and VP at Google, said:

"I think that if you work as a radiologist, you are like Wile E. Coyote in the cartoon. You are already on the edge of the cliff, but you haven't yet looked down. It's just completely obvious that in five years deep learning is going to do better than radiologists."

It is true that developments in Artificial Intelligence have progressed almost at the speed of light. The RSNA/Kaggle bone age competition in 2017 drew 250 participants among 37 teams. In 2018, for the Pneumo-

AI is improving workflows and diagnostic confidence for radiologists, and ultimately, the quality of care for patients.

nia Detection Challenge, the response was overwhelming with 1,400 teams participating in the training phase (the winner was a Canadian radiologist from Laval, Quebec, Dr Alexandre Cadrin-Chenevert); and the RSNA Intracranial Hemorrhage Detection challenge was equally successful with also close to 1,400 teams.

In 2019, at its annual conference, the largest in the world, the Radiology Society of North America opened for the first time an entire new hall dedicated to Artificial Intelligence. There were 113 companies registered as specialized in artificial intelligence in radiology at the beginning of 2020, and more than 100 participated in the virtual RSNA 2020, almost as many as at RSNA 2019. Artificial Intelligence in Radiology had attracted \$1.17 billion in investment as of January 2020.

Of course, four years ago, when artificial intelligence appeared to be a game changer in diagnostic imaging, it created a lot of anxiety in the radiology community – some radiologists really did wonder if Geoff Hinton's prophecy would materialize and if this would really be the end of the profession.

But at the end of 2020, AI solutions had not yet been widely adopted and remained limited to specific conditions or imaging modalities. According to an article published in January 2020 in the Journal of the American College of Radiology (McKinsey), physician adoption, regulatory approval and cost were the biggest barriers to more widespread deployment.

The Canadian Association of Radiologists Artificial Intelligence working group answered the question on the need for radiologists in its recent white paper. It reminds us that radiologists perform complex tasks that require common sense and general intelligence which cannot be achieved through AI yet; it also tells us that

understanding a case requires integration of medical concepts from different fields and clinical specialties to provide plausible explanations for imaging findings.

The radiologist performs many tasks daily including consultation, protocoling, review of prior examinations, quality control, identification and dismissal of artifacts, cancer staging, disease monitoring, interventional procedures, multidisciplinary discussions and patient reassurance.

As with many revolutions in radiology, where each new modality was supposed to eliminate a previous one, artificial intelligence is positioning itself as a valuable tool to help radiologists, and is definitely not replacing them.

There are two main applications of AI in radiology:

- Non-pixel-based AI is probably the more needed currently, as it covers a large number of tasks where workflow can be improved. It starts before imaging, helping with applications such as acquisition of relevant history and medical data, automated imaging protocoling. During imaging, AI can help to optimize image acquisition and quality. After imaging, there are multiple applications such as prioritization, automated contextual information retrieval for reporting, measurements and comparison to priors, intelligent proof-reading and results communication.

- Pixel-based AI includes lesion detection and characterization, STAT prioritization, AI embedded in modalities. Here, the sky is the limit, as there are so many applications which can benefit from AI. Some of the most popular are intracranial hemorrhage, cervical spine fractures, pulmonary embolism, lung nodules, etc.

One of these applications, the Rapid Software platform, has been implemented at the Hamilton General Hospital, Hamilton Health Sciences, Hamilton, Ontario, in June 2019 as the first in a Regional/Provincial stroke centre in Canada.

As a member of the Neuroradiology implementation process, we received great support from the Rapid team and the



Dr. David Koff



Dr. Luciana Ribeiro

adoption of the platform was smooth in our site and across the satellite sites.

The Rapid software uses artificial intelligence in the interpretation of perfusion CT images. The software was conceptually developed for use in the stroke extended window patients (greater than 6 and less than 24 hours) to determine possible benefit of reperfusion.

The Rapid results are summarized and can be easily accessed on a mobile device or through a PACS workstation in less than five minutes. It has been running really well and we have adopted the Rapid software perfusion report in all cases where perfusion imaging is required, not only for extended stroke window, such as for the assessment of stroke mimickers.

The Rapid software also provides an au-

tomated assessment of ASPECTS score, that allows the assessment of stroke size and possible acute hemorrhage. Both applications are also available routinely and may work as double check of our assessment as neuroradiologists. Our experience as neuroradiologists shows that the use of automated ASPECTS score may overestimate stroke size mainly in our population that has multiple previous chronic strokes.

This points to the need of experienced neuroradiologists and stroke neurologists in the interpretation of these results. The automated hemorrhage detection is very helpful for clinicians mainly on call in communities where no neuroradiologists may be available to support their interpretation, as the presence of acute hemorrhage will represent a formal contra-indication to reperfusion.

Overall, these tools have made difficult diagnosis easier and have brought a systematic approach to the interpretation and treatment of extended window stroke patients.

In conclusion, artificial intelligence is taking its place in the panoply of tools which have made radiology one of the most exciting fields in medicine. AI will be a tremendous help for radiologists and other healthcare professionals, improving workflows and diagnostic confidence and ultimately the quality of care for our patients.

Dr. David Koff is a Professor in the Department of Radiology, McMaster University. Dr. Luciana Ribeiro is Neuroradiology Program Director and Associate Professor of Radiology, McMaster University and a Staff Radiologist, Hamilton General Hospital.

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AI solutions are steadily making their way through DI departments

The various forms of AI are proving useful in alerting radiologists to high-priority cases.

BY DAVE WEBB

In the 1950 Stanley Cup playoffs, then-22-year-old Gordie Howe mistimed a check and fell headfirst into the boards. Removed unconscious on a stretcher before a hushed crowd, he was rushed to hospital. With Howe's life on the line, doctors determined that intracranial pressure from a brain bleed would kill him. At a medical imaging conference in Toronto last year, Howe's son Murray, a radiologist, described how neurosurgeons determined where to drill to relieve the pressure: "They guessed."

Fortunately, they guessed right, and saved the young man who would become an ice hockey legend.

Brain imaging has become much more sophisticated since 1950. That's fortunate, since the mortality rate of brain bleeds is almost 50 percent in patients who are not diagnosed within 24 hours. Still, it was a source of frustration for Dr. Errol Colak, a staff radiologist at St. Michael's Hospital in Toronto. Imaging files were being sent to him from the emergency room for analysis in chronological order – on a first-in, first-out basis.

"You don't really know what you've got until you open (the file)," Colak says. The patients in most dramatic need of diagnosis weren't necessarily higher up on the work list. Dr. Colak would get a sinking feeling when, hours and dozens of patients into his list, he would find a brain bleed. "I'd think, 'I really hope this patient is still okay,'" he says.

For all the technology and networking capabilities, "computers are still pretty stupid," Colak says. Having done his undergraduate work in computer programming, he wanted the machines to streamline the diagnosis process and make sure the highest priority cases got attention quickly. If the computers were dumb, he would make them smarter.

AI and signal processing: Enter Hojjat Salehinejad. He wanted to use his talents and education to help people. Hojjat majored in machine learning and signal processing and is now pursuing his PhD in electrical and computer engineering at the University of Toronto, while working as a senior data scientist at Unity Health Toronto – he was a natural fit for an artificial intelligence (AI) project to streamline the emergency radiology process.

"Images and videos are signals (for processing)," he says. And signal processing is critical to AI.

Artificial intelligence is not a technology, but a suite of intertwined technologies – natural language processing, machine learning, deep learning, computer vision – that allow computers to perform human-like, decision-making activities. Rooted in the science of analytics, AI systems can "teach themselves" the relationships among the data collected and outcomes.

But first, they have to be trained.

Salehinejad and Colak spent a year feeding thousands of radiological images into an experimental system, tweaking algorithms and programming. The goal was to build a system that could process imagery from scanning devices and flag potential brain bleeds for the radiologist's analysis.

Rather than waiting several hours, patients could be referred to a neurologist in minutes instead of hours. The system was launched in the fall of 2020, and has an accuracy rate, verified against historical hospital data, of 93 percent. And, Salehinejad says, as

the system collects more data and reports, performance improves.

AI trends in medicine: If Dr. Colak is an "IT guy" turned radiologist, Greg Horne's career arc is the reverse. Once an X-ray technician, he's now the Global Principal for Healthcare at analytics and AI giant SAS Institute. AI is essentially an exercise in pattern matching and search optimization, sorting through assembled experience. Data can't necessarily tell you who will turn up in an emergency room, but it can tell you about why and how many.

It can solve other pressing medical problems, too. For example, the Centre for Addiction and Mental Health (CAMH) crunched data to create a model that identifies patients that are likely candidates for alternate level of care (ALC) – those in

care is in serving as an intelligent assistant, and acting as another set of eyes for physicians. One such application is an algorithm from GE that is very successful at identifying pneumothoraxes. Paired with X-ray technology, it is flagging possible cases of pneumothorax and helping radiologists and other doctors ensure that they're not overlooked.

Radiology and innovation: AI is especially ripe for use in imaging, partly because radiology has thrived on innovation, says Dr. An Tang, a professor in the department of radiology, radiation oncology and nuclear medicine at Université de Montréal. Computerized tomography scans (CT or CAT scans) were developed in the 1980s and had become commonplace in the 1990s. The early 2000s brought image-guided, interventional procedures. Dr. Tang says about 20 percent of radiological work is now interventional, including minimally invasive procedures to heat and burn tumours, precisely target chemotherapy, and cryogenically freeze kidney tumours.

"Our work has changed a lot over the last few decades," he says.

Dr. Tang chairs the Canadian Association of Radiologists (CAR) AI Standing Committee. He is "deeply convinced" that AI married with radiology will render superior results for patient care.

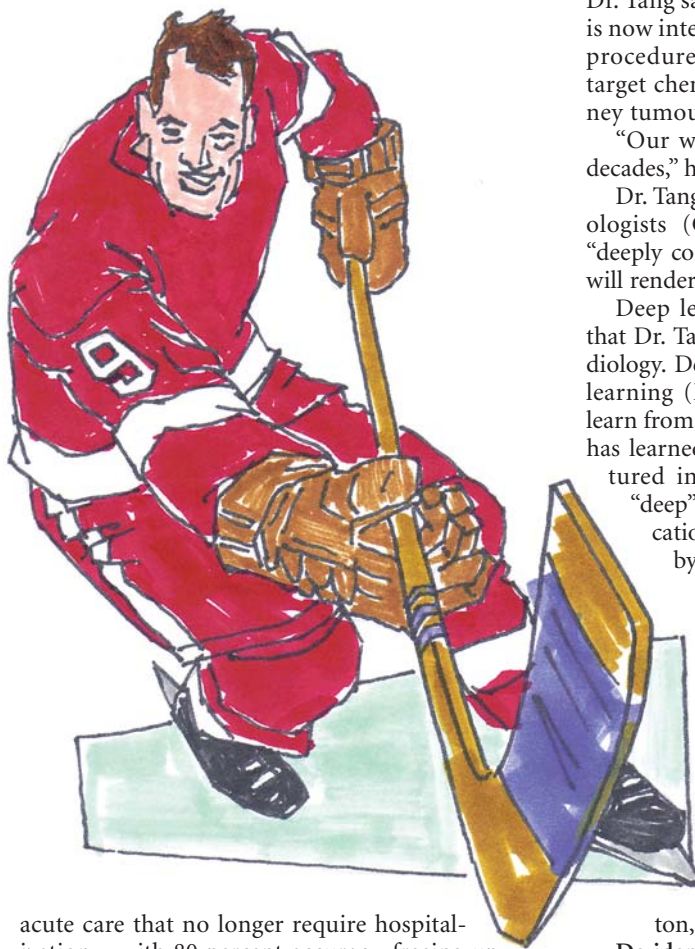
Deep learning is a technological breakthrough that Dr. Tang thinks has enormous potential for radiology. Deep learning (DL) is a subset of machine learning (ML). ML uses algorithms to parse and learn from data and make decisions based on what it has learned. DL is a type of neural network structured in numerous layers (hence the adjective "deep"). DL learns imaging features and classification rules on its own. Its design is inspired by that of biological neurons. Nodes, mimicking neurons, turn on and off if data reaches a certain threshold in the algorithm, says Dr. Geoffrey Hinton, a vice-president and engineering fellow with Google Inc. and professor emeritus at the University of Toronto.

Unlike a decision tree model, which eliminates data as it moves through its branches, DL monitors the state of the millions of "neurons" in the system, using all of the data it has collected for decision-making. Data loss, says Hinton, is the enemy of deep learning.

De-identification: How much data is enough? For a deep learning model to exceed human judgment requires thousands, even hundreds of thousands of images to train on, Dr. Tang says. And there are a couple of obstacles to gathering that much information.

First, it's unrealistic for radiologists to re-input reports that outdate a project. Also, institutions will have to pool datasets and models, called a federated model. Here, the privacy issue raises its head.

"The implementation of ML algorithms often requires sharing highly sensitive (personal health information) contained in medical imaging through collaborations between different sites or data transfer to a third party," wrote the CAR's AI Ethical and Legal Working Group, composed of more than a dozen radiologists, including Dr. Tang, and two lawyers in a two-part White Paper published last fall. "Therefore, careful precautions are required to ensure there is no inadvertent transfer



acute care that no longer require hospitalization – with 80 percent accuracy, freeing up beds and streamlining processing.

(In one case, reconstructing data after the fact, largely customs and airline travel data, algorithms predicted down to the county level where the first U.S. case of Ebola would appear.)

Worldwide, Horne says, AI projects have modeled the viability of kidney transplants, detected the growth of liver metastases in colon cancer patients, and chosen the exact model of stent to match a patient condition. But there are impediments, regulatory and institutional, to the growth of AI in healthcare. On the institutional side "the trend that still wins, over and above everything else, is 'do nothing, watch and observe,'" Horne says.

"Healthcare traditionally has been a place where people don't want to go first. They certainly don't like to go last, either," Horne says.

One of the stronger growth areas for AI in health-

of information which could be used to identify a patient.”

Hospitals share sensitive data governed by the federal Personal Information Protection and Electronic Documents Act (PIPEDA), along with parallel, health-focused acts on a provincial level, like Ontario’s Personal Health Information Protection Act (PHIPA). As a result, when personal health information is used for secondary purposes such as research, care must be taken to ensure health information cannot be traced back to an individual.

The CAR White Paper on De-Identification of Medical Imaging outlines best practices in “data management, access to health care data, de-identification, and accountability practices.”

Movement of images is a challenge, says Dr. Tang, and whatever pooling or distribution models that are used must not remember or expose personal data. “That is a requirement,” he says.

ImageNet: Fortunately, training imagery from hospital networks can be supplemented by ImageNet, a carefully architected database of objects developed to enhance the performance of machine learning. The brainchild of computer science professor Fei-Fei Li, ImageNet was inspired by the work of George Miller, who developed a hierarchical architecture for the English language by not defining words but mapping their associations – something that aligned with machine-readable logic.

Li’s project, though, was to catalogue images in a similar fashion. Beginning in 2007, the dataset had more than three million images by 2010, all labeled and segmented into more than 10,000 categories. In 2012, a team from the University of Toronto created AlexNet, a neural networking architecture that brought image recognition error rates below 25 percent. By 2017, that number was 2 percent.

ImageNet now catalogues more than 14 million hand-annotated images. Stanford University’s Medical ImageNet contains petabytes of de-identified radiology and pathology images, linked to genome and electronic health record data. And more data means better modeling.

Intervention: AI modeling can speed diagnosis in an emergency situation, like Dr. Colak’s, at St. Mike’s. It’s also becoming important for interventional radiology.

However, to guide percutaneous or endovascular intervention, we often need information coming from different imaging modalities (ultrasound, CT, MRI and PET-CT). Algorithms have been developed to merge images coming from modalities where the target lesion is well delineated (CT, MR or PET-CT) with a modality used to track the interventional device during the intervention (ultrasound, fluoroscopy, CT).

This process is called image fusion. Some limitation of this process are related to patient motion, respiration or even deformation of the tissue due to the interventional device.”

AI can be used to improve image fusion (elastic registration of fusion) by predicting the deformation of the image during the intervention. This can be done by using computer modeling of mechanical

properties (Finite Element Analysis (FEA) Computing) assisted by artificial intelligence training.

For endovascular intervention such as arterial occlusive disease or aortic or brain aneurysm, we can now simulate the flow in the target vessel using computational flow dynamic (CFD) simulation and enhance the prediction using AI algorithms. With superior modeling, AI can also be used for

simulations, whether for training purposes or a rehearsal for a specific procedure.

Dr. Gilles Soulez, principal scientist with the University of Montreal Health Centre (CHUM) Research Centre and director of the Laboratory of Clinical Imaging Processing at CRCHUM, now thinks of radiology as a four-part process: image acquisition, classification and risk stratification of the target lesion (is this benign

or malignant? or is the vascular lesion at risk of occlusion or rupture?), semantic segmentation (differentiating tumors or target vessel from the surrounding organ), object segmentation (delineation of individual tumors or target vessel) and intervention planning and guidance. “Before working with data and computer scientists, I didn’t think in these terms,” said Dr. Soulez.

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'Virtual' RSNA 2020 highlights advances in AI assisting radiologists

It was an odd experience to attend the annual RSNA conference “virtually” at the end of 2020. While many educational sessions were online, and vendors offered virtual booths and announcements, the event had a much different vibe than usual.

Normally, with the “live” event in Chicago, you tend to pick up a lot of information informally, through small-talk and chance encounters.

Still, there were interesting and important announcements, and radiologists who appeared on video relayed their current concerns.

Many radiologists asserted that they're struggling to keep up with the volume of exams they must read in a given time. In this environment, workflow improvement is seen as key to enhancing the quality of care and reducing burnout and stress. It's believed by many that AI could play a significant role here, to help manage workflow and image analysis.

Dr. Alan Pitt, a neuroradiologist at the Barrow Neurological Institute, in Phoenix, Ariz., spoke at a presentation sponsored by Philips Medical.

Dr. Pitt, who is also an entrepreneur with nine start-ups to his credit and who is currently the CMO of an AI company, gave his views on the current situation in radiology. In brief, he said, “Imaging volumes have gone through the ceiling. We need new tools to get us through this problem.”

He added that, “The imaging exam has replaced the physical exam for many physicians. So, the volume has continued to climb. There has been an explosion in demand that we haven't been able to keep up with.”

For his part, Dr. Pitt said that he is in a privileged position. He has residents and fellows who prepare much of his imaging work before he looks at it. “It's like having a few sous-chefs getting things ready for the chef.”

He asserted that if technology could do this prep work, for everyone, all radiologists would benefit immensely. “If we can get to the place where technology does this, we will fundamentally change the nature of radiology.”

And that's where AI comes in. It could do the prep work – like a sous chef.

Right now, he said, AI can help interpret various diseases and organs, but it hasn't been integrated into the workflow of radiology. That will no doubt happen, however, and it is just a matter of time. “AI is now like 3D was in the 1990s,” he said, explaining that the technology is still in its formative years.

Kees Wesdrop, chief business leader for precision diagnosis at Philips Medical, echoed the experience of Dr. Pitt. “Exam volumes have increased massively,” he said at the Philips webinar. A great many DI departments

“are unable to meet their reporting requirements ... and many radiologists feel burnt out.”

To improve things in this climate, Wesdrop said that Philips is taking a ‘systems view’.

“Instead of saying, here's our new scanner, we are saying, here's our new AI-enabled suite – including telemedicine, AI and many imaging modalities,” commented Wesdrop.

Philips Medical

Philips' major announcements during RSNA 2020 included patient-related solutions, as well as workflow and AI enhancements. Chief among them is what Philips calls the ‘workflow suite’.

The Philips Radiology Workflow Suite helps drive clinical and operational efficiency across all phases of the diagnostic enterprise, including:

- Scheduling and preparation – Patients anxious about a potentially serious diagnosis can receive support even before arriving for their exams, with personalized

instructions and reminders delivered via SMS-based communications from Philips Patient Management, making its debut at RSNA 2020.

- Image acquisition – Technologists under pressure to achieve a first-time-right scan can now be supported virtually by remote specialists through the ‘vendor neutral’ Radiology Operations Command Center.

Philips' Collaboration Live, available on premiere Philips ultrasound systems, also connects technologists with colleagues and specialists whenever and wherever required. To streamline patient setup, the MR SmartWorkflow reduces and simplifies the number of steps needed in a conventional MR exam workflow, using technology to automate where possible. And the Radiology Imaging Suite provides the technologist with a common imaging platform and more streamlined workflows by integrating patient information and advanced visualization and analysis into one easy-to-view console.

- Image and data interpretation – Radiologists confronted with increasing numbers of

images to read can now receive a prioritized workload from the AI-enabled Workflow Orchestrator, along with an intuitive summary of advanced visualization and analysis from various systems presented in a single view. IntelliSpace Portal Advanced Visualization also connects patient data across departments to create interoperability for greater clinical intelligence and analysis, supported

“Imaging volumes have gone through the ceiling. We need new tools to get us through this problem.”

by AI-tools such as an algorithm for the detection of COVID-19 lesions.

- Outcomes and follow-up care – Radiology administrators are empowered to help patients keep to their treatment plans while improving overall operational efficiency with the real-time performance metrics and follow-up patient tracking provided by Philips Operational Informatics. The Philips Patient Portal empowers patients to access and share their information and access their results between facilities, physicians, specialists and other healthcare providers.

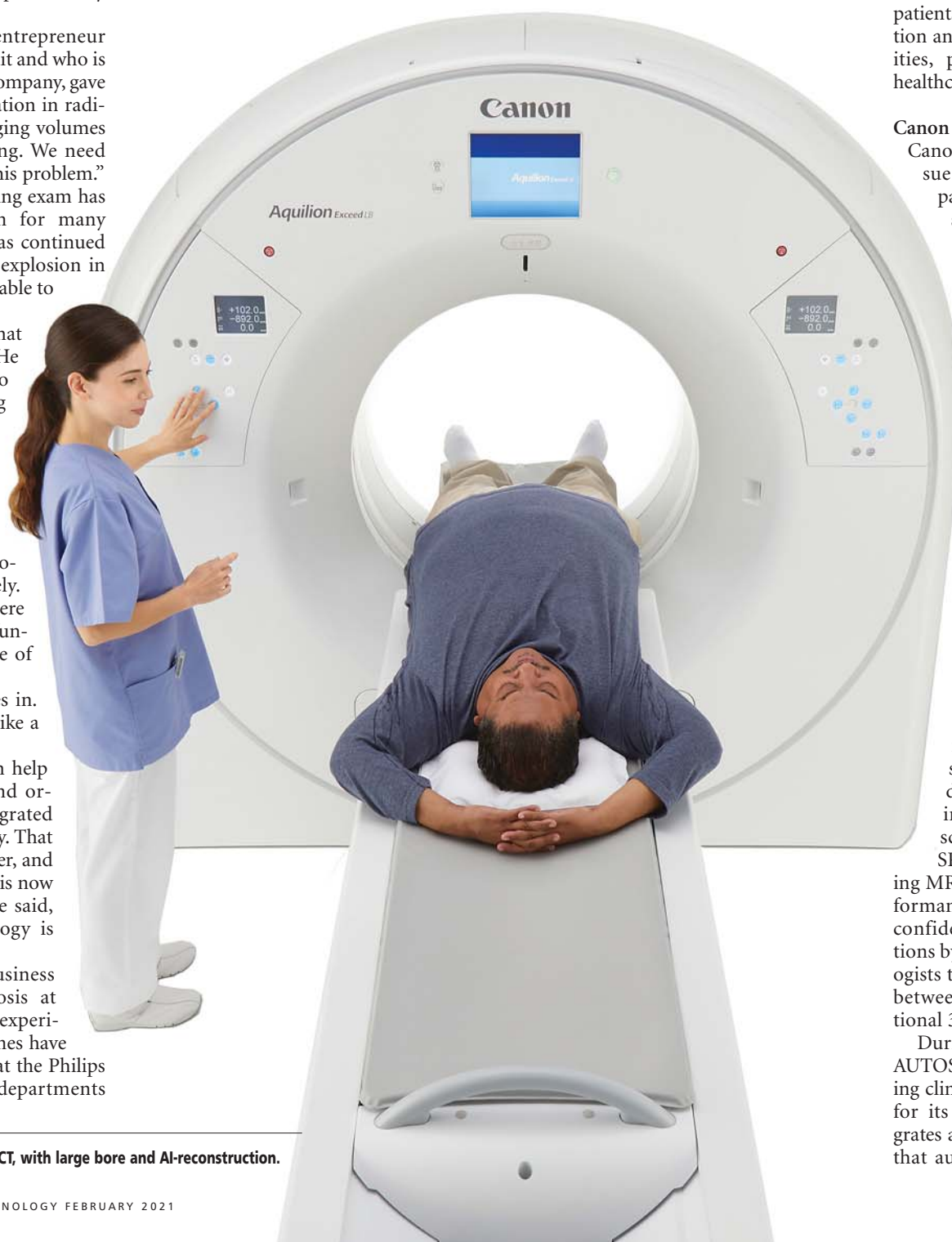
Canon Medical

Canon Medical is also addressing the issue of workflow and burnout by expanding the use of AI in its imaging systems. Canon announced the deployment of its AiCE DLR technology across its CT line of scanners and has also added the automated technology to its Vantage Orian 1.5T MRI system. According to Canon, AiCE is an innovative Deep Learning Reconstruction (DLR) technology that has been trained to reduce noise and boost signal to deliver sharp, distinct images at speed.

AiCE is integrated into routine CT workflow for operational efficiency without causing any extra steps, to produce sharp, distinct images at low doses.

AiCE DLR is now available for virtually all types of clinical exams on Canon's Vantage Orian 1.5T MRI system. The capacity to scan a larger number of clinical indications, from prostate to shoulders, including all joints, cardiac, pelvis, abdomen, and spine – in combination with accelerated scan technologies like Compressed SPEEDER – empowers clinicians using MR to boost their image quality, performance and productivity. Canon is so confident in the quality of reconstructions by AiCE that it is challenging radiologists to see if they can tell the difference between 1.5T AiCE images and traditional 3T image quality.

During RSNA, Canon also announced AUTOSTroke, an AI-powered deep-learning clinical workflow automation solution for its CT scanners. AUTOSTroke integrates a comprehensive set of applications that automatically delivers accurate and



Canon's Aquilion Exceed LB CT, with large bore and AI-reconstruction.

fast clinical insights to emergency and stroke teams.

Once the patient is scanned using a Canon CT system, AUTOSTroke uses deep learning AI algorithms, including Bayesian CTP+ with a zero-click workflow, to automatically complete triage and to help identify large vessel occlusions or intracranial hemorrhages. When it sees a critical case that needs immediate attention, an alert is sent to clinicians so that they can mobilize and respond as fast as possible, to ensure the patient quickly receives appropriate treatment. With advanced AI intelligence for stroke, clinicians can feel confident in delivering the highest level of patient care to those who need it most urgently.

Arthur Voorpool, CT product manager with Canon Medical Systems Canada, explained the “AUTOSTroke solution is at the forefront for stroke care and we are now working on partnerships for the Canadian launch and continued advancement.”

Mr. Voorpool said the company is also taking a major step forward into the oncology sector with its Aquilion Exceed LB, a CT system optimized for radiation therapy planning with a 90 cm bore – the largest in the industry.

Ryan Hazell, MR Application Specialist at Canon Medical Systems Canada, indicated that the company’s AiCE technology is now available for 96 percent of the human anatomy. In the latest iteration of the Compressed SPEEDER with AiCE, clinical staff will experience a significant reduction in scan time while improving image qual-

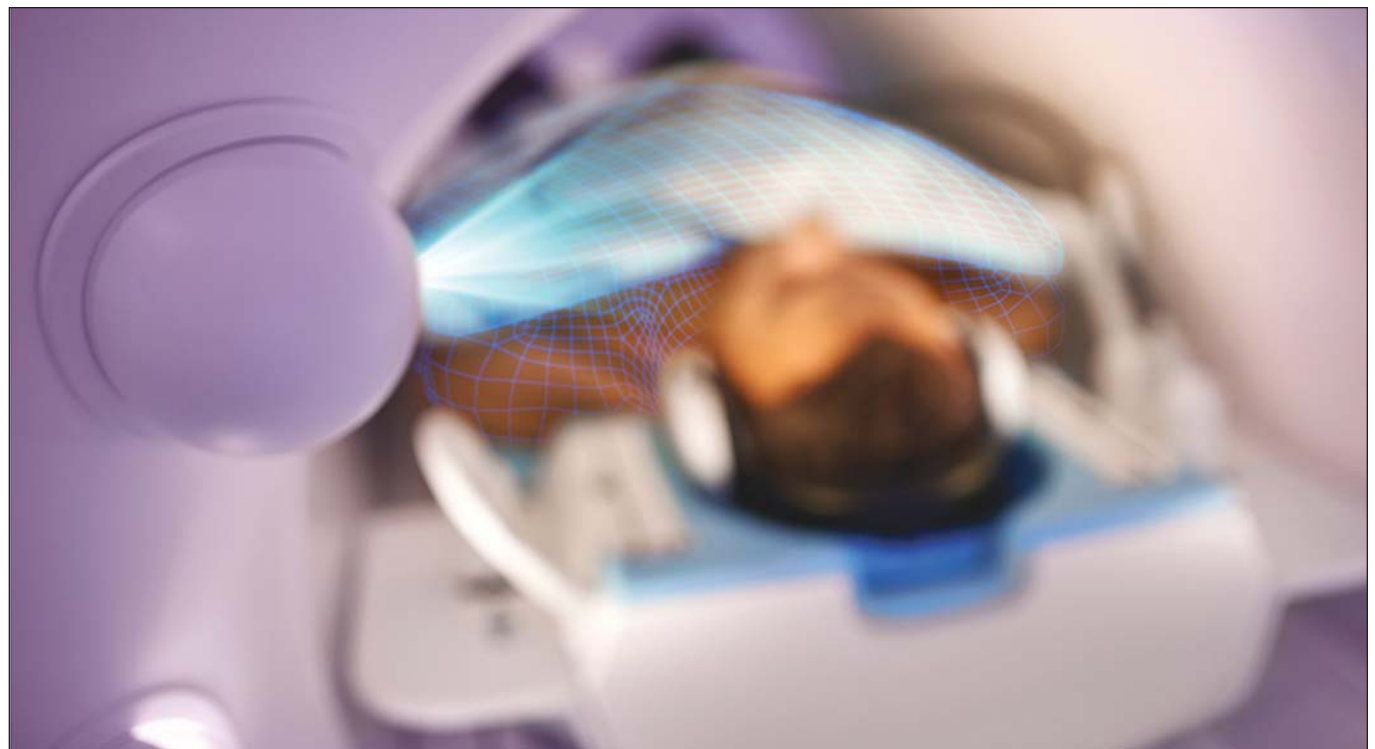
The team from Canon noted that four Alphenix systems will be installed in Newfoundland and Labrador in 2021.

ity. For example, a 4-minute knee examination compared to the current scan time of 10 to 15 minutes, without jeopardizing image quality.

On the interventional radiology front, Tara Utley, senior product manager, XR/VL, expressed the breadth of options targeted for interventional procedures – all developed in collaboration with leading clinicians. The Alphenix family of systems offer a range of C-arm positioners designed to offer full access to the patient. The integration of the Alphenix 4D CT system combines a premium CT with ceiling mounted angiography technology suitable for Canadian Academic facilities.

Most recently, hospitals in Quebec continue to take advantage of the various solutions Canon Medical has to offer. An Alphenix Sky+ and Vitrea Enterprise Solution was installed in Sherbrooke just prior to RSNA. This advanced ceiling-mounted C-arm offers unprecedented flexibility and full body 3D imaging capability with fast acquisition, fewer motion artifacts, and less contrast agent required. Canon’s Alphenix Biplane which combines the exceptional flexibility of a floor-mounted and ceiling-mounted lateral C-arm will be installed in 2021.

Four Alphenix Core+ Floor-mounted multi-access single plane systems, with High-Def Detectors will be installed in Newfoundland in 2021. Additionally, the first Hi-Def Detector in the industry allowing for more than twice the resolution



Philips has been integrating AI technologies into its solutions, offering AI-enabled tools such as workflow and an algorithm for the detection of COVID-19 lesions.

of conventional detectors was also featured at RSNA. Utley commented, “we are very excited to bring this new and advanced technology to Canada.”

And in ultrasound, senior product manager Benoit Duchon noted that Canon has launched a Healthy Sonographer program to reduce work-related musculoskeletal disorders among clinical sonographers. Moreover, the company launched its Ultra-Wide View systems, which provide a significantly larger view of the scan to see more anatomy and to acquire images more quickly.

Canon also deployed their comprehensive Liver Disease Analysis Suite on their high-end ultrasound portfolio. Advanced tools include: Attenuation imaging for the assessment of fatty liver infiltration, Shear Wave Elastography, a non-invasive tool for accurate and reproducible assessment of hepatic fibrosis, Shear Wave Dispersion, a non-invasive tool for assessment of tissue viscosity that can correlate with inflamma-

tion of the liver. Canon also extended its Multi-Parametric reporting to combine the results from both ultrasound and external exams (such as blood tests) and present the multiple liver analysis tools into a single report.

Note: Some Canon products discussed are pending Health Canada approval.

GE Healthcare

For its part, GE Healthcare had some exciting technologies to talk about at the virtual RSNA. Mark Phillips, chief marketing officer for the company, noted that the company is focused on driving efficiencies for radiologists and better outcomes for patients.

It has become a major player in the AI world with its Edison platform, and it’s building a whole ecosystem of solutions by tying in other developers. “Our platform can cross-connect to others, and we’ve launched an app store to develop this even further,” said Phillips. There are now about 100 different clinical AI solutions on offer,

and 250 more in the pipeline, he said. “There is a proliferation of AI companies out there, but they all have different approaches. By working together with Edison, we’re giving customers a common approach,” he said.

With care providers everywhere focused on the problem of COVID-19, Phillips said GE Healthcare has also pivoted, to prioritize its own efforts on finding solutions. Some of its AI-related work includes:

- Critical Care Suite 2.0, with a new AI algorithm to help clinicians assess Endotracheal Tube (ETT) placements, a necessary and important step when ventilating critically ill COVID-19 patients. The AI solution is one of five included in GE Healthcare’s Critical Care Suite 2.0, an industry-first collection of AI algorithms embedded on a mobile X-ray device for automated measurements, case prioritization and quality control that can help improve efficiency on the front lines.
- VenueGo, which features an adaptable



GE Healthcare said the COVID-19 crisis had led to rising demand for its “CT in a Box”, which can be quickly set up in any location. China has been a major customer.

take-anywhere design and AI-enabled auto tools that simplify complicated workflows to help the clinician care for patients at the point of care. From fast and automated assessments, like the AI-enhanced Auto B-line Tool that quickly calculates the overall lung score for triage decisions, to the fluid management and monitoring of pulmonary conditions including those associated with COVID-19, Venue Go can help support the patient across all point of care areas and clinical spaces.

GE Healthcare was also discussing its “CT in a Box” solution, essentially a “pop-up” CT suite that can be quickly set up at any location. The scanner and control room

Agfa Health Care announced its RUBEE platform, which provides curated AI solutions to radiologists.

are all situated in what looks like a container car, and there’s a special airflow system that’s crucial for handling COVID-19 patients.

“We started with it in China,” said Phillips. “It’s for care-providers who don’t have time to build a new room.” He explained that GE Healthcare had already delivered 100 of them to sites in China before RSNA 2020 had begun.

Something that was impressing radiologists visiting the virtual 2020, said Phillips, was GE Healthcare’s newly announced AIR Recon DL for MRI, said to be the industry’s first US FDA-cleared Deep Learning-based image reconstruction technology that works across all anatomies. Available as an upgrade to installed base systems and forward production across all 1.5T and 3.0T scanners, AIR Recon DL can help providers process their COVID-19 backlogs faster without compromising image quality. According to the company, early adopters were seeing between 30-50 percent exam time reductions with AIR Recon DL, with higher signal-to-noise ratios

(SNR) and higher resolution. “We’re getting a lot of the ‘wow’ factor from this announcement,” said Phillips.

Many were also ‘wowed’ by GE Healthcare’s acquisition of Prismatic Sensors, a major player in CT photon counting technology – the deal occurred shortly before the annual RSNA meeting. GE said the purchase signifies the company’s continued investment in photon counting CT technology, which has the potential to significantly increase clinical performance for oncology, cardiology, neurology, and many other clinical CT applications.

Phillips noted that operating room systems are a fast-growing area. “It’s a \$200 million market that’s growing annually in double-digit figures,” he said. On this front, GE Healthcare released what it considers to be a ground-breaking system. Called the OEC 3D, it’s a new C-arm designed to deliver 3D and 2D images in a large field of view to surgeons. According to the company, it integrates seamlessly into existing surgical workflows for enhanced surgical imaging precision and efficiency. OEC 3D features a 3D image reconstruction engine designed to present surgeons with high-resolution volume reconstructed CT-like images enabling surgeons to visualize exactly where they are operating in 3D for procedures where precision matters.

Agfa HealthCare

Recognizing the benefits – and challenges – of AI for radiologists, Agfa announced a comprehensive platform called RUBEE. The system is designed to provide “highly curated” AI solutions to rads, and to also tie-in workflow improvements and precision medicine – the future of healthcare.

“Hospital-centric care is moving to precision care that is patient-centric,” said Dr. Anjum Ahmed, chief medical officer, and global director of Innovation at Agfa HealthCare. “How can radiologists be more involved and more engaged with their colleagues,” he asked.

“Why not use consolidated information

to deploy AI and help with predictive analytics?” He noted that a panoply of advanced tools are appearing in the market to help radiologists, including ML, DL, NLP, analytics, visualization and virtual assistants. But an issue is arising in how to tie them all together.

“There are thousands of companies working on the various pieces,” he said. “It’s better to look at this from an enterprise perspective with an integrated platform.”

That is where RUBEE comes in – it provides the framework that can consolidate all the various pieces. Agfa HealthCare launched this new system during RSNA 2020, also providing a workflow toolkit and two major pieces to begin with, breast imaging using AI and CT lung imaging using AI. Dr. Ahmed said that chest X-ray will be coming soon.

IBM Watson Health

As well as focusing on AI in healthcare, IBM Watson Health is shifting its attention to the cloud. Dr. David Gruen, deputy chief medical officer, Imaging for IBM Watson Health, noted that cloud solutions can better link radiologists at various sites, even if they are working on different systems. Moreover, “the cloud never goes down,” he said, providing physicians with an “always-on,” secure solution.

Dr. Gruen, a practising breast radiologist in the New York City area, said there are three major challenges for DI physicians today: too many interruptions; too many images to handle in a given time; and not enough information about patients.

This is where AI can help, he said. “Radiologists can miss things if they’re not given all of the relevant information.”

Watson Health has produced AI solutions that include Patient Synopsis and Clinical Review.

Carestream Health

For its part, Carestream Health showcased its advances in pediatric health – in particular, the DRX-Revolution Nano Mobile X-

ray system. The system non-invasively examines and aids in the treatment of pediatric patients. Neonatal Intensive Care Units (NICUs) can conduct chest, intensive care and orthopaedic exams quickly, at the patient’s bedside.

“This system is ideal for chest X-rays and other pediatric exams,” said Sarah Verna, worldwide marketing manager for Global X-ray Solutions. “The DRX-Revolution Nano is ideally suited to serve as a dedicated system in an intensive care unit and the NICU.”

The portable, non-motorized X-ray system uses Carbon Nano Tube technology and features an ultra-lightweight design for easy maneuverability and arm positioning. It quietly and carefully moves around equipment that typically surrounds babies in critical care. The DRX Plus 2530C small-format detector provides greater positioning flexibility, especially in bassinets.

“It has no motors, which allows the system to be quiet,” Ms. Verna said. “It is small, lightweight and easy to transport even in tight environments like the NICU.”

The DRX-Revolution Nano addresses concerns over the level of radiation received by pediatric patients during imaging. With its Cesium iodide design for dose-sensitive pediatric applications, the system balances low radiation dose with high image quality, resulting in patient safety and accurate exams. Radiation exposure time is automatically determined to use the shortest exposure possible for effective results.

In the midst of the COVID-19 pandemic, the company noted that the Carestream DRX-Revolution Mobile X-ray System also assists in keeping critically ill patients in isolation. As the industry’s first mobile X-ray system with a collapsible column, the DRX-Revolution delivers high-quality diagnostic images in tight spaces, helping to limit the spread of infection by providing critical imaging services whenever and wherever needed.

“It has become necessary to bring more imaging capabilities to the patient’s bedside,” said Verna. “With the pandemic, hospitals need to quarantine patients who are seriously ill and keep them in their rooms to promote healing. The DRX-Revolution is built with this intent, to help ensure patient and clinician safety while capturing high-quality images.”

Responsive display screens located at both the tube head and main display offer technologists another point of visibility. Additional features aiming to reduce contamination include flush-mounted displays that provide a smooth surface for easier disinfecting; shelves located in each of the detector slots, within the bin, that allow users to safely place protective bags on detectors; and wristband barcode scanners for smoother workflow and limited equipment interaction.

“The display screens are redesigned to better protect against fluid ingress, which is critical for disinfecting,” Ms. Verna said. “Another feature is that the brakes and motors are quieter and less likely to disturb patients.” The DRX-Revolution also has increased security features, including the ability to lock detectors and protect against theft. Powered by a wireless DRX Plus Detector that works across other detector-based X-ray units, the system can be used in other DRX mobile systems or DRX rooms.



Carestream’s DRX-Revolution Nano Mobile X-ray system makes it easier to image pediatric patients, including those in Neonatal Intensive Care Units.

Siemens Healthineers to release an enterprise-wide software platform

BY ALAN STODDART
AND STEVE HOLLOWAY

In addition to the MRI systems, mobile C arms and other hardware being shown off virtually by Siemens Healthineers at the recent RSNA conference, the firm also revealed its new Syngo Carbon software environment.

According to Siemens, the platform, which is still currently under development, will allow for enterprise-wide image interpretation and reporting, pulling together its broad imaging informatics portfolio.

The new platform will enable data from different departments to be pulled out and integrated into a unified environment in a bid to simplify workflows and make it easier for different clinical areas to work together.

Siemens adds that Syngo Carbon, which will incorporate existing technologies and existing Syngo solutions, will also facilitate the automated processing of reports, and is “the starting point for a company-wide system.”

Until now, the vendor’s focus towards enterprise imaging led to some speculation that it was gradually abandoning the core imaging informatics space.

As such, the company had fallen by the wayside somewhat compared to competitors when it came to large-scale medical imaging informatics tenders, especially those focused on enterprise imaging. However, this announcement clearly signifies that the firm intends for an integrated imaging IT platform to act as a foundation of its digital commercial offering in the coming years.



The new Carbon platform will allow for enterprise-wide image interpretation, from various departments.

This is in contrast to the present state of Siemens’ product range, which includes market leading diagnostic applications and various data management and workflow software components. Interoperability between these disparate solutions is limited and specific to different markets.

For example, in Austria, through a partnership with software company ITH, Siemens offers a VNA solution, yet in the US the firm has previously partnered with NTT Data for data management capability.

It also has a workflow solution in the form of its teamplay product-set, bolstered by the acquisition of Medicalis, a legacy PACS in syngo.plaza, while advanced visu-

alisation is handled by the strong syngo.via offering. The firm has also recently added strong new products in the form of AI-Rad Companion and syngo Virtual Cockpit, meeting demand in two emerging growth sectors of the market.

These compartmentalized solutions may work well individually, but as workflow efficiencies and interdepartmental compatibility become more important to providers, Siemens needs to join these, and other, elements together. This is the role Syngo Carbon will take on.

The foundation of Syngo Carbon is based on a centralized data management and workflow solution, essentially taking

the ITH VNA and teamplay offerings and “levelling up” their interoperability competencies and future-proofing for integration with broader systems and non-DICOM data, such as the use of FHIR standards.

Over the coming years, Siemens will then ensure all new upgrades and core product modules link via the Syngo Carbon platform, creating a broad, interoperable imaging informatics solution. Given Siemens’ recent announcement of the acquisition of Varian, no doubt longer-term the important oncology IT assets of Varian will also become part of this integration effort.

Integration of IT across multiple clinical disciplines is complex, not only for vendors, but also for healthcare providers. Imaging IT purchases have traditionally been led by radiology departments.

However, as the platforms encompass greater numbers of clinical areas, more and more hospital departments, from interventional cardiology to digital pathology, procurement becomes significantly more complex and deals take longer to complete.

This complexity means that the enterprise imaging market has, to date, progressed slowly, despite the readiness of some vendors to offer imaging IT solutions capable of supporting enterprise imaging strategies.

As such, even though Siemens has been somewhat behind the curve compared to some of its competition in this area, the delay may not have damaged its prospects long-term. In some markets (Northern Europe, USA, Oceania), where enterprise imaging has been a strong driver for system

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AI and enterprise platforms were the dominant themes at the RSNA

BY THOMAS HOUGH, CMC

For the first time in its history, RSNA’s format shifted from an in-person medical conference to a virtual conference with hundreds of simultaneous Zoom meetings and thousands attending via web site and vendor displays.

Typically, when RSNA is held in Chicago, attendance is approximately 55,000 to 60,000 delegates. With the stress and strains of the global pandemic over 29,000 attended via the Internet. A very impressive number of attendees, considering the huge change in format and the change in individuals work life demands.

In many ways, this new meeting format had its positive points. The elimination of travel costs and travel days made everyone more productive, along with the ability to stay close to family and home and dedicate non-conference hours to other priorities was a huge benefit.

Selecting the lectures and vendors you wanted to speak with by clicking on the URL was much easier to do than finding the physical location in the McCormick Center. Yes, dinners with colleagues and vendors were lost, but, sleeping in your

own bed was the reward.

Artificial Intelligence was the number one theme of the meeting, with most lectures provided by researchers, educators and vendors. The AI technology progress continues the relentless march forward with a “platform” based technology as opposed to individual server apps or client server deployments.

Additionally, three years ago, there were approximately 79 DI-related medical AI companies; two years ago, the number grew to 200, and within the past year there were approximately 700 competing for your attention and business.

Is the market ready? Not in the least. For every 1,000 AI algorithms submitted to the FDA for approval, only one receives approval.

Recently, there were only 20 submissions at the FDA gaining approval, indicating there are many hoops and challenges to get through prior to commercialization. This is followed by an even larger challenge of achieving market acceptance and sales.

The AI vendors demonstrated different strategies on how they would offer their “platform” solutions. GE’s Edison “platform” offers an Open AI

Orchestrator, enabling multiple vendors to participate by using an API to exchange data needed.

Siemens showed a very wide approach that supports not only AI, but also includes a Digital Marketplace that goes beyond imaging to include applications to the broader healthcare community. Philips’ focus is on a precision diagnosis with Intellispace AI



Thomas Hough

Workflow Suite and Intellispace Precision Medicine. New this year were start-ups offering solutions for COVID-19 screening and diagnosis, with one or two offering emergency authorizations such as Curacloud. A non-imaging AI company, Qure.AI, announced a partnership with AstraZeneca (AZ) during the RSNA week with a focus on early detection of Lung Cancer using lung imaging in emerging markets such as Africa, Middle East and Asia.

A use case which works well with

imaging departments in these regions can permit AZ to use cloud-based algorithms to assess signs of tuberculosis.

The second most important topic of RSNA was Enterprise Imaging (EI). EI organizes elements of imaging from different departments; the aim is to integrate the multiple solutions that have emerged throughout hospitals, from different vendors. To date, it has been a challenge to make these solutions interoperable, and to provide an efficient, reliable, sustainable, workflow for clinicians and technologists.

Agfa’s newest offering, “RUBEE”, is an enterprise imaging platform aimed at hospitals to select the best AI solution for their needs. RUBEE will save time for healthcare providers by offering a curated set of intelligent applications for seamless integration into the hospital’s workflow in a rapid timeline.

Will RSNA 2021 be a virtual meeting again or not? No one knows for sure right now. One thing is for sure, rapid changes will continue to occur in these technologies as they march forward to change the world of Diagnostic Imaging.

Thomas Hough is the President of True North Consulting. The company is based in Mississauga, Ont.

Siemens Healthineers set to release an enterprise-wide software platform

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replacement and imaging IT consolidation, re-penetrating the core imaging IT market will be an uphill struggle, especially given the length of contracting cycles today.

However, this only accounts for a small proportion of the worldwide market. In most other markets, despite its lateness, the fact that potential customers aren't yet committed to long-term enterprise imaging strategies with other vendors, means that Siemens hasn't missed its chance.

Furthermore, the addition of a comprehensive enterprise imaging platform to Siemens' portfolio also plays into its wider

strategy of forging long-term, holistic partnerships with providers and health networks.

The importance of imaging hardware, software, service and broader "solutions" are becoming more important in securing larger deals. Siemens hopes Syngo Carbon will deliver in this regard, not only serving as the basis of its digital platform, but one which improves operational efficiency for providers, and, in tying together an array of disparate elements, ensures Siemens remains one of the few vendors that has the breadth to be able to offer providers totally comprehensive deals across diagnostic imaging and enterprise imaging.

As the platform that will connect the spectrum of Siemens's software products, the ultimate success of Syngo Carbon will be measured in its ability to usefully incor-

Siemens' RSNA announcement removes any doubt about the company's commitment to the enterprise imaging space.

porate future modules, both from within Siemens, but also those that are collected through acquisitions, such as those gained through the Varian deal.

It will also be a test to see if the firm can leverage strong positions in imaging modality hardware and advanced visualization as entry points for enterprise imaging in markets where enterprise imaging adoption has been gathering pace already.

Siemens' RSNA announcement removes any doubt about the company's commitment to the enterprise imaging space. Despite its comparatively slow start, its eventual aspirations are no lesser than its competitors. Successfully integrating its individual packages into a comprehensive platform will be a significant challenge, as it has been and will continue to be for other vendors.

But, for Siemens to realize its target of forming high value, long-term partnerships with providers for comprehensive imaging capabilities, it is a challenge the German vendor must rise to.

Alan Stoddart and Steve Holloway are analysts with Signify Research, a UK-based market research firm specializing in health technology. For more information, see www.signifyresearch.net

e-VOLVE modernizes records at Southwest Ontario hospitals

CONTINUED FROM PAGE 4

our notes instantly and we can edit as we go," said Dr. Ruisi. "This is especially important in acute care if a patient becomes unstable and an attending doctor needs to have access to the most current information.

"The meds, vitals and labs auto populate into our notes, whereas before we had to dictate all of that. Now, we are only responsible for dictating the history of present illness, the physical exam and the assessment of plan. All of the other objective data are pulled into the final note, so there's less dictating than previously. The only downside is that we can't speak as fast as we want.

"If a patient has multiple issues – for example, hypertension, diabetes and atrial fibrillation – they are now maintained in the patient's chart, so the next time they're admitted, they are already there. We just have to confirm that we've reviewed them. It's the same with their social history and allergies. It's all pulled forward. Pre-Cerner, we had to look through scanned documents and old dictations, question

the patient and get histories from scratch over and over again."

Hôtel-Dieu Grace is a 313-bed post-acute hospital offering rehabilitative care, complex medical and palliative care, as well as mental health services. The

Chatham-Kent Health Alliance operates a 200-bed community hospital, and Erie Shores serves its community with 58 beds. Windsor Regional Hospital, the region's full-service acute care facility, operates on two campuses with a total of 595 beds.

Primary care clinic uses CHIME to improve communication

CONTINUED FROM PAGE 10

exchange of information between health professionals and patients."

CHIME includes all operational software (billing, scheduling etc.) and is designed to orchestrate an entire medical clinic. Importantly, the system can improve the provider experience so doctors don't have to rush through each appointment.

The cost to launch CHIME in a clinic includes start-up costs for all the clinic software, a monthly subscription fee as well as a per room fee.

Although there are many interesting

features of CHIME, Palmer noted that not all are being actively used. "Presently, we're not using a screen in the waiting room indicating how long a patient will

CHIME is currently in the set-up phase with another primary care clinic, a large medical centre in Oakville, Ont.

wait, or announcing which room they should go to."

Beyond patient and staff communication, another huge challenge the clinic

faced in moving to its new location, during a pandemic, was the manner in which the move took place – all at once. "We were provided with a bit of training on CHIME shortly before the move. And although representatives from CHIME were on hand to help with the transition it was still a bit chaotic," said Palmer. "Even today, we're still learning how everything works."

CHIME is currently in the set-up phase with another primary care clinic, this one in Oakville, Ont. The clinic – roughly 10,000 square feet – has 24 exam rooms, two operating rooms, an endoscope suite and various pre/post-op rooms. They hope to be up and running very soon.

Mental health clinic uses technology to treat patients effectively

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back is the follow, where the energy and passion reside. If you cut the connection between the two, your emotions are untethered from the part of the brain that should be directing them."

Life-changing results: For Emma Piggott, a 32-year-old resident of Keswick, Ontario, the clinic's novel approach has been life-transforming. After suffering from deep depression, OCD and attention deficit hyperactivity disorder (ADHD) for more than half of her life, the young mother of two boys was desperate for help. When she suffered a major breakdown in September, her parents encouraged her to give the new TMS clinic a try.

"I've been in and out of therapy for years and used to be on a variety of medications," Piggott said. "Since I started TMS treatment, I'm a changed person. I'm more engaged with my kids, I get up in the morning and I'm back to being the happy, positive person I was

when I was younger," she said, adding that even her sons, ages eight and nine, notice a difference.

Not only does Piggott now feel like a huge weight has lifted, she's also moving forward with her dream to become an electrician and recently started a pre-apprenticeship program. "Throughout the pandemic, people have been saying what a horrible year 2020 was," she said. "For me, it was one of my best years yet because I finally got out of my depression."

Sam Bessey, a 50-year-old war veteran who began experiencing post-traumatic stress-related depression following 21 years of military service, including four stints in Bosnia and two in Afghanistan, reported similar results from his TMS treatment.

"Before the therapy, I felt completely black and hopeless, and had no happiness at all," said Bessey, who is based in Chalk River, Ontario, and was treated with Dr. Steiner's TMS and talk therapy for just over five weeks.

"The treatment alleviated my

depression and I now have a larger emotional range of feelings, am more present with my family and not as reclusive as I was," he explained, adding that his wife and three grown daughters noticed a change in his previously flat voice tone after just three weeks. "I may not always be

In addition to treating depression and anxiety, the clinic just acquired a coil for smoking cessation.

happy now, but if I'm not, it's my choice not to be and not the black feeling in my brain blocking it."

Dr. Steiner, who has more than 30 years of experience in the mental health field, has worked with indigenous populations, federal inmates, and military veterans, as well as both in-patient and out-patient psychiatric departments in GTA hospitals. With a specialty in Rehabilitation Psychology

and Neuropsychology, he decided to invest in TMS technology after visiting several clinics in the U.S. where the treatment has been approved by the FDA for the last 10 years. "I know what patients look like when they're in the midst of treatment and I couldn't believe it. People were actually beaming, optimistic and happy. There was a certain amount of energy in the room that you just don't see in a traditional clinic setting," he said.

The breakthrough machine used at TMS Clinics of Canada is capable of precisely targeting deeper, more diffuse parts of the brain. In addition to treating depression and anxiety, the clinic just acquired a coil designed to treat OCD that was recently approved by Health Canada and will also be used for smoking cessation in the future.

"Many of the people I see simply cannot talk. They're angry, depressed, despairing and they just sit there while the hour ticks by," Dr. Steiner explained. "This treatment often helps them open up and facilitates talk therapy."

Frost & Sullivan awards RapidAI 2020 Global Company of the Year

SANTA CLARA, CALIF. – Based on its recent analysis of the global AI-based stroke imaging and diagnosis market, Frost & Sullivan recognized RapidAI with the 2020 Global Company of the Year Award. Its innovative and clinically validated Rapid platform leverages AI to support almost all phases of stroke imaging workflow, from initial interpretation to final reporting.

RapidAI products help perform the early identification of stroke and aneurysm using software such as Rapid ICH, Rapid ASPECTS, Rapid CTA, Rapid LVO, Rapid CTP, Rapid MRI and Surgical Preview, to expedite treatment.

RapidAI offers an end-to-end portfolio of advanced stroke imaging and stroke assessment products for hospitals of all sizes. The Rapid platform uses artificial intelligence to create high quality, advanced images from non-contrast CT, CT angiography, CT perfusion, and MRI diffusion and perfusion scans, helping hospitals to speed up time-critical triage or transfer decisions and facilitate better patient outcomes.

Rapid ICH uses AI to quickly triage NCCT scans to identify suspected intracranial hemorrhages (ICH). Rapid ASPECTS uses machine learning algorithms to automatically identify regions of the brain and generate scores to help physicians quickly assess patient eligibility for thrombectomy. Rapid CTA and Rapid LVO help physicians quickly identify suspected large vessel occlusions (LVOs) by automatically processing CT scans and delivering clear, easy-to-interpret CT angiography images.

Rapid CTP enables physicians to assess salvageable brain tissue through the delivery of quantified and color-coded CT perfusions maps that identify brain regions with reduced cerebral blood flow, volume, density, and transit time.

Surgical Preview provides comprehensive cerebral aneurysm management – automating the workflow from initial assessment to growth monitoring and treatment planning. The Rapid Mobile and Web apps enable streamlined communication and workflow across treatment teams and hospitals for faster treatment and transfer decisions.

On top of this RapidAI Insights is a powerful analytics solution that provides metrics to help hospital sites and systems deliver standardized care and make more informed business decisions.

“RapidAI has a footprint across 1,600 hospitals in more than 60 countries. In addition to a global distribution network, the company leverages partnerships with various healthcare technology leaders such as Siemens Healthineers, Samsung Neurologica, Mobile Heartbeat, and Halo Health to grow its customer base and improve brand loyalty,” said Parth Shah, senior research analyst.

“The company’s products make hospitals more responsive while enabling better transfer decisions for patients. As a result, RapidAI not only saves time and costs but improves long-term outcomes by enabling faster stroke interventions.”

RapidAI can be integrated with almost every CT and MRI manufacturer model and make. Its workflow implementation requires minimal effort, according to Frost & Sullivan, while its software platform is fully automated and works on a single virtual or physical server within the hospital firewall.

The RapidAI team configures the server using remote access via a Site2Site VPN tunnel, client-based VPN connection, or portal-based connection.

RapidAI’s installation and implementation teams also work with the client’s IT team to schedule and optimize upgrades.

“The company’s Rapid Web App extends access into yet another user environment, offering stroke team members a

convenient way to view real-time browser notifications regarding new cases and enable workflow communications via a desktop or laptop. The Rapid Mobile App is another useful tool that provides anytime-anywhere alerts and access to RapidAI results,” noted Shah. “Overall, the company’s relentless focus on innovation and strategic technological acquisitions enables the development of new capabilities that will

drive continuing growth and improve vascular care globally.”

Each year, Frost & Sullivan presents a Company of the Year award to the organization that demonstrates excellence in terms of growth strategy and implementation in its field. The award recognizes a high degree of innovation with products and technologies, and the resulting leadership in terms of customer value and market penetration.



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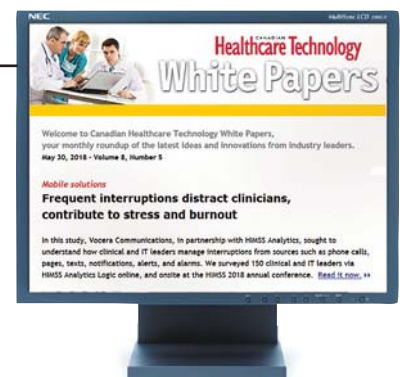


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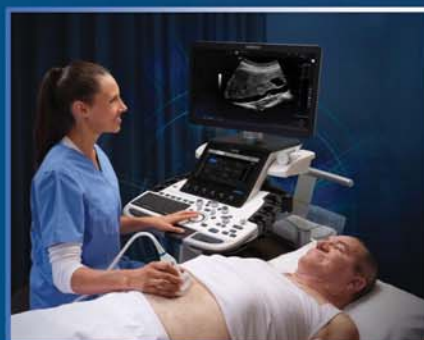
*Take advantage of our most
technologically-advanced ultrasound
ever to bring fast, precise, consistent
imaging to your patients—your way.*

- > **Confident diagnosis**
- > **Comprehensive tools**
- > **Concise workflow**
- > **Smart investment**

Every day, you have the opportunity to **make a real difference in the lives of your patients.**

The new LOGIQ™ E10 Series supports your expertise with **next generation, leadership** ultrasound that's built for **innovation.**

The LOGIQ™ E10 Series is designed for you – so you can make **confident diagnoses** using **comprehensive tools** and achieve a **new standard of concise workflow** – all adding up to a **smart investment.**



Make the difference for your patients

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