



# CANADIAN Healthcare Technology

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William Osler Health System has replaced manual white boards with real-time, electronic huddle boards. They're keeping staff posted about patient flow and the quality of care across three sites.

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Six leading radiologists predict how the radiology profession will change in the next five years. They foresee some radical changes in technology and in the way radiologists work, including far fewer hours.

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PHOTO: RSNA

## How to gain greater trust in AI?

Dr. Siddhartha Mukherjee, the famed oncologist and author, gave a keynote address at the recent RSNA conference. He noted the feverish work being done in Deep Learning, but pointed out that many physicians still don't trust it. The problem, he observed, is that AI operates as a black box which doesn't tell us how it makes decisions. Dr. Mukherjee commented on what's needed before we put our faith in it. **SEE STORY ON PAGE 18.**

## Trillium issues RFP for managed equipment, services

BY JERRY ZEIDENBERG

**M**ISSISSAUGA, ONT. – Trillium Health Partners recently issued an RFP for a Managed Equipment Services (MES) contract for the two new hospital projects currently underway. The final contract – valued at approximately \$1 billion – has the potential to become the world's largest MES agreement.

The winning MES vendor will work with the hospital to provide a range of equipment and services for everything from CT and MRI scanners in DI departments to surgical and cardiac equipment, and more. In return, the vendor will receive a pre-arranged monthly payment.

"There will be about 9,000 to 10,000

pieces of equipment covered," said Scott Jarrett, executive vice president of Trillium Health Partners, in Mississauga, Ont. "That's a lot of equipment to plan for."

As such, some of the largest medical equipment providers are expected to re-

**Valued at approximately \$1 billion, the final contract has the potential to become the world's largest MES.**

spond. The RFP closes early in 2023, and the hospital will evaluate the proposals for much of the year. A winner will be publicly announced in early 2024.

The MES contract will cover equipment and upkeep of the products for two new

centres – a 24-floor acute-care hospital with 950 beds, called The Peter Gilgan Mississauga Hospital, which is replacing the current, 60-year-old Mississauga Hospital, as well as Trillium's upcoming, nine-storey rehab and complex continuing care centre, with 350 beds – the future home of The Gilgan Family Queensway Health Centre. These facilities will provide more beds, shorter wait times, and better equipment and technology to support patient care.

Finally, the MES partner will also supply a legacy site, the Credit Valley Hospital, which operates under the Trillium Health Partners umbrella. It's unusual to have an MES cover a legacy site, Jarrett said, in addition to new centres; as a strategy, it will help

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# Trillium Heath Partners issues RFP for managed equipment, services

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modernize the operations of the Credit Valley Hospital.

"With that volume of equipment purchasing, we needed to think very hard about planning and acquiring responsibly," said Eric Sun, director of ICAT and FFE planning at Trillium. Taking on an MES partner was considered the best way of doing it, he added.

A few other hospitals in Canada have arranged MES agreements for their new hospitals. They include Humber River Hospital, which works with GE Healthcare, and Mackenzie Health, in Richmond Hill, Ont., which partnered with Philips.

The contracts are considered to be win/win arrangements for large projects. Because of the size and scope of the equipment being procured, there's a significant discount that can be negotiated, resulting in a huge cost savings for the hospital.

"We expect to do much better on price, using an MES, than if we tried to procure it all ourselves," said Jarrett.

Moreover, all the equipment will be put

on a schedule for regular maintenance, upgrades and replacement. This last factor is especially important, as it ensures that all the equipment remains leading-edge.

"Everything is life-cycled," said Sun. "In a traditional hospital, they'll often run their equipment as long as possible, until it can't be used any longer." There's an economic argument for that, but it means that patients are not receiving care using the latest available solutions.

Partnering with an MES provider will allow physicians and other clinicians to use the best tools available to deliver care.

Jarrett used to work at the Humber River Hospital, which just celebrated its seven-year anniversary of using an MES agreement with GE Healthcare. He's familiar with the value that can be achieved, as well as with the advantages of timely renewals of equipment.

Acquiring capital equipment, he says, is one of the biggest problems in the health-care system. And the annual budgeting process in many hospitals, he adds, "is like the NHL draft. Everyone is bidding for what they need."

However, depending on the politics and



Scott Jarrett, Executive Vice President

economics at work in a particular hospital, the DI department may lose out on its bid for a new MRI, or the surgeons may not get the image-guided equipment that they wanted. Amid the fray, upgrading work-horse items like bedside monitors can sometimes be overlooked.

With an MES agreement worked out to cover the long term, everything that's needed can be accounted for, serviced, and replaced long before it becomes obsolete.



Eric Sun, Director of ICAT, Trillium Health Partners

The arrival of 'best-of-breed' equipment becomes predictable for the hospital, just as a revenue stream is predictable for the vendor – a true win/win arrangement.

Sun noted that the selection of equipment is decided collaboratively by the hospital and the vendor. "Our clinicians will be closely involved in the choice of equipment," he said. "The vendor will tell us what's new when it comes to technology, but our clinicians will tell them what they really need. We'll explain our requirements."

Under MES agreements, some of the equipment is provided by the vendor, using its own brand-name technology. However, there's typically a percentage of the mix that can be supplied by outside vendors. This percentage is part of the negotiations that are involved in writing the MES contract.

With an MES, the winning vendor provides staff that work closely with the hospital team. Jarrett noted that they become very engaged with the clinicians in the medical and administrative challenges and help to provide solutions.

This will be encouraged at Trillium, as the hospital has recently expanded its research and development work. "We have a research division now that's engaged mostly in applied research. We're hoping that the partnership with an MES vendor will open this up even further.

"We'd like to try out different models."

The technologies that are included in the MES are equipment for Diagnostic Imaging, Surgery, Cardiology, Women and Children's Health, as well as monitors and ventilators. Items that aren't a part of the MES are more commonplace products, such as beds and furniture.

With his experience at Humber River Hospital, and the current project at Trillium Health Partners, Jarrett is convinced that MES contracts are the way to go for new hospitals. Noting that to date, there haven't been too many of them, he asserted: "It's a missed opportunity."

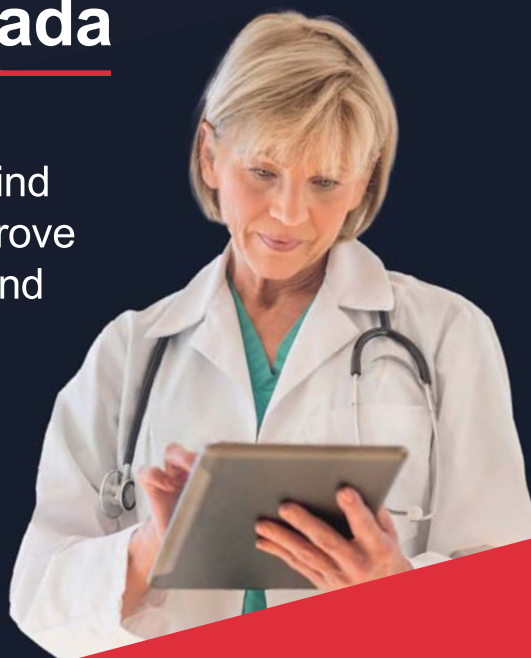
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# Eastern Ontario community hospitals up-and-running on Epic system

BY NORM TOLLINSKY

Three Eastern Ontario community hospitals went live with the Epic health information system in November, joining the Atlas Alliance, a group of healthcare organizations all using Epic.

The Kemptville District Hospital (KDH), the Winchester District Memorial Hospital and the Deep River & District Hospital join six other healthcare organizations, including The Ottawa Hospital, in a common, region-wide health information system that allows patient information to be shared to all Alliance members.

It's designed to improve the continuity of care and the patient experience when accessing care at different facilities in the region.

The original six Atlas Alliance members, including the Ottawa Hospital Academic Family Health Team, Hawkesbury District General Hospital, Renfrew Victoria Hospital, St. Francis Memorial Hospital in Barry's Bay and the University of Ottawa Heart Institute, went live with Epic in 2019. All Alliance partners make use of The Ottawa Hospital's data centre.

"In the past, if we were transferring a patient from our facility to Ottawa, for example, we would literally have to photocopy all of the paper chart, all of the labs and X-ray reports, download a copy of the X-ray onto a CD, put all of it in an envelope and send it off with the patient via EMS," said KDH clinical project lead Cathy Burke.

"If the receiving physicians had any questions or wanted any other information, they'd have to call our ED, get a hold of the ED doc and have a conversation. That's how it was done in the past. Now that we are part of the Atlas Alliance, the receiving hospital can see everything through Epic."

Located in Kemptville, 55 kilometres south of Ottawa, KDH serves a catchment



Kemptville District Hospital staff celebrate successful launch of Epic health information system as part of region-wide Atlas Alliance in Eastern Ontario. The new system is closely integrated with several others.

area with a population of 85,000. It has 40 beds, a wide array of outpatient services and an emergency department with approximately 22,000 patient visits per year.

Prior to the adoption of Epic, KDH relied on an assortment of electronic and paper systems, including an Anzer EHR that "was primarily used in patient registration and wasn't used in the clinical areas as much as Epic," said Brittany Rivard, KDH CFO and vice-president operations.

"With Epic, patients are entered into the system right from the time they walk in the door and the information flows freely through every department they go to as well as to the other hospitals."

Patient registration data from January 1, 2019 was transferred to Epic, but the prevalence of paper charting in the past limited the migration of historical data.

KDH CEO Frank Vassallo noted that it's relatively uncommon for small community hospitals like KDH to adopt an Epic

EMR but predicts the trend will continue now that there is a critical mass of 43 hospitals in Ontario on Epic.

"The biggest challenge is that it's unforgivable to do it on your own," he said. "By piggybacking on The Ottawa Hospital and the Atlas Alliance, the costs are shared across all of the regional partners."

Indeed, the opportunity to avoid a huge cash outlay for a dedicated deployment persuaded the Group Health Centre, a primary care organization serving 70,000 rostered patients in Sault Ste. Marie, 800 kilometres away in Northern Ontario, to join the Atlas Alliance last April.

Ottawa-based information technology provider Nova Networks worked closely with KDH on the transition to Epic.

"We have a very small internal IT team and an aging infrastructure, most of which needed updating from a hardware perspective in order to support Epic, and Nova Networks put those things in place,"

said Rivard. "The transition was remarkably seamless. We were able to leverage the rich experience of the six original members of the Alliance and had tons of support in place from Nova Networks, Deloitte and The Ottawa Hospital."

Established in 1993, Nova Networks provides a range of IT managed services to the healthcare sector through offices in Ottawa, Montreal, Toronto, Calgary and Ogdensburg, New York.

Gus Isaac, president and CEO of Nova Networks, attributes the company's success to the emphasis it places on speaking the same language as its clients and understanding their needs.

Particularly helpful in this most recent transition to Epic by KDH, Deep River and Winchester was the lead role played by Nova Networks VP Tyson Roffey, who as a former VP and CIO of both the Children's Hospital of Eastern Ontario and Toronto's Hospital for Sick Children, drove their shared adoption of Epic.

The Epic EMR offers KDH a wide range of benefits over and above streamlined collaboration with external partners. Its My Chart portal, for example, allows patients to access, print and download diagnostic test results and physician notes. They can also see their upcoming appointments, as well as lists of allergies and medications.

Epic also improves patient safety by documenting procedures to ensure the accurate dispensing of medication. In the future, said Burke, KDH can also take advantage of Epic Care Link, a web-based portal offering primary care doctors access to their patients' hospital records.

The adoption of Epic is a "game changer" for KDH, said CEO Vassallo. "This investment in infrastructure will enable more effective collaboration internally and gives us the tools and processes to deliver excellent patient care."

## Adaptive language-learning software helps stroke survivors regain skills

TORONTO – Canadians suffer an estimated 89,000 strokes each year, and survivors are often faced with life-altering complications as a result.

Among other troubles, many stroke survivors experience aphasia, a language disorder that can affect all aspects of communication. For example, many individuals living with aphasia experience difficulty with word-finding when trying to name everyday objects.

Fortunately, using adaptive language-learning software is extremely beneficial in helping these individuals regain their language skills, according to a recent Baycrest study.

Current treatment approaches for aphasia typically require engaging specialized therapy. Unfortunately, those specialists are scarce and expensive. As well, the therapy is usually conducted in a clinical setting.

In contrast, individuals can use language-learning software when and where they choose.

"These results are highly encouraging and suggest that the use of adaptive language-learning software should be considered for widespread adoption in treating aphasia," says senior author Dr. Jed Meltzer, Canada Research Chair in Interventional Cognitive Neuroscience at Baycrest, a global leader in brain health and aging research, innovation, education and care for older adults.

For the study, Dr. Meltzer and his team recruited 28 subjects from aphasia support programs and aphasia-related groups on social media. Each participant began by completing an evaluation with a team member, where they were shown pictures and asked to name them – for example, "umbrella" or "squirrel."

Next, participants used an online program to practice identifying images they could not name during their initial evaluation. Each picture included two hints and the answer. Participants were asked to use this program 30 minutes a day for two weeks.

The research team also tested three

different strategies to schedule repetition of words in the software. One of these was an adaptive "spaced repetition" strategy, which presented correctly named items less frequently, thus focusing more on the items that users did

not remember correctly. After finishing their training, participants completed two additional evaluations. The first was conducted the week following the training, and the second, four weeks later, to test how well they had retained their skills.

The researchers found that participants successfully relearned the majority of the trained items using the software. The adaptive spaced repetition strategy performed the best, meaning there was no downside to dropping items from the

practice list once they had been mastered.

"These results suggest that stroke survivors and others living with aphasia can improve their language skills using apps over several months and can potentially relearn hundreds of words if they practice enough," says Dr. Meltzer, who is also a senior scientist at Baycrest's Rotman Research Institute. "Adaptive language-learning software using spaced repetition appears to be extremely helpful in scaling treatment for stroke survivors and other individuals living with aphasia, ultimately helping to improve their quality of life."

In a follow-up study, the research team will evaluate the benefit of app-based practice for general skills, such as short-term memory and attention, in addition to training on relearning specific words, to maximize the degree of recovery possible using adaptive software.

This research was supported by the Heart and Stroke Foundation of Canada and the Canada Research Chairs program.



Jed Meltzer



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# Osler's iHuddle app facilitates team communication and collaboration

**B**RAMPTON, ONT. – Knowledge is power, and for managers and frontline healthcare workers, having access to real-time data at their fingertips can make all the difference in terms of sustaining and enhancing quality, patient safety and access to care. That was just one of the key drivers behind the development of William Osler Health System's award-winning iHuddle Boards – a global leading practice as recognized by the Health Standards Organization (HSO) and Accreditation Canada.

Seeking a way to bring a consistent, organization-wide approach to quality improvement, and enhanced communication to regular team huddles across its three hospital sites, Osler undertook a refresh of unit-level huddle boards in late 2019.

The Quality and Organizational Performance teams mapped out their vision on a white board, posting desired metrics on pieces of paper and creating visual sections based on the organization's four strategic directions.

Unit-specific metrics included number of falls, pressure injuries, patient safety incidents, real-time number of patients on the unit, number of pending transfers to the unit and number of confirmed and potential discharges.

Trending metrics showcasing monthly medication reconciliation on discharge, patient-reported experience metrics, hand hygiene and time to inpatient bed (90th percentile) were also incorporated.

The goal was to develop a communication tool that visually translated Osler's strategic plan, as well as key quality, safety and performance metrics, in a manner that was meaningful to a breadth of stakeholders – from the frontline teams to the Executive Team and the Board of Directors.

Recognizing that manually updating information and metrics had its drawbacks,



Real-time, electronic white boards show staff what's happening on their units and across the organization.

Osler abandoned its unit-level white boards and magnets in November 2020 in favour of an innovative digital iHuddle board – a platform created in-house by Osler's Information, Intelligence and Technical Innovation (IITI) team.

"Our ask of the IITI team was significant, as we wanted not only to standardize and share real-time metrics from multiple data sources to electronic huddle boards on each unit, we also wanted the boards to be interactive in nature, something we didn't see at other hospitals when conducting an environmental scan," said Tony Raso, associate vice president, Clinical Practice and Quality.

"We wanted managers and staff to be able to enter unit-specific information, such as staff recognition and the status of local quality improvement initiatives, as a way to further support communication, collaboration and timely decision-making."

According to Osler's Andreea Popescu, manager, Organizational Performance, the Quality and Organizational teams created

a mock-up of what the digital version could look like. "We provided specifications for each metric, how it should be displayed, where the data should be pulled from, and how often it should be pulled. We gave the technical specs and design to our IITI team, who then developed the iHuddle App."

Throughout its creation, the IITI team conducted iterations, validation and testing, piloting the iHuddle App on select inpatient units at Osler's Brampton Civic Hospital and Etobicoke General Hospital prior to the broader organizational roll-out.

Information is streamed via the iHuddle App to forty-three 55-inch touchscreen monitors in each Emergency Department, inpatient and outpatient area.

The roll-out was accompanied by robust resources and onboarding, including scripts, training and technical videos for directors and managers to familiarize staff and physicians with the new process, and to maximize the various sections on the boards.

"For team members who are not as familiar with our Strategic Plan, iHuddle Boards are truly transformational in nature as staff and physicians can clearly see how their actions at the point of care directly impact a particular metric both locally and corporately," said Raso.

"They can see what is happening on their unit and across the organization through real-time data and a standardized process that facilitates input, engagement and feedback."

At a time when hospitals are facing unprecedented challenges moving patients through the system due to high patient volumes, higher acuity and staffing shortages, the real-time data available on the iHuddle Boards is proving crucial in supporting safe patient flow across Osler sites.

Osler's Gresham Kimm, clinical services manager, Stroke Unit, agrees. "The metrics for admissions to the Emergency Departments and the inpatient bed census across the organization is live on the board – this helps our team see firsthand where the pressures in the organization are and why decisions that may directly impact the unit are made."

Following the roll-out of the iHuddle Boards to inpatient units across Osler, staff and managers were invited to share feedback through a survey. The results validated the tool's positive impacts.

"Managers felt the iHuddle Boards were an effective tool for facilitating open team dialogue, generating quality improvement ideas and supporting program decision-making," said Popescu.

"Staff really appreciated the transparency of the metrics and having access to a broader organizational view of the data," Popescu added. "Both staff and managers either agreed, or strongly agreed, that the iHuddle Boards were meeting the desired goals."

## How health law programs have advanced my career

**A**nna Tersigni is the Director of Quality & Risk, Chief Privacy Officer at the Canadian Mental Health Association (CMHA) in Waterloo-Wellington. Anna is a passionate and lifelong learner, having taken 10 health and elder law programs at Osgoode Professional Development. She shares how they have helped her professionally and have guided her succession plan.

**CHT:** What led you to work in the healthcare field, and what has your education journey looked like?

**Tersigni:** As a young student working my way through university to become a language teacher, I worked at my local hospital for 10 years: part-time, weekends, holidays and nights to pay for my education. I dropped out of Teacher's College when I realized that I didn't feel value of teaching Italian to students who only saw it as a credit they needed to fulfill their curriculum.

I then took a medical secretarial course and landed a job at the local

community mental health clinic, where I fell in love with all that is quality and risk management, health information management and privacy and security. I worked as an Office Manager for the Arbors Day Therapy Program and left in 1986 for a position as a Supervisor at Cambridge Memorial Hospital Medical Records Department. In 1988, CMHC leadership asked me to return to become the Manager of Health Records and Privacy Officer.

During my career, I have upgraded my BA with the CHIMA program, and years of participating in healthcare-focused Osgoode Professional Development programs.

**CHT:** What was the first program you took at OsgoodePD, and how did it help you in your job? How many have you done since?

**Tersigni:** I can't remember the exact first program, but I do know that for at least the last 10 years I have regularly attended and have presented at Osgood-

ePD health programs. I first heard of it through our legal retainer DDO – MJ Dykeman and Kate Dewhirst – who are regular presenters.

Every single one-day and certificate program I took at OsgoodePD inspired me and kept me current in whatever was happening legislatively; policy, ministry and mental health service delivery.

It has become my go-to in order to

**Every program I took at OsgoodePD inspired me and kept me current in whatever was happening.**

crystallize complicated concepts and changing legislation, but especially strategies on how to apply them.

I can truly say I have become much better at my role because of the OsgoodePD courses, as they have cutting-edge new information, techniques and strategies on how to navigate a very

complicated, ever-changing legal and policy environment.

**CHT:** What is your advice for others looking to navigate a career in health?

**Tersigni:** Well, I'm walking the talk ... I have a two-year succession plan and the Osgoode Certificate programs in health are being embedded by design for my two successors to take – they have already taken two each this year and will continue each year to take at minimum one of them. Their feedback to date is that the programs are invaluable in this rapidly changing healthcare landscape (increased liability due to virtual care, heightened risk in the mental health and addictions system to provision of timely services to the most vulnerable in the community; increased overdoses, tragedies happening with our youth as consequences of pandemic, increases in sentinel events, etc.).

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# Enterprise Content Management streamlines data collection, saves staff time

BY TOM ROMEO

**H**ealth Information Management (HIM) professionals deal with hundreds of documents each day. An important role in any health system's ecosystem, these staff members are tasked with ensuring data is accurate, complete, timely and secure.

While HIM professionals have always been challenged to manage and make sense of data, COVID-19 created unprecedented challenges as medical volumes throughout the last two years fluctuated exponentially. There is no denying the COVID-19 pandemic caused an influx of patients requesting care at hospitals globally; the Canadian Institute for Health Information reported more than 2.7 million acute inpatient hospitalizations throughout Canada from 2020-2021.

Given this volume, combined with the pressure of meeting compliance regulations while managing records and ensuring the completion of patient charts, HIM professionals can't afford to lose a second – especially as job vacancies within the health sector across Canada reach an all-time high.

**Content management:** More than ever, HIM professionals need tools that can increase productivity and streamline processes. One important tool is Enterprise Content Management (ECM): by providing 24/7 access to information, clinicians and

analysts can view and work on any medical record, at any time, resulting in a significant decrease in chart completion delays.

Additionally, many health systems globally use the Healthcare Information and Management Systems Society's (HIMSS) Electronic Medical Record Adoption Model (EMRAM) to assist in measuring clinical outcomes, patient engagement and clinician use of the health system's electronic health record (EHR) technology.

This system helps strengthen organizational performance and health outcomes across patient populations.

When used to its fullest potential, HIMSS' EMRAM can help improve patient safety and satisfaction, secure data and support busy clinicians. However, hospitals often wind up stalled close to the program's completion, as Stage 7 of the process mandates that an organization does not use paper charts to deliver and manage patient care, with all data electronically entered within 24 hours.

This can be a challenging step for health systems. Out of thousands of providers globally, only 329 facilities have reached this phase.

However, reaching this part of the process comes with significant benefits: a recent study showed that achieving Stage 7's status significantly elevated physician satisfaction levels.

In addition, by providing access to data

and critical information when and where it's needed, clinicians can improve patient security and meaningfully engage with patients and clinicians to reduce the risk of errors in care delivery and strengthen the patient experience.

While many organizations stall as efforts to meet the 24-hour turnaround time prove more challenging than anticipated, certain integrations can help organizations

**Using a content management solution can save organizations hundreds of hours of time for admin staff and nurses.**

manage critical deadlines with systems and features they may already have.

These integrations can enhance efficiency and make the most of crunched resources. Health systems cannot afford to have limited staff bogged down by information delays and chart completion – especially when each of these tasks can be alleviated with an electronic content management system that optimizes the flow of information.

**System integration at St. Joseph's Healthcare Hamilton:** Implementing a content management solution can save a health system thousands of hours. One health system that saw a significant return

on their investment in this area was St. Joseph's Healthcare Hamilton (SJHH), based in Hamilton, Ontario.

Together with a team from Quest Diagnostics, SJHH worked to use solutions provided through Quest's Quantum Enterprise Content Solutions (ECS) to capture and index metadata for a variety of documents. After just two months, the SJHH team began using the new setup, and information started to flow directly into Quantum Enterprise Content Solutions from the Epic EHR.

Less than one year after deploying the system, SJHH reported over 1,347 hours of administrative staff time saved and more than 500 hours of nursing staff time saved in less than one year.

Volumes of Ocean eReferrals, a streamlined electronic referral, and their attachments increased significantly. Vitals monitoring also showed significant time saved, as more than 5,800 instances were uploaded automatically over 11 months, freeing time for providers to attend to more urgent requests.

Additionally, by working with the team at Quest to customize a solution that fit its collaborative needs, SJHH deployed a scan acquisition tool allowing clinical units to conduct point of care scanning directly into Quantum ECS.

With clinicians now empowered to

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# Gravitating towards better medicine: The benefits of space health technology

Technologies devised for space are being used effectively on Earth for telehealth and to help specific populations.

BY DR. SUNNY MALHOTRA

As I began this column, I didn't expect to combine developments in space technology with home care and virtual care. However, when I recently looked at technologies being used in space, I realized they could be effectively redeployed on Earth. Some of them are already being used in this way.

As we expand our space journey toward Mars, it benefits us to consider how technology and knowledge can be repurposed and used more broadly. The future of medicine is looking bright, with many advances occurring in recent years – some of them spurred on by the COVID-19 pandemic.

Many people, for example, are unaware that modern medical technology allows us to perform endoscopic surgeries without needing an actual surgeon. From the surface, this may sound very complicated, but it's actually relatively easy with the right technology.

Remote patient monitoring companies like VisualDx and Hexoskin have recently noticed an opportunity to broaden their research beyond the narrow field of space and astronaut health.

For its part, VisualDX developed a questioning and image-based app to help diagnose medical conditions without needing an actual physician. While meant for astronaut emergencies, it could be vital in rural areas or even emergency trauma situations. In everyday life, patients can use this tool to take pictures of a rash or specific adverse effect, and the software will create a "pre-visit differential."

The image-based software is beneficial in telehealth, rare diseases, or patients of colour who may not be diagnosed as quickly due to variations in presentation.

Another example is Astroskin, a "portable, precise, and non-invasive" garment developed by Hexoskin to scan and monitor an astronaut's vital signs and general health.

Because this software can detect stress, performance, and possible health conditions, it has gone beyond the scope of space. This health sensor allows for physiologic data collection and treatment suggestions once a diagnosis has been made – all by AI.

**Focusing on astronaut health is crucial for space exploration, yet it also leads to gains in longevity for civilians on earth and new ways of treating illnesses.**

Hexoskin now focuses on athletes, police officers, and first responders, explicitly monitoring stress and cardiorespiratory conditions.

Yet another company that adapted its original technology for Earth is Pulsar Informatics. Pulsar Informatics created a "Fatigue Meter" to measure one's circadian misalignment. The software, created to monitor astronauts' fatigue and cognitive state, was later redirected toward pilots, maintenance workers, and long-haul truckers due to the similarity in working hours and occupational risks.

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The software's value proposition is that it gathers sleep data and patterns, followed by a predictive analysis of each worker's future fatigue 'level.' This analysis gives management an insight when planning the next few days or weekly schedule to avoid unforeseen circumstances or accidents. A wearable "Fatigue Meter" is a future innovation concept that can be extrapolated to pilots, drivers, and first responders.

These companies and many more are setting the stage for space health technology that can also be used by certain populations here on Earth. While initially meant for space and astronaut health, the technology can be used for a simple diagnosis, emergency conditions, or even to predict a future health accident.

We now know what's possible, given the right mindset and adaptation of virtual care since COVID.

Focusing on astronaut health is crucial for space exploration, yet it leads to gains in longevity.

The field of space medicine still has many areas to improve. Still, with the continued enhancement of artificial intelligence and deep learning, we are trending toward the path of life in orbit and extra-terrestrial exploration.

Health technology is enabling men and women to survive in the harsh and unpredictable environment of outer space. In some areas, the technology may help us redefine aging and illness through its application on Earth. I believe the next few decades will be crucial to achieving these goals.

## Remote patient monitoring can change the course of healthcare

BY DR. KEITH THOMPSON

The world is facing a global healthcare crisis. Despite the efforts of the World Economic Forum in addressing sustainable development goals, half of the world's population is without access to essential health services. Developed nations are still on their heels from the COVID pandemic, human health resources continue to shrink, and patients are experiencing increased wait times, poorer access, and greater inequality of care.

The development and use of virtual care during COVID has benefited many, but it has also exposed a significant digital divide. Unless patients have access to computers, smartphones and networks, they usually won't participate in virtual visits. For its part, the UN has declared internet access an essential human right, and while connectivity has improved to include 63 percent

of the world, access remains difficult or non-existent for many.

The advent of Remote Patient Monitoring, with greater penetration of wearables in consumer healthcare, coupled with AI/ML algorithms, will be an important solution. RPM can provide "high-volume, lower physician touch services" to support a world in need. Increased healthcare demands, in both developed nations and low- and middle-income countries (LMIC), will require a focus on the greater causes of patient morbidity/mortality to achieve the sustainable development goals outlined in WHO-ITU policy positions as early as 2015.

The world's healthcare needs are diverse, varying by region and resources that are available, but the leading drivers of mortality and morbidity are cardiovascular disease and associated risk factors. One billion people worldwide suffer from hypertension, of which 46 percent

are unaware they have it and only about 25 percent of patients diagnosed are being treated to the suggested targets for control.

According to recent WHO stats:

- Cardiovascular diseases (CVDs) are the leading cause of death globally.
- An estimated 17.9 million people (about the population of New York

**The world's healthcare needs are diverse, but the leading drivers of mortality are cardiovascular diseases.**

City) died from CVDs in 2019, representing 32 percent of all global deaths. Of these deaths, 85 percent were due to heart attack and stroke.

- Over three quarters of CVD deaths take place in low- and middle-income countries.
- Most cardiovascular diseases can be prevented by addressing behav-

ioral risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity, and harmful use of alcohol.

- It is important to detect cardiovascular disease as early as possible so that management with counselling and medicines can begin.

This epidemic of CVD is being fueled by conditions like prediabetes and fatty liver, which affects 1 in 3 to 1 in 4 persons. About 70 percent of these patients will advance to type 2 diabetes, which currently affects 460 million people around the world.

The prevailing need is to improve patient health literacy, and the first step is improved awareness of the conditions.

Toronto-based Nuralogix has taken on this global task. Founded by Mr. Marzio Pozzuoli and Dr. Kang Lee in 2015, the company's mission statement reads: "Using affective AI to improve the lives of people everywhere." Nuralogix is us-

CONTINUED ON PAGE 19



# Who owns the patient record? Clarifying issues of sharing, ownership

BY ABIGAIL CARTER-LANGFORD

The COVID-19 pandemic and the increased use of virtual care have intensified the calls for timely and accurate data sharing in Canada. We can answer the calls by taking a collaborative pan-Canadian approach to secure data sharing in a digital environment that empowers patients and clinicians while protecting patient information.

Canada Health Infoway (Infoway) recently published a white paper called *A Path Forward for Data Sharing In Canada* that champions this approach, and makes it clear that privacy is NOT a barrier to data sharing. The white paper was developed through a literature review, key reports published during the pandemic, and consultations with stakeholders including privacy commissioners and privacy leaders, clinicians, patients and health technology providers.

Many of these stakeholders are living and breathing the challenges of data sharing every day, so it's vital that their voices be heard.

The observations and recommendations in the paper are based on these underlying principles:

- Expansion of virtual or digital care enables better healthcare for patients and improves the overall Canadian health care system;

- Patients benefit from health data sharing among their providers;
- Patients benefit from having increased control over their health data; and
- Increased collaboration across jurisdictions is desirable because it benefits all Canadians.

The rapid adoption of virtual care during the early months of the pandemic put a stark focus on the privacy controls and processes around the sharing of health data. As one privacy leader who participated in our consultations put it, "all the tiny gaps in the systems got highlighted." From this experience, we have been able to clearly articulate the barriers and challenges, identify opportunities, and propose solutions.

The barriers and challenges fall into these categories:

- Health privacy laws and regulations across Canada are complex, and guidance and education on permissible uses and disclosures of data is unclear;
- It's complex to determine the legislative roles of the parties, which is a key enabler to setting efficient rules for collections, uses and disclosures;
- Shared custodianship (where the participants in a data system share the decision-making around data) is not well-understood, making the obligations of each party unclear. This impedes timely implementation of these kinds of arrangements

and increases reliance on complex data sharing agreements;

- The assumed accountabilities and risks of protecting personal health information (PHI), are not equal between data custodians and service providers and may create a discrepancy between assumption and ability to mitigate risk;
- Some custodians believe that they, not the patients, "own" the PHI;
- There is a gap in privacy education provided to custodians and this gap can result in fear of penalties for unauthorized disclosure/sharing;
- There is a lack of standardized data sharing agreements and resources to support data sharing; and
- The role that technology providers can and should share in protecting and enabling data sharing is unclear.

That's quite a laundry list! The white paper goes into much greater detail about each category, so I'll focus now on the opportunities we've identified and the solutions we propose.

There is a need for clear frameworks and standards for health technology providers and custodians that provide greater clarity about how to abide by pri-

vacy and security best practices and laws. Pan-Canadian standards will support practical and enforceable measures to enable a common "language for everyone to speak" and a common set of rules to follow. They will also help establish trust.

We need to move from considering only custodianship, and toward embracing a model of information stewardship.

This shift in perspective will give clinicians access to the data they need to provide care, while retaining accountability for the quality and security of the data, and it could enable patients to have more meaningful access to their PHI.

We need to take opportunities to modernize our data governance legislation to consistently put patients at the centre. We should also continue to embed requirements for data sharing within privacy legislation including considering where health technology providers may play a key role in ensuring data protection.

There are also benefits to be gained from data literacy education, including privacy education, for patients, as well as privacy training and education for health technology providers and custodians.

*Abigail Carter-Langford is Chief Privacy & Security Officer and Executive Vice President, Governance, Risk & Compliance with Canada Health Infoway.*



Abigail Carter-Langford

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# Hospitals and imaging centres are grappling with imaging backlogs

Newer equipment is needed, as are technologists, schedulers and security staff.

BY DIANNE DANIEL

Can our country's diagnostic imaging (DI) network – across all modalities, provinces and sites – and the picture is clear: Canadians are waiting too long for routine medical imaging exams. “We’ve been arguing that it’s a crisis and action needs to happen now,” said B.C. Radiological Society President Dr. Charlotte Yong-Hing. “We just can’t sit back and study this for the next two years.”

The most pressing problem is wait times for semi-urgent and non-urgent MRI and CT examinations, referred to as priority 3 and 4 (P3 and P4), which should be 30 and 60 days respectively, according to pan-Canadian benchmarks set by the Canadian Association of Radiologists (CAR). Instead, people are waiting 60 days for P3 investigations on average and anywhere from six months to a year for P4 investigations, depending on where they live.

“Among these patients you have those who are awaiting a cancer diagnosis and during that time, they have a progression of disease and sometimes they lose their chance,” said CAR president Dr. Gilles Soulez, a vascular and interventional radiologist at the University of Montreal Hospital Centre (CHUM). According to Soulez, CAR has calculated the economic impact of longer medical imaging wait times to be in the range of \$3.5 billion in terms of lost GDP, due in part to people ending up in need of more urgent, more invasive care or not being able to work while they wait.

In B.C., delays are particularly worrying for patients who require further examination after receiving abnormal results on screening tests like breast mammography, where it is estimated people are waiting as long as six months for image-guided breast biopsies and supplemental imaging, said Yong-Hing. The province only tracks wait times for CT and MRI, which are currently at 93 days and 133 days respectively.

“It should be 30 days on average,” she said. “It’s clear that more investment is needed.”

From coast-to-coast, the underlying challenges causing the bottlenecks are similar. Investment in new equipment is needed, both to replace aging technology and to keep pace with growing demand. At the same time, Canada is facing a massive shortage of highly trained medical radiation technologists (MRTs) and sonographers required to run imaging equipment.

There’s also room to speed up workflow and diagnostics by implementing advanced radiology solutions, including clinical decision support, e-referral and emerging AI technologies, said Soulez.

CAR states that investment in medical imaging equipment is at a 20-year low. A recent study by the Conference Board of Canada indicates 35 percent of existing equipment is 10 years or older whereas the ‘golden rule’ is no more than 10 percent – putting Canada below the mean of countries in the Organization for Economic Co-operation and Development (OECD).

Consequently, equipment is prone to downtime, meaning exams need to be delayed and rescheduled. Imaging centres are also losing out on productivity gains because newer, smarter equipment performs faster.

The B.C. Radiological Society is advocating for the

provincial government to make annual investments of \$100 million over the next five years to replace aging equipment and add capacity. “It’s a big issue,” said Yong-Hing. “There’s a big gap and there needs to be sustained investment.”

In Nova Scotia, where a provincial DI operations council – made up of administrative directors and medical representatives – meets regularly to examine challenges, leaders are exploring options such as operational leasing or managed equipment services to address the aging equipment issue.

“Historically, we’ve relied on traditional capital equipment purchases, but I really think there’s an appetite now to explore new ideas and we’re starting to see progress on that,” said Nova Scotia Health Direc-

School of Health Sciences to offer full-time employment to all graduates in diagnostic medical ultrasound and radiological technology. It is also working with its union partners to offer full-time hours to permanent part-time staff without competition and is looking at a longer-term strategy to attract qualified candidates from outside of Canada as well.

Relying on robust health data analytics, the DI operations council has also developed a business case to present a clear roadmap to the province on how to reduce wait times. “It’s not a request for technology at this point,” explained Connolly. “... It’s about using our current capital asset base and resourcing it appropriately so we can improve access and get those wait times down to within 60 days.”

The objective is to run all modalities into the evenings and weekends, and the business case examines what is required from a system view, including how many additional radiologists and registration and booking clerks are needed, and whether security personnel would be required to keep doors open after hours. “We calculated based on five to eight percent growth on the demand side, so it’s really about future proofing us as well,” he said.

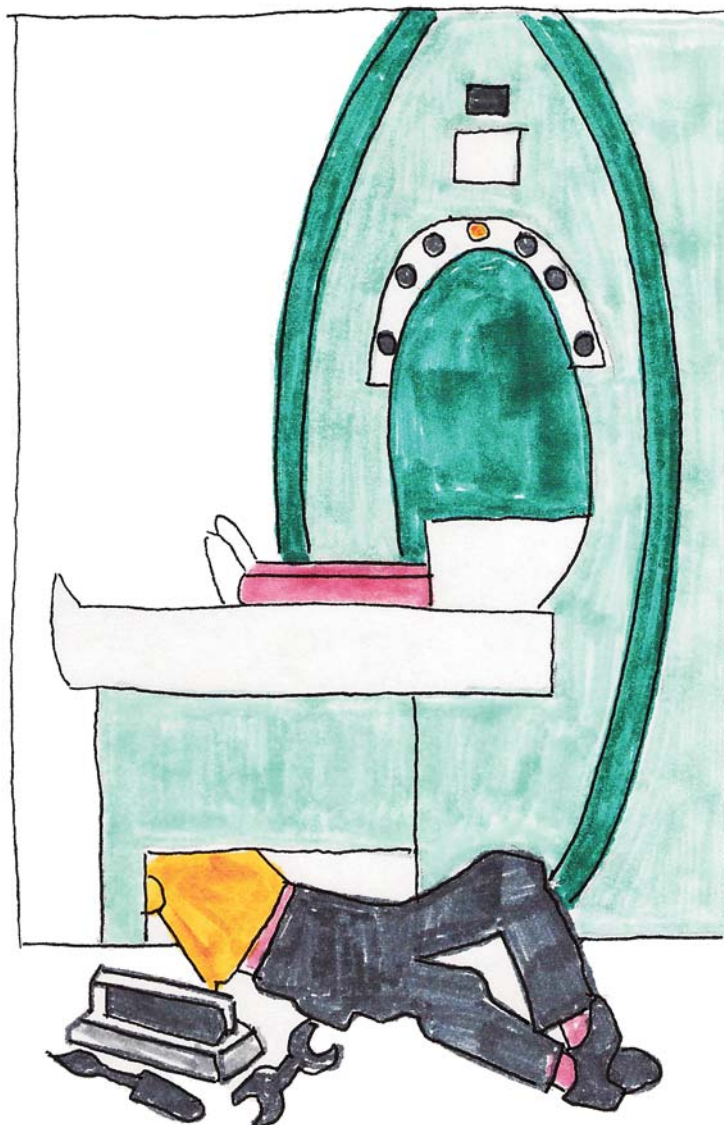
In addition to expanding the core complement of staff and optimizing resources, the business case also includes a modernization of the province’s referral system. Right now, community physicians and nurse practitioners rely on faxed or emailed forms to request exams. Using an external vendor, the aim is to implement a fully electronic system that will support the medical imaging process from end to end, including intake, triage, adherence to protocols and patient appointment notification.

“Within it, we’re hoping to have decision support so that if a general practitioner says, ‘I’d like to do a bone scan, here are the clinical indications,’ the system might suggest that that’s not the best option, that maybe MR or CT is better,” explained Connolly. Assistive software could also help to evaluate whether stroke patients are eligible for

endovascular thrombectomy based on subtle findings in a CT scan, he added, so that only those patients who require it are transported to Halifax where it is performed.

Nova Scotia Health vice-president, Operations, Eastern Zone, Brett MacDougall said expectations are high that the business case will be approved, and provincial solutions will move forward in an accelerated fashion.

“We’re not working in two parallel streams; we’re working collectively together so that when the business case is presented to Cabinet and the Treasury Board for approvals, it’s already gone through chan-



tor, DI and Cardiac Investigation, Western Zone, Chris Connolly, who co-chairs the council.

The number one challenge in Nova Scotia right now is excessive wait times for routine studies, which “have gone beyond where we’re comfortable with them,” he added. To bring them back in line with CAR recommendations, the council is working collaboratively with Nova Scotia Health executive leadership, government authorities and other partners to implement a multi-pronged wait-time solution, starting with efforts to recruit and retain staff.

For example, Nova Scotia Health has supported a five-year agreement with Dalhousie University’s



nels in our health leadership team that has representation from our CEO and Deputy Minister of Health,” said MacDougall. “We’re very hopeful that it will be received positively, and we’ll get the go ahead.”

In B.C., the Radiological Society is calling for immediate government action to address what Yong-Hing calls a “dire shortage” of MRTs. “We’ve got 2,100 now, and we’re 1,400 short just to get to the national average,” she said.

The society is recommending the government introduce incentives for experienced technologists, as well as educational bursaries to attract more students to the program. “This is an issue that’s been growing over time,” she said. “When demand goes up substantially for medical imaging, and you’re not keeping up with technologists, the gap gets even wider.”

To address wait times for breast biopsies and supplemental breast imaging, B.C. radiologists have identified four potential fee code changes they say will promote expansion within the province’s community imaging clinics (CICs), privately owned clinics that provide publicly funded services.

In particular, a new fee code application was made for tomosynthesis or 3D mammography, which is now the standard of care at many Canadian imaging sites.

In the meantime, the society continues to advocate for action. “It’s nice to see there’s some light being shone on the issue,” said Yong-Hing. “We just hope there’s an equal and urgent response to what we classify as a crisis.”

At the national level, CAR is asking the federal government to take a leadership position to help address the backlogs by investing in new medical imaging equipment across the country; developing a robust health human resources strategy; harnessing new and emerging AI technologies to both speed up workflow and assist with assessing and treating disease; and implementing a national directive for clinical decision support tools.

“We need to tackle this problem from different vantage points: equipment, optimizing the workforce and the last one is to work smarter,” said Soulez.

By the end of 2023, the Referral Guidelines Working Group established by CAR to develop evidence-based, peer-reviewed guidelines to support clinical decision-making, will have ‘Canadianized’ roughly 70 percent of the guidelines used in current e-referral and clinical decision support systems, which are built to adhere to either U.S. or U.K. protocols.

A pilot project under way at North York General Hospital in Toronto shows that using clinical decision support decreases imaging examinations by 10 to 15 percent, helping to optimize equipment use and ensuring patients receive the right imaging procedure at the right time.

“We are putting a lot of emphasis on clinical decision support because imaging is very complex now. With all of the protocols with the new technologies, it is very difficult for first- and second-line physicians to be aware of what is the best and most efficient imaging test,” said Soulez. “I believe we can gain the 10 to 15 percent efficiency as observed – the point being that we want to avoid having patients on a wait list who perhaps do not require a

medical imaging exam and give that chance to others.”

Emerging AI solutions also hold promise when it comes to shortening wait times for medical imaging, he added, by helping to speed diagnosis and manage workflow.

For example, smart technology exists to ensure patients are well positioned before starting an exam so all parameters

will be correct, assisting technologists in their roles and ensuring radiologists get high quality imaging.

Other solutions are geared to solving specific problems, such as early detection of stroke or long cancer, or automating the time-consuming process of calculating measurements to track tumour growth.

“A lot of solutions are coming,” said

Soulez. “It’s a little bit of a random process, so we need to organize and have strong collaboration within industry to make these things operational in Canadian workflows.”

On the east coast, Connolly remains hopeful wait times can be shortened. “I think there’s a general feeling of optimism that we’re going to be able to make some inroads,” he said.



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# Three major developments in DI: spectral CT, AI and cloud computing

BY THOMAS HOUGH  
AND JOSEPH MARION

**S**pectral CT: In our opinion, the hottest modality advancement in 2022 was the emergence of spectral CT. Spectral CT is differentiated by the ability to acquire multiple layers of data – conventional and spectral – within a single exposure and without special scan modes for improved tissue characterization and visualization.

Spectral CT is a way to visualize tissue composition. Spectral photon-counting CT measures how specific X-ray wavelengths are attenuated, which is used to determine material composition. For example, if iodinated contrast is administered to the patient, spectral CT can distinguish iodine from body tissues (bone, fat) and determine the amount present.

Besides the additional information derived from a spectral CT procedure, there are patient safety, diagnostic accuracy, and system efficiency considerations. Conventional CT can require more protocols, thereby impacting workflow. Sub-optimal contrast scans can be utilized without rescanning the patient.

**Artificial Intelligence:** For the past few years research and development initiatives have been pouring resources into Artificial Intelligence (AI) in Diagnostic Imaging to seek some early benefits to gain acceptance by users and to guide firms as to where to focus benefits for the users and enhance the development firm's bottom line.

As per the Gartner Hype Cycle, AI is now on the downward slope of the "Trough of Disillusionment", which comes

after the "Peak of Inflated Expectations" on the hype curve. So far vendors have only been able to deliver minimal savings and productivity gains through workflow enhancements and few diagnostic imaging algorithms.

In the past year in the United States, CPT codes have been implemented to provide for the reimbursement of AI, which will provide small incremental revenue to offset some of the costs of AI.

However, the hundreds of AI firms working on AI initiatives have come to understand that by working alone, they will not be able to provide comprehensive solutions. And so, large numbers of big and small firms are creating alliances, partnerships, and other types of relationships to provide more comprehensive solutions.

Right now, AI and its ability to provide improvements in workflow for radiologists is outpacing improvements in diagnosis quality. What is holding back AI in achieving more diagnostic algorithms is: a lack of standards for communications between applications (remember back to the days before DICOM) to create uniformity in analysis and sharing of AI findings; the large amount of data which needs to be processed in order to keep the algorithms well-fed and maintained; and the current infrastructure within healthcare IT to collect the data, store data and then deliver data back to the AI platform fast enough for AI analysis.

Ultimately, more work needs to be done at the healthcare institution IT level to prepare for comprehensive AI solutions which should be ready within three to five years, depending on many variables.

Both Philips and GE Healthcare intro-

duced expanded AI platforms at the 2022 RSNA. The Philips AI Manager provides an end-to-end AI enablement solution that integrates with existing IT infrastructure and PACS solutions that enables radiologists to leverage AI applications for more comprehensive assessment and to gain deeper clinical insights in radiology workflow.

For its part, GE Healthcare is bringing to market a digital health platform called the Edison Digital Health Platform. The



Thomas Hough



Joseph Marion

company is recruiting healthcare providers and ecosystem participants to help evaluate the platform.

The platform is being designed to seamlessly aggregate data from multiple sources and vendors to enable clinical applications that support integrated care pathway management and holistic views of each patient. It will include a healthcare specific AI toolkit for building and running applications.

**Cloud applications:** In the United States, data storage is starting to migrate to the cloud external to the hospital or enterprise site. By contrast, in Canada, the data is being stored in Diagnostic Imag-

ing Repositories across geographical regions. The DI data is now adding up to large volumes.

This storage shift helps set the stage for AI. Inserting the infrastructure required to feed the data to AI at the speed it needs can be achieved much easier and cost effectively at the cloud level and facilitates AI to be deployed regionally thus sharing the cost of AI across many sites. Huge storage requirements and the ability to have one or more AI applications perform services for hundreds of sites/offices is much more cost effective than purchasing large number of AI applications for each office.

In addition to storage, many facilities are beginning to see the advantage of cloud-native applications, distinguished by the fact that they are optimized for the cloud as opposed to applications that are simply ported from local computers. Another advantage of cloud-native applications is their ability to tie into AI applications.

In the past there has been apprehension about data security with medical data in the cloud, but improved security measures, emphasis, and economics have led to greater support for cloud storage and applications.

*Thomas Hough has retired from True North Consulting & Associates, Inc., based in Mississauga, Ont. He is currently doing specialized engagements. Joseph Marion is principal of Healthcare Integration Strategies, LLC, (HIS) in Waukesha, WI. HIS assists clients with strategic planning and implementation for imaging integration into the healthcare enterprise information systems infrastructure. He can be reached at jmarion@hisconsultant.com.*

## Canada Safe Imaging to deploy a five-star system for best practices

BY DAVID KOFF, MD

**D**uring the difficult years we went through, with a devastating pandemic which killed millions of people worldwide, radiation safety has not been on top of our agendas. The war in Ukraine with the risks to the Zaporizhzhia nuclear power plant, one of the largest in Europe, and the constant threats of nuclear war, have reminded us that the potential risk of radiation is not trivial.

The risk of medical radiation exposure is much less lethal, but still prevalent. Medical Imaging remains the first source of radiation at the population level, with ever increasing cumulative doses, mostly from Computed Tomography, even if dose reduction technology and protocols keep improving. The need to establish and follow Dose Reference Levels (DRL) is far from being evenly established, and in too many instances, doses higher than expected are delivered to patients.

The impact of radiation is twofold:

- Deterministic effects where severity

increases with dose, such as burns or erythema.

- Stochastic effects where probability of occurrence increases with dose, such as cancer or genetic disorders.

As the level which will trigger the adverse effects is not known, the rule is to keep the dose as low as possible; this is the ALARA principle, where ALARA stands for As Low As Reasonably Achievable.

Inappropriate utilization, lack of standardization and excessive exposure are still too often demonstrated and the need for a harmonized strategy to deal with medical radiation exposure is more present than ever.

This is where Canada Safe Imaging comes into place.

In 2012 the International Atomic Energy Agency (IAEA) and the World Health Organization (WHO) held the "International Conference on Radiation Protection in Medicine: Setting the Scene for next Decade" in Bonn, Germany, attended by 536 participants from 77 countries and 16 international organizations. The outcome of the conference was an initiative called the "Bonn Call for Action," which outlines ten major strate-

gies for promoting medical radiation protection.

In response, Canada Safe Imaging (CSI) was formed in 2015 to address the need for a national strategy and action plan in Canada, to strengthen medical radiation protection in patients and foster a culture of radiation safety in healthcare in Canada.



Dr. David Koff

CSI represents a collaborative undertaking between professional associations, universities, colleges, national research institutions and hospitals. Within each sector, a multi-disciplinary approach has also been adopted, involving radiologists, researchers, technologists, medical and health physicists, and other healthcare providers using or prescribing the use of radiation. The founding organizations include the Canadian Association of Radiologists, the Canadian Association of Medical Radiation Technologists and the Canadian Organization of Medical Physicists.

To be relevant, and fulfill its mission, CSI had to understand the specificities of the Canadian landscape. CSI conducted several reviews, starting with a survey of the close to 50 organizations, federal, provincial or territorial, involved at some point with radiation; then with the Canadian Agency for Drugs and Technology in Health (CADTH), we did a pan-Canadian assessment of awareness and adoption of the Bonn Call-for-Action in our healthcare institutions.

CSI also reviewed the level of communication between patients and physicians when it comes to radiation awareness.

Canada Safe Imaging belongs to a network of like-minded initiatives worldwide such as Image Gently, Image Wisely in the United States, or EuroSafe Imaging in Europe, under the auspices of the International Society of Radiology Safety and Quality Alliance (ISRQSA), and in collaboration with the WHO and IAEA.

Recently, the ISRQSA has developed its own Call-for-Action that the different campaigns will promote worldwide. The campaigns meet twice a year at the European Congress of Radiology and at the meeting of the Radiology Society of North America to present their achieve-



# OCINet to consolidate regional DI repositories, improving access to images

BY JERRY ZEIDENBERG

Last April, Ontario's three diagnostic imaging repositories (DIRs) began the process of merging into one super-DIR, called the Ontario Clinical Imaging Network, or OCINet, for short. By consolidating access to the DI records of all Ontarians, radiologists and other clinicians will be able to quickly obtain images and reports from across the province – reducing repeat exams and saving time.

For example, patients who travel between the three regions of the traditional DIRs for specialty care won't have to worry about bringing their images with them on a CD. They will be obtainable online by radiologists anywhere, anytime.

"Patients are travelling long distances for care more than ever," said OCINet's new President and CEO, Shafique Shamji, who was previously Executive VP and CIO at The Ottawa Hospital. "They're travelling for pediatric care, cancer care and other reasons, often to see specialists."

They often need to bring their files with them, and if the images are forgotten, or for some reason a radiologist would like to see different images, repeats are usually ordered. That results in time delays, added costs to the system, and unnecessary exposure to more radiation.

The consolidation will also correct some seemingly absurd problems. Radiologists could be working in a region across the street from where another regional repository is housed. To access the images needed, they must enter a different system, requiring more logins and logouts. Merging the three repositories will save them

time and create efficiencies in providing access to care.

The consolidation of the three systems is taking place in two steps. First, there is an administrative merger of personnel and policies, which is currently in progress. Next will be the technological consolidation of the three systems, which means connecting six repositories – three main repositories and three failover systems.

There are some large decisions to be made, such as whether there should be one giant data warehouse, using one vendor, or if the current repositories should be maintained and connected, creating a "virtual" repository.

At the moment, the old HDIRS repository, covering the Greater Toronto Area and central parts of Ontario, uses Agfa HealthCare technology. The old Ontario southwest (SWODIN) and northeastern (NEODIN) systems have deployed different configurations of GE Healthcare technology.

How those systems will be used in the future is still being decided, Shamji said.

Each of those repositories already handles an immense amount of data. Together, "we're managing approximately 150 million shareable exams, with 15 million added each year," he said.

The images and reports are collected several times each day from each of the partners. "There are over 65 configurations of PACS across the province," he noted. As such, maintaining and refining the flow of images back and forth within three regions are considerable tasks.

OCINet has three major priorities starting in the next year, commented Shamji.

First, it aims to consolidate the DIRs in

ments and coordinate their activities, understanding that the priorities may be significantly different between the regions they represent.

To promote best practices in radiation protection in our healthcare institutions, Canada Safe Imaging plans to deploy a system based on the EuroSafe Five Stars program, designed to acknowledge the institutions which best comply with the best practices adapted from the Bonn Call-for-Action. This is Action 3 of the ISRQSA Call for Action.

Institutions applying for the Canadian 5 Stars must demonstrate that they fulfill several criteria, divided in six sections: optimization, justification, quality and safety, education, research, and regulatory compliance. The full Five Star description can be found on the Canada Safe Imaging website, but here are a few examples:

- Optimization includes the need to demonstrate that the facility has protocols in place for CT, or to demonstrate that local diagnostic reference levels are in place.
- Justification requires that imaging referral guidelines be made available in the institution, or that a process for evaluating cross-sectional imaging request be in place.
- Quality and Safety mandates clear ra-

diation protection tasks for radiographers as well as regular equipment control.

The Canada Safe Imaging Stars will be a label of quality for the facility and should become part of the radiation safety component of the accreditation process. It will benefit the participating healthcare organizations by improving the level of trust between the institutions and their patients.

To achieve this goal, it will be critical to have champions at all sites to promote the system and help with implementation. These champions will be the local radiation safety officers, medical physicists, medical radiation technologists and radiologists. They are in the best position to identify the gaps and propose the steps required to remediate and achieve the highest level of stars.

More information is available on the CSI website at: [www.car.ca/about/associates/csi/](http://www.car.ca/about/associates/csi/)

*Dr. David Koff is Professor Emeritus, Radiology, at McMaster University. He is also Chair of Canada Safe Imaging, and founder and director of MIIRCAM, the Medical Imaging Informatics Research Centre at McMaster, where he leads research projects on radiation risk, validation of technology and applications of Artificial Intelligence to medical imaging.*



Shafique Shamji, President and CEO of OCINet

the most cost-effective way possible. That work is already under way.

Next, as Shamji told Canadian Healthcare Technology, it is not well known, but the DIR groups currently provide shared PACS services to 34 hospitals that didn't wish to procure their own imaging system.

It must continue to serve those hospital customers, bringing them new capabilities to remain up to date with current practices. Ultimately, they want to encourage more hospitals to use these shared PACS systems to save costs and improve collaboration.

And thirdly, the organization wants to increase the number of independent health facilities (IHF) that have partnered with the DIRs. Independent imaging centres produce half of the diagnostic images in the province of Ontario, but only 20 percent of them share their images and data with the DIRs. The plan is to boost this significantly, to take advantage of the work going on outside of hospitals.

Shamji noted there are also two "stretch-goals", as well.

They include expanding the types of images housed in the repositories, which currently serve radiologists. As clinicians tend to work in teams, it's far better if they can access other images and information in a single system.

"If you can see all images in one place, it makes care much more effective," said Shamji.

However, he and his colleagues at OCINet are cognizant of "not consolidating images for the sake of having more images."

"We want to make sure it's clinically relevant and useful," he commented, noting that several "ologies" have reached out to the organization to say that keeping their images together with those of radiology departments would be useful.

"Cardiology jumps to the top," he said, "followed by endoscopy." For this reason, the organization has already created pilot projects to start collecting these kinds of images. Down the road, he added, pathology may be added.

A second stretch goal is to create AI-

powered applications that could benefit clinicians.

"We've got between 10 petabytes and 12 petabytes of information," said Shamji. "That by definition is Big Data. We're in an excellent position to develop applications using AI, machine learning and predictive analytics."

At the same time, he realizes the data consists of personal records and that OCINet is not the "custodian" of the data but rather a network provider. It will need to be careful, legally and ethically, about working with the data. That includes using de-identified techniques or synthesized records and ensuring partnership with hospitals at every step along the way.

Asked whether OCINet plans to give patients access to their own diagnostic imaging records, Shamji commented that there is already a strong effort underway by the Ontario government to create a single health portal for patients.

"We know that patients want to see their full health record, and that they don't want to have to go to multiple places to access their information," he said.

He added that OCINet is working with the province on the creation of the patient portal to ensure all the imaging from OCINet is also eventually available for patients.

For the moment, however, the focus is on the merger and serving clinicians.

Because OCINet is a relatively small organization – with about 50 employees – it is important to work hand-in-hand with outside organizations to maintain its technology and to bring in new solutions.

Shamji supports this philosophy – he has spent much of his career in the private sector, where collaboration with others was a way of life. By working closely with partner organizations, he said, much more can be attained than by acting separately.

For example, while Executive VP at The Ottawa Hospital, he emphasized the role of collaboration when the hospital brought

**OCINet wants to increase the number of IHFs supplying images and data, to further widen its scope.**

in the new Epic information system. He was a leader in the effort to forge partnerships with smaller, regional hospitals so they, too, could obtain the high-functioning Epic system. "It meant that six hospital organizations could benefit from the Epic system, not just one," said Shamji.

This year, four more regional partners in southeastern Ontario joined the The Ottawa Hospital's Epic network, creating a system of 10 organizations working together. They can share records, and by using the Epic tools, function in a collaborative way across the region. In the end, this benefits patient care and outcomes.

Shamji said he wants to build on the spirit of organizational openness and collaboration in his work at OCINet. He will be assisted by an able team, he said. "I've now met all our employees and I'm excited by how hard-working and talented they are. I believe we'll be able to achieve a lot together."



# Diagnostic imaging: How will radiology change five years from now?

BY JERRY ZEIDENBERG

**W**hat will radiology look like five years from now? Radiologists from across the United States and Canada weighed in on this topic at the annual RSNA meeting in Chicago last November. While it's difficult to paint an exact picture of the future, the DI experts seemed to have a good sense of what will happen – in broad strokes.

The speakers had to be clear and concise in this session – they were limited to five minutes each. Here's how they see the future unfolding:

**Bethany Casagrande**  
Chair, Dept. of Radiology and Imaging  
Institute, Allegheny Health Network  
Pittsburgh, Penn.

Dr. Casagrande focused on the role of teleradiology. Is teleradiology a friend or foe, she asked.

"Twenty years ago, I would have said foe," said Dr. Casagrande. "I was raised in academic radiology, and you always stuck it out together. You did the commute together, distributed your conferences together, you sat in the bone pit together. You did everything together. Teleradiology threatened that togetherness – it's breaking up the family! And you don't want to break up the family."

However, today things have changed.

"I'm now the chair [of radiology] in a hospital system that has 10 hospitals and 28 outpatient imaging centres. We are responsible for putting out just over a million RVUs last year," she said. (In the U.S., an RVU or relative value unit is a standard that defines the volume of work doctors perform.)

Addressing the rising demand for DI exams and the shortage of skilled personnel that plagues healthcare systems across North America, she observed: "In programs this big, the old-fashioned way of doing radiology has become incredibly difficult and some would say, impossible. So, in recent times, ignited by the (COVID-19) pandemic, there's been a seismic shift in the way we do work."

In short, work can be done by professionals from anywhere, anytime. The tools are available, and it makes sense to draw on remote human resources. As well, some people don't want to be at the office all the time – work and life balance are becoming a bigger issue.

"When you take a look at this, in our own workforce, people are no longer interested in doing things the way we've always done them," she asserted.

On a daily basis, she said, she is dealing with:

- Large geographic areas
- After hours - 24/7 after hours coverage.
- Multispecialty interpretation in the setting of increasing case complexity
- Reduction of turnaround times
- Expanding access to the underserved

"When I looked at the list, I realized that this is the backbone of teleradiology," said Dr. Casagrande. "In my department, I now say that teleradiology is now copasetic."

So, what is the real foe of academic ra-

diology? "I'm going to be a little controversial and say that it's been the historic inflexibility of academic radiology," she commented.

And she had some definite ideas for things that should change.

First, Dr. Casagrande said that management should support work from home days for academic radiologists.

Second, they should engage junior staff in early leadership roles and passion projects. "It used to be that all the leadership decisions were made at the top – I recommend that you start levelling that out. You want to make it so that they never want to leave their jobs."

Finally, she addressed what could be called 'the old boys club' of medicine.

Dr. Casagrande showed a slide with an historic photo of her hospital's department chairpersons. The 35 images were all of white men!

"I'm not here to white-man bash. But what if things looked like this," she said, bringing up a slide, with an ethnically diverse group of 35 faces. "This is 25 percent of our department. What if we were welcoming and inclusive, so that all the brightest minds went into radiology?"

In the future, she said, the secret sauce for success will be inclusivity. "I think that as we go along, we will be representing the community that we serve."

**Reed Omary**  
Chair, Radiology, Vanderbilt University  
Medical Centre, interventional radiologist

Dr. Omary focused on the threat to human health from climate change, saying it should become a major issue for radiologists, as well as all physicians. He pointed out that in March 2020, the COVID-19 crisis struck and morbidity and death in its wake. It also changed the way medicine is practiced.

"Today another crisis is looming even larger," said Dr. Omary. "We know that flooding has occurred, not just Harvey but Sandy in New York. California, I've lost track of how many wildfires there are. Pakistan had a third of its nation under water, and France has suffered from drought."

He noted that the same individuals who are likely to be affected by COVID are likely to be affected by climate change – the elderly and people with chronic conditions.

Dr. Omary asserted that healthcare is contributing to the problem. "We in healthcare are a major contributor to greenhouse gas emissions. If healthcare were a country, we'd be the 5th largest emitter in the world. The direct costs of climate change to health, according to the WHO, are over \$2 billion."

Interestingly, he observed that radiological publications on environmental sustainability and climate change are increasing – a sign of the growing interest in this issue. "There has been a sea change in radiology publications on environmental sustainability and climate change – 10 in 2020, 14 in 2022. I predict in 2023, we will break 30 and in 2024 we'll break 100."

Dr. Omary concluded by looking into the future. "How do we define if we've been successful five years from now? It'll be if we see an EcoRadiology [stream] coming to RSNA 2027. We'd learn about green resources, we'd even be able to share our



favourite plant-based restaurants. This can happen, I'm confident that it will happen."

**Bruce Forster**  
Professor, UBC Dept of Radiology  
Vancouver

Dr. Forster aimed his remarks on sports medicine. In particular, he looked at the radiologist's role in determining when an injured athlete should go back to the playing field. "In radiology we get asked a lot about injured athletes going back to their sport. The trick is to do it without causing re-injury – either in the acute sense or in the chronic sense, which could put athletes out for months or even years from their sport," said Dr. Forster.

He observed that most often, the patients are amateurs – for them, recovering at home isn't a major issue. However, when you get up to elite amateurs it's more difficult – they've been training their whole lives. "It gets even more difficult with professional athletes. In major league baseball, injuries cost them \$700 million each year."

Dr. Forster asked, "How are we doing on this [as radiologists]? The media thinks we're doing awesome."

He cited a few examples, including that of Alphonso Davies, the Canadian soccer

star who injured his hamstring just before the World Cup; the media reported that his upcoming MRI scans would reveal the exact extent of his injury.

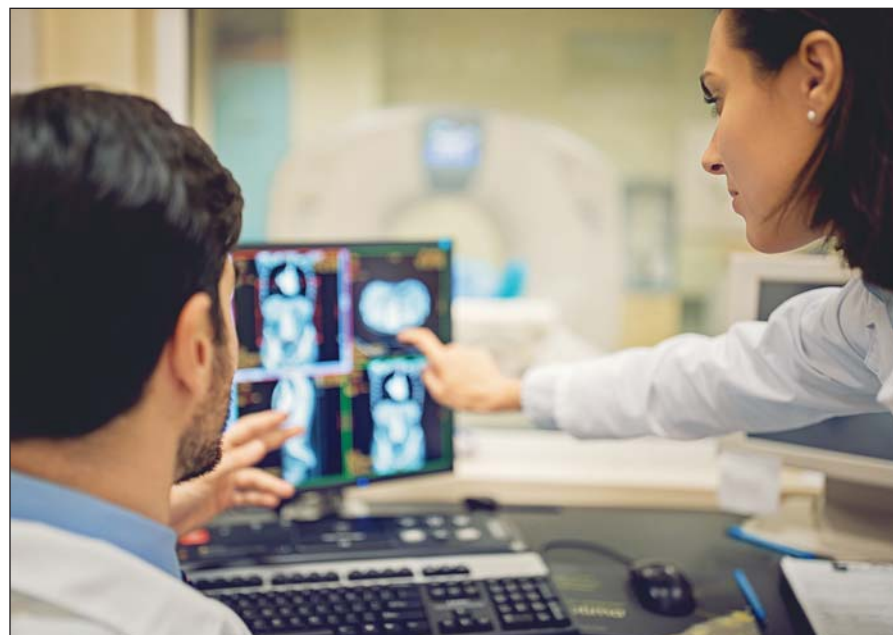
"So, no pressure, no pressure there," quipped Dr. Forster.

He then asked what the science says in terms of return to play? "It's all over the place," he answered. "There are some really good things we've learned, like using the Frederickson score system for tibia stress fractures in MRIs." (Frederickson scores and images are a good predictor of how soon the athlete can go back to his or her sport.)

"But it's with hamstring tears that the wheels fall off. This is a very controversial area. Some investigators have shown that when you tear the central tendon, patients take longer to return to play. High ankle sprains? We can make the diagnosis really well, but the things we see can't seem to correlate to return to play."

Apparently, there are stumbling blocks in diagnosing sports injuries and determining when athletes should return to play.

Dr. Forster said that improvements will occur, but they will probably require 10 years rather than just five. That's because he's factoring in the use of AI and machine learning in diagnosis. But collecting and analyzing the data, and building it into





workflows, will take about 10 years, he predicts.

Moreover, there will be a lot of data. “There will be data that we input that AI and ML will help us solve. But it’s not just regular images but quantitative images, T2 mapping, temperature imaging to look at muscle fibre orientation. Also, things like elastography, to look at what role fibrosis plays in return to play decisions.

“Biomechanics is super important,” he added, “and that’s got to be part of the data set. Maybe there’s also data from physiotherapy. Bone, muscle and fat mass is another important thing to include. And certainly, the ultimate to include is genomics.”

He suggested that radiologists are in an excellent position to “quarterback” the decision-making, leading the medical team. “I predict that radiologists have an incredible opportunity here,” said Dr. Forster. “We know the imaging, which is an important but not exclusive part of the decision-making. But we also have an advantage because we’re a little ahead of the game in AI and ML. As long as we do the research, we’re in a good position to become the team leader in making return to play decisions.”

**Michael Recht**  
Professor and Chair,  
NYU Langone Health.

Dr. Recht spoke about AI-enabled training as the future of radiology education. He noted that his daughter finished her radiology residency about two years ago while he finished his own approximately 30 years ago. Despite the time difference, “the structure of the residency program was essentially the same,” said Dr. Recht. “In the first three years of residency, all residents rotate through the same subspecialties, for the same length of time, regardless of their individual backgrounds and their performance on the radiology rotation.”

One of the most important facets of an educational residency program, he said, is the daily readout at the workstation. “And yet we all rely on random cases to populate the resident’s workload every day. What that means is that there is no guarantee that every resident will see the full spectrum of cases and pathology that they should see on each rotation. And, in fact, it is likely that they don’t.”

Dr. Recht observed that we don’t have a very good way of objectively evaluating a resident’s performance on the rotation. “Typically, we rely on the subjective evaluation of our attending radiologists. But we all know that our attendings only spend a few days a month with the resident, limiting their ability to truly evaluate each resident’s strengths and weaknesses.”

But thanks to AI, we can change all that. “For the first time, we can tailor each resident’s education to their own strengths and weaknesses. Let me explain how we’ve started to develop such a system at NYU Langone.”

He described how the first step was to define the types of cases and pathology that each resident should see in each year of their residency.

Second, Langone has started to build

a curated set of cases that includes multiple types of pathology and types of cases for each rotation.

They’re also tracking, accurately, the types of pathology and cases that each resident sees on each rotation. “Using that information, we can supplement the cases the resident sees on their rotation with our curated cases, to make sure they

**Younger people don’t want to be tied to a job 40 to 60 hours a week. They value their personal time.**

see the full set of pathology,” he said.

The department has also devised an NLP algorithm that compares a resident’s dictations with that of the attending radiologist. “We can use that to identify gaps in each resident’s learning,” said Dr. Recht. “We can further supplement the resident’s worklist with cases that address their weaknesses.”

For example, if a resident is good at diagnosing musculoskeletal tumours, but not so good at differentiating the types of inflammatory arthritides, more arthritis cases can be added to their daily worklist.

“What we hope to use this information for, in the future, is to vary the length of each individual’s rotations,” said Dr. Recht. “So, if someone is really good at MSK radiology in their third year, maybe they only do a rotation of two weeks instead of four weeks. And they use those extra weeks for a rotation in something they’re not so strong in. Maybe neuroradiology.”

In the future, Langone hopes to be able to use this technology not only to vary the length of the rotation, but perhaps for the entire residency – allowing professors to graduate a resident based on their individual competencies, and by hitting milestones, rather than on the current, one-size fits all approach.

**Timothy Mosher**  
MD, Chair, Radiology,  
Penn State University

Dr. Mosher concentrated on the HR crisis that’s impacting the healthcare sector, and industry, in general. “I predict that the 32-hour work week will become the new standard for full-time employment within the next five years,” he averred. “Those of you who might be responsible for staffing, or if you’re an administrator, you might greet this with a little bit of skepticism.”

After all, many radiologists have been working 60-hour weeks. How will management staff their departments if a 32-hour week becomes the standard?

He answered, “I would argue, you’re not going to have a choice. Because this is not an internal disruptor, this will be an external disruptor. If you look through history, the changes in work hours never came from the top down, they came from the bottom up.”

Dr. Mosher suggested that we’re on the cusp of sea-change in attitudes, where the public doesn’t want to work long hours anymore.

He mentioned “The Great Resigna-

tion”, in which workers have been retiring well before they need to. “A lot has been said about the Great Resignation, but the trend started well before the pandemic, largely due to the aging Baby Boomers who were retiring from their work,” he commented. “Their retirement funds have allowed them to retire. COVID accelerated that. It reached a peak in November 2021.”

Dr. Mosher added, “But we’re going to continue to see this attrition in the workforce.”

Those folks, of course, are older people taking earlier retirement. Pressure is coming from the other end of the age spectrum, as well.

The attitude of younger people who are just entering the workforce is different. They don’t want to be tied to a job 40 to 60 hours a week. They value their time as well as their compensation.

Already, in the US, there are a lot of companies that have switched to a 32-hour work week.

“These are the industries – often high tech – that we’ll have to compete with in the future when we want people to go into medicine,” said Dr. Mosher. “We will have to be able to compete with the flexibility being offered to people by these other industries.”

And it’s not only companies – there are many countries that are piloting a four-day work week. They include Japan, the UK, Belgium, Scotland, Iceland, Spain and Ireland.

The US House and the California state government have already introduced bills to shorten the work week. They died, but the effort has already started.

In Iceland, 86 percent of the working population is already on a shorter work week or has the right to do so in the future.

“So, on the innovation curve, we’re already past the point of early adopters,” said Dr. Mosher. “We’re close to the tipping point, as the idea is achieving acceptance by the ‘early majority.’”

He concluded by saying, “As we see further attrition of the workforce, it won’t be a matter of ‘will’ we adapt but ‘how’ will we adapt.”

**Leon Lenchik, MD.** Chief of  
Musculoskeletal Imaging, Wake Forest  
University School of Medicine, Winston-Salem, North Carolina

Dr. Lenchik dedicated his five minutes to radiomics, which he believes will become routine in diagnostic imaging. “I don’t know when that will happen – possibly in five years. What is routine now? Orthopedic surgeons love measuring things and radiologists hate measuring things – because (measuring is) manual, we make mistakes, we face the wrong way, and something we hate even more is segmentation. Fortunately, aside from research

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# Radiology conference shows continuing advances in technology

Announcements included solutions featuring the application of AI to diagnostic imaging.

**C**HICAGO – Throughout the 2010s, the annual Radiological Society of North America attracted 50,000+ clinicians, researchers and vendors annually to what is among the continent's largest medical conferences and trade shows.

Its momentum was interrupted for two years by COVID – nevertheless, the latest meeting, which started right after the American Thanksgiving holiday, attracted nearly 38,000 participants. That's a testament to the value attendees derive from the educational sessions and vendor displays.

According to Signify Research, a UK-based market research company, last fall's trade show didn't launch trailblazing new technologies, but it did provide useful refinements of existing systems. The company predicts that exciting and even "disruptive" technologies will be at the next iteration of the show, in 2023.

Still, useful refinements can be very helpful to imaging departments. Here's a roundup of what the major vendors announced at the conference. (Note: Some of the systems may not yet be approved by Health Canada; others may still be in the development stage.)

## GE Healthcare

Perhaps the biggest news for GE Healthcare was its planned spinoff from the parent company, which occurred in January. Still, the healthcare giant did announce some 40 solutions that aim to improve patient outcomes and increase healthcare efficiency.

One of the highlights was in MRI, where GE Healthcare announced the SIGNA Experience, a platform of four components consisting of:

- **SIGNA One** is the cornerstone of these solutions: A next generation, imaging software platform supporting an elegant, intuitive user interface, designed to offer high quality magnetic resonance (MR) imaging with a minimal number of clicks.

- **AI/Deep-learning solutions:** Pioneering, deep-learning AI applications, such as AIR Recon DL for improved signal-to-noise ratio (SNR), image sharpness and shorter scan time. To date, an estimated 5.5 million patients globally have been scanned with AIR Recon DL. Of note, AIR Recon won a "Best of What's New Award" from Popular Science magazine late last year. Popular Science said the awards celebrate "the most exciting and ground-breaking innovations of the year." There's also a Canadian connection to AIR Recon DL. Marc Lebel, Lead Scientist for Neuro MR at GE Healthcare and adjunct professor at the University of Calgary, is the technical visionary and innovator behind AIR Recon DL – GE's first deep learning reconstruction in MRI. It reduces scan times while improving image quality, benefiting patients, clinicians and imaging centres.

- **Workflow solutions:** Automated, intelligent workflow technologies, that include AIR x and AIRTouch, which guide technologists to help make an MRI scan set up better, faster, and easier.

- **AIR Coils:** Industry leading, transformative technology in coils, which are flexible, lightweight, and comfortable, enabling total freedom in coil positioning and handling during an MRI scan.

The company also announced the SIGNA Victor, the newest 1.5T 60 cm system designed to address current challenges, such as the sharp increase in MR

examinations driven by the stalled pandemic demand, surging power and commodity costs, and labor shortage and staff burnout. With the SIGNA Experience platform being integrated for the first time in this 1.5T segment, the system offers all the benefits of the platform, in addition to efficient helium and power consumption that can support higher patient throughput and lower costs.

For CT, it announced the Revolution Apex platform with Effortless Workflow: An industry-first Computed Tomography (CT) platform with built-in scalability for onsite CT detector upgrades – all without replacing the gantry. GE says the new Revolution Apex platform offers the world's fastest gantry speed and helps radiology departments stay ahead of the technology curve with a modular design that offers a path to continuous hardware and software scalability.

The company also announced Imaging 360 for Operations, an ecosystem of applications designed for core imaging operations functions such as protocoling, staffing, analytics, and scheduling.

On the AI front, it announced Quality Care Suite 2.0: A collection of AI algorithms that enable the delivery of high quality, radiologist-ready images for every patient – including pediatric patients, a first for GE Healthcare X-ray AI.

GE Healthcare also publicized an interesting partnership with MediView XR, Inc., a leading clinical augmented reality med-tech company, to integrate

tion, telecollaboration capabilities and procedural data insights to enhance and simplify clinical decision making along with GE Healthcare's interventional imaging technologies, digital infrastructure, data analytics, and clinical decision support capabilities.

"Augmented reality in imaging is key to improved visualization of anatomy and enhanced user experience. Our collaboration with MediView demonstrates our commitment to advancing the delivery of precision care by expanding the capabilities of our own imaging guided systems through an open architecture and the integration of promising and complementary technologies," said Arnaud Marie, General Manager for Global Interventional at GE Healthcare.

## Canon Medical

**MRI:** A major shift was unveiled in MRI workflow, with an intelligent remote tablet and in-room camera solutions for monitoring and positioning patients to maximize workflow on Canon's flagship Vantage Galan 3T and Vantage Orian 1.5T systems. In line with the recent release of Altivity – Canon's new approach to AI innovation that uses smart technologies – the Vantage portfolio now incorporates machine learning and deep learning technology that enhances image quality by removing noise and restoring SNR. It also automates many scan proce-



GE Healthcare is partnering with MediView XR to integrate medical imaging into mixed reality and augment reality solutions.

medical imaging into mixed reality solutions through the development of the OmnifyXR Interventional Suite System.

MediView's current technology platform leverages spatial computing and mixed reality, united with medical imaging in combining augmented reality visualization, remote collaboration and evidence-based clinical insights.

The collaboration between the two organizations brings together MediView's expertise in 3D augmented reality medical visualization, surgical naviga-

tures and confirms set-up steps to save time and reduce errors.

All of Canon's MRI systems now have the ability to utilize Advanced intelligent Clear-IQ Engine (AiCE), which leverages deep learning reconstruction (DLR) technology to automate scan planning for Liver, Prostate and Whole Spine, and to remove noise from images for SNR improvement and time saving.

**CT:** Canon Medical introduced the latest updates to the Aquilion ONE / PRISM Edition. With Precise IQ Engine (PIQE), Canon has added Deep Learning



Reconstruction for CT cardiac scans that will further improve the level of image quality that Aquilion ONE/PRISM Edition can deliver.

PIQE provides improved spatial resolution and 45 percent reduced noise for improved in-stent visualization with clear depiction of vessel lumen to evaluate neointimal hyperplasia and in-stent restenosis. The high contrast to noise properties of PIQE exams also provide better evaluation in heavily calcified coronary arteries with no loss of low contrast detectability – and these benefits are provided without any additional dose. Another new feature is the SilverBeam Filter, which allows CT lung cancer screening at a dose on the order of a chest X-ray exam.

**HIT:** At RSNA 2022, Canon Medical Healthcare IT solidified its commitment to improving patient care and access through advancements in cloud innovation. The Canadian HIT team collaborated at meetings with other imaging modalities to provide the latest updates on visualization, clinical workflow, image informatics, and orchestration of essential medical imaging data.

Canon visualization techniques continued to impress, especially with Global Illu-

**Canon Medical celebrated the 30th anniversary of its Hybrid Angio-CT technology. It offers a family of Alphenix solutions.**

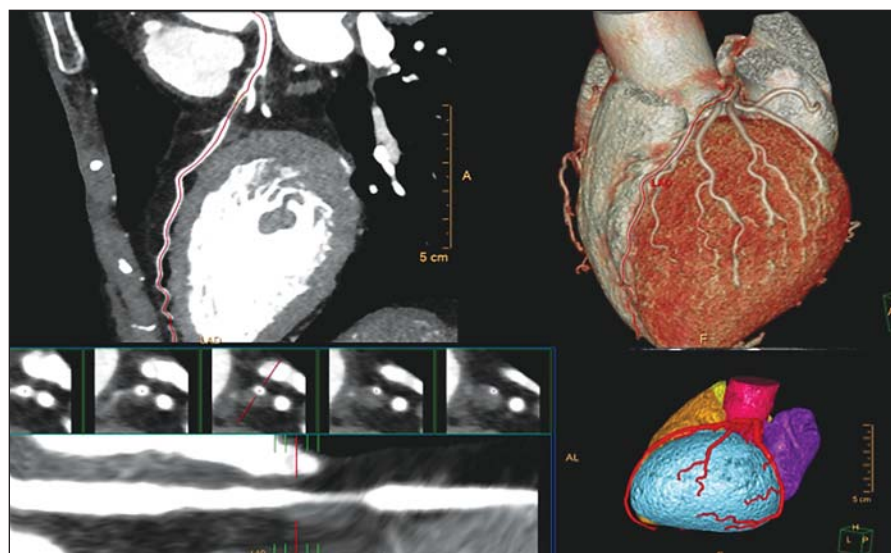
mination Rendering (GIR) – known as a revolutionary 3D/4D rendering technique to help provide a more photorealistic view of human anatomy. On November 29, 2022, a GIR image illustrating unusual pathology was selected as the “2022 Top image in Radiology: Radiology in Training” award by the RSNA Radiology publication. Canon Medical shared this example of how their technology contributes to radiology education and diagnostic communication. Learn more: <https://pubs.rsna.org/doi/abs/10.1148/radiol.229031>

Disclaimer: neurovascular and CT Chest Pain packages are pending Health Canada approval for CT and MR.

**Angiography:** Celebrating the 30th anniversary of Hybrid Angio-CT technology at RSNA 2022, Canon Medical said its Alphenix family of interventional systems deliver the most comprehensive portfolio in the industry. Coupled with the unparalleled flexible C-arm, the Alphenix 4D CT offers the highest resolution on the market. HD 76 high-definition detector provides more than twice the spatial resolution of conventional flat panel detectors, helping clinicians see fine details in complex interventional procedures. Deep Learning Spectral CT reconstruction is an upgrade option for Alphenix 4D CT customers with Aquilion ONE / Genesis Edition CT scanners. HD 76 high-definition detector is also available for all Alphenix customers with a 12x12” or 12x16” detector.

**Philips**

**New Advanced Visualization Workspace powered by AI:** At RSNA, Philips introduced its next-generation Advanced Visualization Workspace platform with AI-enabled algorithms and workflows. This lat-



Siemens discussed progress on NAEOTOM photon counting CT scanner, which is becoming available.

est innovation is vendor-neutral, providing a single, advanced platform for multiple modalities across cardiology, oncology, neurology, and radiology with a comprehensive suite of advanced visualization solutions to support care teams, and tailored to fit the needs of any hospital network, from a single workstation to an enterprise solution.

Philips Advanced Visualization Workspace now includes more than 70 clinical applications for clinical insights, designed to support workflow and diagnostic confidence as well as automated processing for multiple clinical domains across the continuum of care. New applications include the MR cardiac suite, an all-in-one environment for cardiac MR, providing one overview for all imaging data types to support diagnosis and report creation.

The new AI-powered CT ASPECT (Alberta Stroke Program Early CT Score) scoring feature indicates early signs of brain infarction on non-contrast CT scans for the management of ischemic stroke patients. The application automatically identifies ASPECTS regions of the brain via AI and generates an ASPECT score sent directly to the PACS (Picture Archiving and Communication System). New features also include enhanced CT Liver Analysis, with tools to analyze and quantify the whole liver, liver segments, and user-defined regions of interest.

**Integrated radiology workflow:** Visitors to the Philips booth at RSNA viewed the expanded Philips Radiology Workflow, a combination of solutions that support clear and efficient radiology workflows. Designed as vendor-neutral, the solution components are AI-enabled and can be implemented in any radiology department to assist customers by automating or accelerating routine and repetitive tasks and help to generate insights from large amounts of data.

In addition to the latest Advanced Visualization Workspace, at RSNA, Philips introduced the new Radiology Information System (RIS) natively integrated into Philips Image Management Vue PACS. This new administrative and clinical workflow management solution allows the entire radiology department and ancillary users to enter, store, view, manage and transfer patient information with a quick and easy-to-use web solution.

The newest release of RIS also expands patient-oriented functionalities, allowing

patients to self-schedule their exams from the web, while the patient kiosk application gives patients the opportunity to check in when they arrive at their healthcare facility.

Philips also demonstrated how it combines the power of AI with deep clinical knowledge to create solutions that integrate into the workflows of healthcare providers and people’s daily health routines. Philips’ AI-enabled PACS provides automatic analysis of medical data and extraction of relevant information to generate meaningful – and actionable – insights that enable more precise and personalized patient care. It also allows access to a large portfolio of validated third-party AI algorithms that integrate seamlessly into the existing radiology workflow.

**Agfa HealthCare**

At RSNA, Agfa HealthCare showcased how the right solutions can help redefine the radiologist’s flow by increasing the efficiency of their workflow, enhancing their productivity, and boosting the value of their work.

**Shared Reading Workflow:** enables faster diagnosis and treatment by balancing radiologists’ workloads, synchronizing their task lists, and optimizing their time management with intelligent distribution of diagnostic reporting tasks across the hospital network.

**Precision Reporting:** supports clear, efficient communication between radiologists and clinicians to enhance diagnostic decision making, with innovative structured reporting. Radiologists can use pre-defined report templates based on ACR BI-RADS® and ACR PI-RADS®, as well as the new OB-GYN module for fetal reporting and data system.

**Teach and Research:** enhances diagnostic confidence with the easy creation and curating of reference exams for teaching and research. Facilitates scientific research, clinical trials or collaboration with AI vendors.

**Multimedia Gateway:** gives radiologists and clinicians a more comprehensive view of the patient, by making images and videos from departments with non-standardized image sources part of the patient’s imaging history.

**Molecular Imaging:** makes it easier for radiologists and their colleagues throughout the hospital to follow up on patient care for oncology and other pathologies. With embedded PET, SPECT, CT and MR hybrid imaging and fusion tools, as well as easy access to all other imaging studies, clinicians have a fast and streamlined workflow in a unified reporting environment.

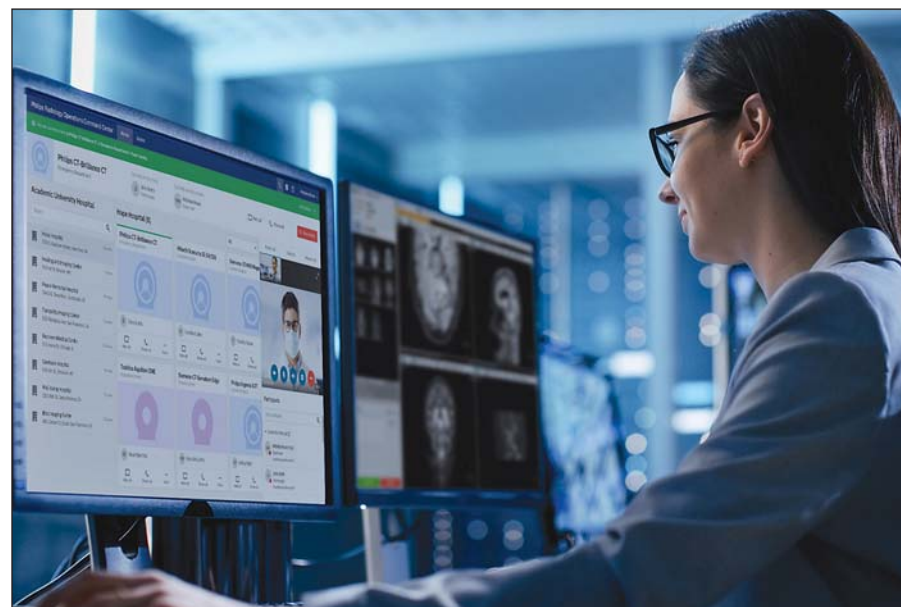
**RUBEE™ for AI:** puts the benefits of augmented intelligence in radiologists’ hands for triage, workflow orchestration, advanced visualization, smart hanging protocols and precision reporting, with seamlessly embedded, carefully selected and curated AI packages: Breast AI & Breast AI Analysis, CT Lung AI, Chest X-Ray AI Visualization, and Chest AI Analysis\*

Breast AI is powered by ScreenPoint Medical BV Transpara®, Breast AI Analysis is powered by Lunit Inc. INSIGHT® MMG®, CT Lung AI is powered by Riverain Technologies & LLC ClearRead™ CT, Chest X-ray AI Visualization is powered by the Riverain Technologies & LLC ClearRead™ X-ray platform, and Chest AI Analysis packages is powered by Lunit Inc. INSIGHT® CXR.

Agfa HealthCare continues to work on innovative solutions and tools to enhance the radiologist’s workflow and value. At RSNA, visitors found out more about Works in Progress, including:

**Actionable Findings:** Close the loop on communicating critical findings. Radiologists can notify colleagues of critical and

CONTINUED ON PAGE 19



Philips introduced its next-generation Advanced Visualization Workspace platform with AI-enabled algorithm.



# New year, new tools: digital health solutions to support clinical practice

BY JAMIE LOUIE,  
COMMUNICATIONS ADVISOR, ONTARIOMD

With every new year and seasonal change, there comes an opportunity for growth and transformation. The team at OntarioMD (OMD) has been busy integrating practical digital health solutions with electronic medical record (EMR) systems and developing new supports to help Ontario clinicians with their unique practice needs.

Ten new and exciting projects are coming down the digital pipeline in 2023:

- **Access to Drug Information:** Clinicians can now access medication information from the provincial Digital Health Drug Repository (DHDR) directly through their EMR. This invaluable digital health tool has been connected to OMD-certified EMR systems so clinicians can securely view dispensed drugs covered under the Ontario Drug Benefit (ODB) Program, narcotics or controlled substances, pharmacy administered flu shots, and COVID-19 vaccination information. Contact [support@ontariomd.com](mailto:support@ontariomd.com) to get connected to the DHDR.

- **Access to immunization data:** OMD is working with Ontario Health to provide clinicians with real-time access to comprehensive immunization information directly from their EMR. This integration will also allow clinicians administering vaccinations to submit patients' immunization data, retrieve data related to patients' immunizations administered by schools, public health units and hospitals, and forecast upcoming required immunizations according to the provincial immunization schedule.

- **Digital advocacy to address clinicians' digital burden:** OMD is working with



health care partners to offer digital health solutions, such as Artificial Intelligence tools like scribing and virtual assistants, as well as other advanced technology applications, to address and help reduce clinicians' administrative burden.

- **eCoaching & QI workshops:** OMD is planning to create a platform that makes coaching assistance available to clinicians in their own time and location. eCoaching will provide best practices and EMR tools needed to improve practice efficiencies on different topics such as preventive and complex care. It will be an interactive and intuitive solution based on Quality Improvement (QI) principles and can support physicians with their mandatory Practice Improvement Plans (PIP). OMD will also continue its partnership with

University of Ottawa to offer Essentials for Practice Improvement (QI) Workshops and education for physicians who are working on their College of Physicians and Surgeons of Ontario (CPSO) QI Program or to help them achieve their own personal QI goals in 2023.

- **eForms:** OMD is making form submission easier for clinicians with the recent launch of eForms. eForms are digital forms clinicians can complete and submit from the convenience of their EMR. They are an improvement over other digital forms in EMRs, which arrive at the receiving organization as faxes. This initiative simplifies and streamlines form completion through guided navigation, ensures the most up-to-date forms are always used, and offers a secure and reliable method of submitting

forms. eForms is a collaborative initiative with the Ministry of Transportation (MTO) and Ontario Health. There are 32 forms from MTO available (16 each for English and French), with more to come. For users of Avaros EMR, Cerebrum, Clinician Information System, EMR Advantage, GlobeMed, YES EMR, and YMS EMR: request eForms by contacting [support@ontariomd.com](mailto:support@ontariomd.com).

- **EMR as a gateway:** Better than a bookmarked link, EMRs will soon provide users with a truly integrated experience through easier access to several services directly from their EMR. This contextual launch capability – launching a digital health tool using the user and patient (where applicable) context set by the EMR – will simplify access to online services and enable relevant information to be delivered back into the EMR. Access to OTNhub tools, community care patient information, and electronic reports (eReports) are coming, building on the existing eForms and ClinicalConnect services available today.

- **eOrdering:** If users can see lab results from the Ontario Laboratories Information System (OLIS) through their EMR, why do they still need to request labs through fax-based requisitions? Soon they won't have to. eOrdering is coming to clinicians' EMRs to permit a more streamlined approach to ordering labs electronically.

- **Online Appointment Booking (OAB):** OAB allows patients and their caregivers to request or schedule virtual or in-person primary care appointments using a computer or mobile device. This means less likelihood of 'no shows' and less administrative time spent on booking appointments, increasing practice efficiency and freeing up valuable time for clinic staff to focus on other important tasks. To learn more, view OMD's Benefits of Online Appointment Booking brochure, and an OAB Webinar Recording hosted by OMD and the Ontario Medical Association, on [OntarioMD.ca](http://OntarioMD.ca).

- **Secure Messaging:** Several new features and add-on technology will be available for community-based EMRs, such as secure messaging. OMD Advisors (and Peer Leaders) are available to support clinicians in choosing a suitable secure messaging platform and other EMR features to integrate with, and enhance, their clinical practice and workflow.

- **Website Refresh:** OMD is currently in the process of updating its [OntarioMD.ca](http://OntarioMD.ca) website to optimize navigation and the user experience, making it easier for clinicians to find what they're looking for. The redesign will also embrace a new look and feel.

OMD looks forward to sharing these exciting and useful technology solutions throughout 2023 with the healthcare community.

OMD is further committed to supporting Ontario clinicians with their use of digital health and virtual care tools. To learn more about these tools for your practice, or for help with your EMR, connect with OMD's expert Advisors and clinician Peer Leaders at [support@ontariomd.com](mailto:support@ontariomd.com), or visit [OntarioMD.ca](http://OntarioMD.ca).

Jamie Louie is a Communications Advisor, OntarioMD.

## Siddhartha Mukherjee points to problems in Deep Learning

BY JERRY ZEIDENBERG

During his keynote address at the recent RSNA conference in Chicago, Dr. Siddhartha Mukherjee – an oncologist and Pulitzer Prize-winning author of *The Emperor of all Maladies* – identified artificial intelligence as a key development for medicine. However, he also emphasized that doctors don't quite trust AI, and that there's a fair degree of skepticism about it.

"There's a hesitancy to embrace AI technology because of the limitations of the technology – AI networks still remain black boxes," said Dr. Mukherjee, addressing the Radiological Society of North America. "Physicians are trained mechanistically, in why something works some way. Most of the algorithms offer no perspective on why a particular lesion is classified as benign or malignant. They only offer the end-point solution. There's hesitancy because our brains are trained to think about why."

He illustrated this "doctor's dilemma" by pointing to a dermatology project that employed AI to detect cancerous skin lesions.

The researchers put together challenge sets of hundreds of thousands of lesions and used them to train algorithms. "To the

human eye, it is difficult or even impossible to tell the difference between some of the lesions," he noted.

Indeed, in the images he displayed on a large screen, some of the lesions that looked benign were actually malignant, while others that looked malignant were benign.

However, the AI-powered system that was created performed well on the large

**"Knowing about bicycles doesn't mean that you know how to ride one," Dr. Mukherjee asserted.**

test set, and efficiently separated malignant skin tumours from the benign lesions.

Upon further analysis, the researchers discovered that the in the training set, some radiologists had marked the lesions they thought were malignant with a yellow mark. "So that's what the algorithm was picking up," said Dr. Mukherjee. "It's a case of garbage in, garbage out."

That's a kind of worst-case scenario that can disturb and dismay physicians about AI.

Dr. Mukherjee spent some time on the underpinnings of AI. When it comes to

Deep Learning, he asked, "How do we learn? Can machines learn like us? And can machines learn medicine?"

He pointed to the philosopher Gilbert Ryle, who made the distinction between "knowing that" and "knowing how."

"Knowing about bicycles, for example, doesn't mean you know how to ride one," said Dr. Mukherjee. "Think about how you learnt to ride a bicycle, or how you taught your children to ride. What you didn't do is hand them a manual that said, climb on the seat (step one), push with 60 psi on the front pedal (step two), push your back foot with 10 psi (step three), balance yourself and hold the handlebars at the same time."

What you did instead was show your kids how to ride the bike.

Encapsulating the "knowing-how" into computer AI systems may be something of a roadblock now, as the solutions tend to the "knowing that" side in their algorithms.

Gilbert Ryle was very interested in the difference between rule-based or algorithmic learning and experience-based learning. And he said, "Rules, like birds, must live before they can be stuffed."

He added, "That's going to become very important, because as we move forward, we'll understand what these lived rules are."



## RSNA roundup

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actionable findings more easily, and track the notification status, from within their Enterprise Imaging desktop. (Work in progress)

Streaming Client for Radiologists: Agfa HealthCare's browser-based streaming client, currently a work in progress, will provide freedom of access to patient imaging data with its game-changing technology. This streaming option changes the dynamic of how large- and medium-sized organizations manage operations across their various imaging and reading groups. Built for wide deployment, Agfa EI Streaming Client innovations will support the latest and most efficient server-side rendering and image federation and has the flexibility to stream the diagnostic client either from an on-prem solution or from a cloud-based solution.

Lesion Management and Tracking: The

lesion management module will assist the radiologist in reporting lesions in a structured way and will allow to track lesion trending over time. (Work in progress)

### Siemens Healthineers

For its part, Siemens discussed its progress as the first company to release commercial Photon Counting CT scanners. Its NAEOTOM Alpha scanner has been used in over 80,000 scans in a one-year period.

According to the company, with a slice

thickness of 0.4 mm and an in-plane resolution of 0.24 mm in standard scan protocols, NAEOTOM Alpha provides an impressive

**Siemens' breakthrough in photon-counting CT, the NAEOTOM Alpha, is being used in a wide-variety of exams.**

level of detail at low dose. Benefits include:

- High resolution in all standard native protocols

- High resolution in all standard CT angiography protocols
- High level of detail for evaluating fine structures in all anatomical areas

Among others, its new technology is useful in areas like cardiology. According to Siemens, using conventional CT, the limit for high-resolution images in cardiac CT is 0.6 mm slice thickness (without using comb filters). With NAEOTOM Alpha, this limit is pushed to 0.4 mm while retaining a remarkable temporal resolution of 66 ms and maintaining full dose efficiency – revealing impressive details in coronary vessels.

## Diagnostic imaging: How will radiology change in five years

CONTINUED FROM PAGE 15

where we get fellows to do it for us, we don't have to do it very often."

However, he asserted that in the next few years, radiologists won't have to bother

with manual procedures for segmentations and measurements. Instead, it will become automated, and radiomics will be automatically applied on top of these metrics.

But in the next few years, this will change, so we will have automated segmentations and measurements. And in the next five years, radiomics will be added to the process.

"Essentially, the first step in radiomics is to do some sort of image segmentation and feature extraction," said Dr. Lenchik. "And you get a bunch of variables, so in addition to muscle size and density, you

ample, in cardiac CT and MRI, pancreatitis, renal stones, and of course, musculoskeletal imaging."

He added, "In my view, muscle, bone and fat radiomics will improve the care of older adults. In sarcopenia (the decline of skeletal muscle tissue with age), with which I've been involved, there are a lot of risk factors for getting sarcopenia and a lot of things that can go wrong once you have it.

"You can die faster, your brain can decline faster, you get re-admitted to hospital, you're miserable. So, how do we change that?"

He suggested that analyzing sarcopenia on CT, measuring muscle size and density is one way. From there, radiologists can apply radiomic analysis. "There's freely available software – and it will be embedded in the manufacturers' toolbox soon, as well," he said.

He said that radiomics can be combined with other 'omics', like proteomics, genomics, metabolomics, to create models of health and disease that are more accurate than other models.

"This has been done by many groups and will continue to be done in the next five years," said Dr. Lenchik. "But in my view, radiomics will become routine, by improving image-derived analytics, hopefully by improving prognostic tools and best of all, by improving patient care.

## ECM can streamline data collection

CONTINUED FROM PAGE 7

create documents that appear directly in the patient's chart, supplemented with automated content intake from Quantum ECS' Intelligent Data Capture (IDC), SJHH was able to meet HIMSS Stage 7 certification requirements. In particular, the use of IDC was crucial in achieving HIMSS Stage 7 by ensuring that out-patient referral information was processed promptly and accurately.

Reducing errors: As demand for service across the healthcare industry continues to rise, technology that saves time and money while reducing error is a needed resource to supplement the workforce's efforts. Introducing tools like Enterprise Content Management is vital for organizations looking to evolve their data strategies and meet goals created by the shifting landscape of healthcare and meet the needs of patients. COVID-19 and its after-effects

have proven how necessary it is for organizations to be prepared for anything – and the ever-changing future of data and content management is sure to be only one piece of this puzzle.

Currently, the International Data Corporation reports that data is growing at a rate of 10x per year. By 2025, the global datasphere will have an estimated 160-plus zettabytes of data worldwide, making it critical for organizations to address growth and management.

Additionally, many across the industry continue to predict an increase of data challenges, underlining the importance of systems that alleviate pressure from HIMs who are already stretched thin.

*Tom Romeo is the General Manager of Healthcare IT at Quest Diagnostics, a global leader in diagnostic information services. For more information, please visit Enterprise Content Management/Quest Diagnostics.*

**Segmentations and measurements will become automated, and radiomics will be applied, as well.**

get about 80 different variables or phenotypes, that represent texture. And it turns out that these texture features are invisible to you with the naked eye, but they're visible to the machine."

He noted that there is currently a lot of discussion about the use of radiomics in cancer care. "But I'm going to make an argument that it goes beyond cancer. Right now, there are people writing papers about radiomics in Alzheimer's Disease and other non-cancerous conditions. For ex-

## Remote monitoring

CONTINUED FROM PAGE 8

ing a patented technique called Transdermal Optical Imaging (TOI, their trademark terminology) to address the global healthcare shortage. TOI is a novel form of remote photoplethysmography, powered by machine learning models that have been trained on 40,000+ individuals.

The models are trained to measure vital signs, and to determine which patients are at risk due to elevated cholesterol or triglycerides, type 2 diabetes, hypertension, and mental stress. The vital signs measurements are for investigational purposes only in the USA, as Nuralogix seeks regulatory approval. For other models that may be considered medical devices, NuraLogix plans to pursue regulatory approval in the future.

The company announced its research has shown the TOI models can now determine as a percentage probability, if a

patient has HbA1c above 5.7 percent or fasting blood sugar above 5.5.

Most recently, Nuralogix announced that they have achieved the 'Holy Grail' of contactless blood pressure (BP) measurement using the company's Anura app.

"What is the Holy Grail of contactless blood pressure measurement? It's when you can measure your blood pressure with an accuracy corresponding to a standard deviation of error of less than 8mmHg," said NuraLogix CEO and co-founder Marzio Pozzuoli. "This represents a breakthrough achievement by the research team at NuraLogix and sets a new industry benchmark."

Even more importantly this level of accuracy was achieved without physiological calibration of the measuring device (i.e. Anura) to the individual having their blood pressure measured.

Previously in 2020, NuraLogix was the first to achieve this level of accuracy for contactless video camera-based BP devices with 85 subjects, which is the minimum requirement according to ISO

standards. The current testing was done on 554 subjects, which represents a new benchmark and shows that the technology is more generalizable to a broader population.

It is the company's intention to publish results as part of a planned series of clinical trials in the U.S and other countries in 2023.

Director of Research, Dr. Naresh Vempala, announced, "What makes our

**Nuralogix announced that they have achieved accurate contactless blood pressure measurement.**

touchless technology seminal is that our classifier models can extract hidden and unique information about each of these health risks through facial blood flow patterns and predict them with a high degree of accuracy.

Nuralogix is now positioned as world leader to provide health-risk

screening to populations in a manner never before possible, using their first of its kind technology.

In my opinion, this technology is a disruptive tool for population health. We live in an era where half of the globe's population is without adequate healthcare. Traditional medical screenings are time-consuming and costly. This technology allows us to democratize NCD screening by moving away from traditional use of physician and laboratory services through the use of internet-connected devices.

We hope to announce, later this year, a partnership with a LMIC government using our technology to serve a population of over 10 million people in need. This is a perfect use case to demonstrate the power of our solution as a population health tool that will change the course of human health history.

*Nuralogix is based in Toronto, with regional offices in Latin America, EMEA, APAC and China. Dr. Keith Thompson is Chief Medical Officer at NuraLogix.*

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