



CANADIAN

TWENTY-FIVE YEARS

Healthcare Technology

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Finding a walk-in clinic

A Vancouver start-up company called Medimap has produced an app that shows consumers across Canada where the shortest wait times are at their local walk-in clinics. The app makes clinics more efficient too.

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PHOTO: COURTESY MCGILL UNIVERSITY HEALTH CENTRE

MUHC and CAE team up on medical simulation

CAE, a leading developer of aviation and healthcare training systems, is donating \$500,000 to the McGill University Health Centre's new Interprofessional Skills & Simulation Network. Innovations in medical simulation technologies were demonstrated at a recent event at MUHC, which is deploying the systems to elevate the skills of care-givers and students, and to enhance teamwork. **SEE STORY ON PAGE 11.**

Hamilton Health Sciences launches advanced IT group

BY JERRY ZEIDENBERG

HAMILTON, ONT. — Hamilton Health Sciences (HHS) has launched a team called “CREATE” that’s staffed with experts in artificial intelligence, data sciences and software engineering. The group will help clinicians in the multi-site hospital and in the surrounding area produce information technology solutions that can raise the quality of patient care and improve medical outcomes.

CREATE is an acronym for CentRE for dAta science and digiTal hEalth, and it currently has seven employees. They’re led by Dr. Jeremy Petch, who recently joined HHS

from St. Michael’s Hospital in Toronto, where he was involved in cutting-edge AI, big data and analytics projects.

While CREATE members are lending their skills to clinicians, it’s the physicians

CREATE will help clinicians turn their ideas into effective applications, using leading-edge IT.

and others who are driving the agenda when it comes to actual work being done. “Clinicians are best positioned to determine what needs to happen,” said Dr. Petch.

He explained that doctors, nurses and other healthcare professionals often envisage

superb solutions for patient care or workflow, but they don’t always have the expertise in software engineering, data science, AI and interoperability needed to turn good concepts into real-world solutions.

That’s where the team at CREATE steps in, as its members do possess these skills. “We can bring their ideas to life,” said Dr. Petch.

The data scientists at CREATE have expertise in AI and machine learning, as well as in managing high-volume data. They know how to apply it to challenging data problems like risk prediction, image recognition and natural language processing.

At the same time, CREATE employs digital experts with enterprise skills in solutions

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HHS launches advanced IT group to assist clinicians and researchers

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architecture, interoperability and deploying large-scale systems.

Already, the CREATE team is working on several projects. In one, they're helping a local physiatrist design a software platform for managing patients who have suffered concussions, and where the patients need ongoing care.

The system will enable patients to better manage their care and report on their symptoms, progress or problems. It will also help patients with their therapies. "We want to make sure they're doing enough to get better, but not too much – because that can also hinder them," said Dr. Ted Scott, vice president of research at HHS.

Dr. Scott noted the system will also tie patients to clinicians more closely than before, so that they're better supervised.

"There are many systems available or under development for assessing concussions, but few that help with the ongoing management of patients who have been diagnosed and are undergoing treatment. It's on this score that the CREATE system is unique," said Dr. Scott. "Not a lot of peo-

ple are paying attention to recovery."

One of the project's many innovations includes the use of wearables to help with the monitoring of concussion patients, to help track their treatment and automatically alert clinicians when their attention is needed.

Another project CREATE is supporting is SMARTVIEW, led by Drs. Michael McGillion, assistant dean, research, School of Nursing, McMaster University and PJ Devereaux, HHS cardiologist, professor of medicine at McMaster University and scientific lead of Population Health Research Institute's perioperative and surgery program.

HHS developed this initiative with industry and government partners to monitor post-op cardiac surgery patients once they've been moved from the OR to step-down units, and even after they've left hospital and have returned home.

It's at this point, after leaving the highly supervised OR, that they're most vulnerable and may require attention.

SMARTVIEW can remotely monitor patients using a variety of devices, including weight scales, blood oxygen saturation and video. The data can be tracked and an-



Members of the CREATE team at Hamilton Health Sciences are helping clinicians produce effective systems.

alyzed to determine if a patient is deteriorating and needs attention.

"We're examining the streaming data and planning to run it through new machine learning algorithms," said Dr. Petch.

"We're working to build capacity for prediction of adverse health events."

Dr. Scott noted that Hamilton Health Sciences has a large trial of the SMARTVIEW technology under way in Hamilton and in Liverpool, UK. It currently involves 500 patients, but that will soon increase to 800.

Not only are clinicians notified when patients are running into trouble, but the machine learning will be taught to predict when patients are going to deteriorate, so that early actions can be taken. "We're partnering with CREATE to use the intelligence of machine learning to become more proactive in patient-care," said Dr. McGillion.

The goal with the systems under development is to improve the care of patients not only in the Hamilton area, but across Canada, in the United States and around the world.

Dr. Scott said a substantial investment has been made in CREATE, and the group will expand its numbers in the near future.

CREATE is also exploring alliances with public and private-sector partners.

However, the intent is not to commercialize its own inventions, but to work in partnership with others, and to allow them to bring the innovations to market.

By partnering with other organizations, HHS will be able to bring in the revenue stream needed to grow CREATE and sustain itself over the long term, Dr. Scott said.

Along with clinicians, CREATE will also support the research community at Hamilton Health Sciences, helping it to incorporate AI, machine learning and other advanced technologies into its work.

Enovacom appoints new Canadian country manager

The Orange Business Services subsidiary, Enovacom, is proud to announce the appointment of Mr. Alain Larochelle as country manager for Canada. An engineer, Mr. Larochelle's background includes working for innovative healthcare IT companies such as Emergis, Telus, IMS Health (now IQVIA) and Purkinje.

Alain has demonstrated great leadership skills and an innate ability to innovate and implement developmental projects on any scale by establishing numerous partnerships and working closely with his clients and healthcare professionals. His goal is to promote Enovacom – now part of the Orange group – throughout Canada where it has been operating since 2017.

"I am excited to join Enovacom and contribute to its continued success. They are a team of experienced professionals that has clearly demonstrated its ability to exceed client expectations with innovative solutions in this critical market. As a subsidiary of Orange Business Services, Enovacom has the required support to fulfil its vision of delivering solutions that will support its client's objective of delivering the best healthcare to their patients," says Alain.

"Alain brings a wealth of experience and knowledge of the Canadian eHealth market which will support our ambitions to further

support healthcare organizations in Canada. With a sharp focus and ability to innovate, Alain will work closely with healthcare and IT professionals across the country to deliver on their ever-evolving challenges and needs," says Christophe Thibault, international sales director at Enovacom.

In 2017, Enovacom began collaborating with Purkinje and soon after they were chosen by the Ministry of Health and Social Services to deploy its interoperability platform throughout Quebec. ESV2 (Enovacom suite V2) will make it easier for regional healthcare facilities such as hospitals to exchange



Alain Larochelle

healthcare data between different information systems. The platform has already been successfully deployed and is operational in several Health and Social Services Centres.

Enovacom has a specific goal: helping the University of Montreal Health Centre (CHUM) deploy the ESV2 interoperability platform in every institution in the province.

Enovacom is involved in other projects

such as interoperability and biomedical devices/IoT (Internet of Things), healthcare and clinical research data warehouses, Big Data and artificial intelligence. As such, Enovacom participated in a key project at the Montreal Heart Institute (MHI) where the skills of its resources in interoperability and connecting biomedical devices contributes to the reduction of time spent by healthcare professionals (including nurses) transcribing key patient information in their clinical information system.

Healthcare institutions across Canada are always seeking innovative solutions to improve patient safety, healthcare worker satisfaction and system performance. Enovacom presents a number of solutions addressing these important challenges.

At the MHI, for instance, anaesthesia ventilators from the intensive care unit (ICU) were connected to export data through ENOVACOM Patient Connect (EPC), its biomedical interoperability solution. Another project aims to deploy EPC in order to connect infusion and syringe pumps. This solution saves healthcare teams time and lets them focus on treating patients by reducing the number of transcription errors and hours spent entering data manually. Alain can be reached by email at alarochelle@enovacom.com

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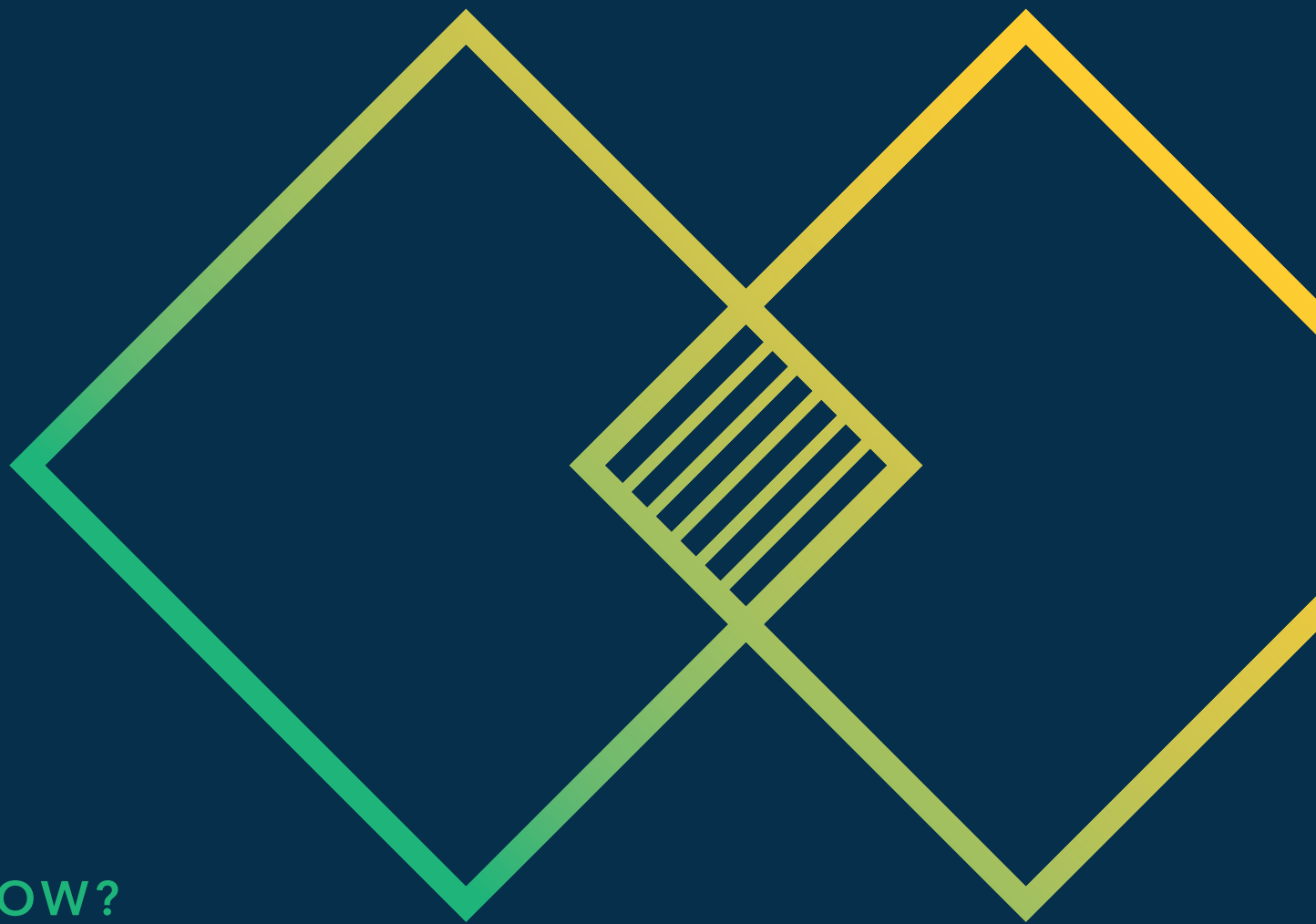
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HHS signs large-scale DI procurement deal with Siemens Healthineers

BY JERRY ZEIDENBERG

HAMILTON, ONT. – Hamilton Health Sciences has inked a \$270 million deal with Siemens Healthineers that will see the hospital replace nearly all of its diagnostic imaging gear – about 500 pieces of equipment – over the next five years. The agreement will last 15 years, and includes training and maintenance, as well as procurement services.

“The truth is, for years we haven’t invested adequately in diagnostic imaging, and that our equipment is outdated,” said hospital president and CEO Rob MacIsaac at the announcement of the agreement, held at the medical centre’s David Braley Research Institute.

“We know that breaking this cycle of underinvestment is critical,” said MacIsaac.

He asserted that with the new agreement, “we’re taking some bold steps ... and investing in modern tools and technology so we can do our best work for patients.”

MacIsaac noted that HHS has devised a plan to transform care in several different ways, and that having leading-edge technology is a key part of the strategy.

In addition to the new machinery and software, “staff will receive training and 24/7 access to support,” said MacIsaac.



Leaders from Hamilton Health Sciences and Siemens Healthineers at the announcement of the agreement.

For its part, Siemens will have full-time staff at the hospital helping to solve any problems equipment-related problems that come up, and to refine the hospital’s processes so that staff workflows and patient throughput are smoother.

“It’s not just equipment, but we’re also helping Hamilton Health Sciences run things more effectively,” said David Pacitti,

president and head of Siemens Healthineers in North America.

“This is going to do so much for our hospitals,” said Dr. Karen Finlay, acting chief of diagnostic imaging at Hamilton Health Sciences. “We use DI for almost every patient who enters our doors, from neonates to palliative care.”

Hamilton Health Sciences, with five

hospitals and a cancer clinic, is one of the biggest medical centres in Canada and provides a full-range of medical services. Its patients are drawn from a catchment area of 2.5 million persons.

The new equipment covers everything from X-ray and mammography machines to CT and MRI, to echocardiography and interventional radiology systems.

“There will also be lots of things that we don’t have right now and can’t even imagine, as we move into new areas of imaging,” said Dr. Finlay.

She noted that Siemens doesn’t produce everything, and while a set percentage of equipment will come from Siemens, a large proportion will come from other vendors. Still, Siemens Healthineers will manage the procurement process, bringing in the equipment desired by clinicians.

Meetings are already under way, she said, to determine a schedule for bringing replacement systems into the hospitals. One of the highest priorities is a new MRI system at the McMaster University Hospital. “It’s the oldest in our fleet,”

Overall, there’s going to be all of activity, happening quickly. “In the first year, we’re going to replace 100 pieces of equipment,” said Dr. Finlay. About half of the existing systems will be replaced in a matter of three years.

“Much of our equipment is past its best-before date,” she quipped.

Hospitals perform pilot study of low-dose radiation to help AD patients

TORONTO – Baycrest Health Sciences and Sunnybrook Health Sciences are piloting a study of a novel therapy for Alzheimer’s dementia that uses low doses of ionizing radiation, such as X-rays, to stimulate brain functioning. A CT scanner is employed to provide the treatments, using normal diagnostic exposures.

Each candidate, who has severe dementia, receives three treatments and is subsequently evaluated for cognition, memory and behaviour changes. In 2019, five Baycrest patients were treated and the observations have been encouraging.

One of the investigators is Dr. Jerry Cuttler, who has a DSc in nuclear sciences. He was employed by Atomic Energy of Canada Ltd from 1974 until 2000 to design and support the construction and operation of 25 CANDU reactors in Canada and abroad. He is also an expert in radiation sciences, and since 1995 has been collaborating with medical scientists and radiobiologists on applications of radiation in medical therapies.

Dr. Cuttler notes that in the first half of the 20th century, hundreds of thousands of patients received treatments that stimulated their own natural protection systems against many different types of diseases, including cancers and infections.

Dr. Cuttler is the author of a new

article, titled “Application of Low Doses of Ionizing Radiation in Medical Therapies,” which appears in the January 2020 edition of *Dose-Response: An International Journal*. (<https://journals.sagepub.com/doi/full/10.1177/1559325819895739>)

In it, he presents evidence of the existence of dose thresholds and dose-rate thresholds. If exposures exceed these thresholds, then risks of harmful effects start to increase. But, if treatments with X-rays are provided that are below these thresholds, adaptive natural protection systems are stimulated.

They start to work harder against internal agents, such as oxidative stress, and external agents, such as toxins, pathogens, radiation and physical injuries. Natural protection systems produce antioxidants that prevent oxidative damage. They also repair damage to DNA and other biomolecules, scavenge damaged cells, destroy mutated cells, kill pathogens and restore health. Important health improvements can be expected after low-dose radiation treatments, writes Dr. Cuttler.

Recently, impressive results

have been achieved by medical scientists in Japan using low doses of radiation to combat various types of cancers, including prostate and breast cancer. The therapy has also been used with good results to treat ulcerative colitis inflammation and autoimmune diseases.

The current Baycrest-Sunnybrook study was undertaken to repeat the treatments that were given in 2015 to save the life of an 81-year-old woman who was in hospice. A case report was published about the improvements that were observed in her cognition, memory, speech, movement and appetite. After treatments using CT radiation, she was moved to a mental care home with a stimulating day-care program.

In the Alzheimer’s trial in Toronto, the patients receive the same three treatments that were given to the patient who was treated in 2015. The first CT session delivers a total X-ray dose of 80 mGy (milligray) to the brain. The second, two weeks later, is a single CT scan that provides a dose of 40 mGy, and the third, two weeks later, is also a single scan.

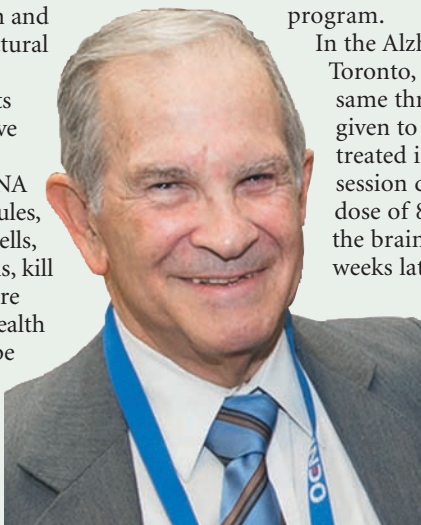
Dr. Cuttler transports each patient, with a

family member, in a wheelchair taxi from Baycrest to Sunnybrook, as Baycrest does not have a CT scanner. Taking the patient, providing the treatment, and returning the patient takes only two hours.

The protocol specifies objective tests to evaluate changes in patient condition. In addition, subjective evidence from observations by family members is collected. For example, Dr. Cuttler said, “After a reminiscence by family members on her life history, one patient exclaimed, ‘Don’t give away all the family secrets!’”

The phase one clinical trial will be completed soon. Most of the facts and observations collected have been subjective because patients with severe dementia do not readily respond to strangers. If the investigators agree that this method of treatment is effective in producing improvement in cognition, memory, speech and other symptoms, Dr. Cuttler would like further studies to be carried out to find the optimal treatment protocol and a low cost therapeutic device instead of a CT scanner.

“It’s not the image that we’re after,” he said. “It’s the radiation. That’s what stimulates recovery in the patient. We should track biological markers of oxidative damage and neurodegeneration during therapy. Ultimately, we want a treatment that would delay the onset of Alzheimer’s in people who are at risk.”



Dr. Jerry Cuttler



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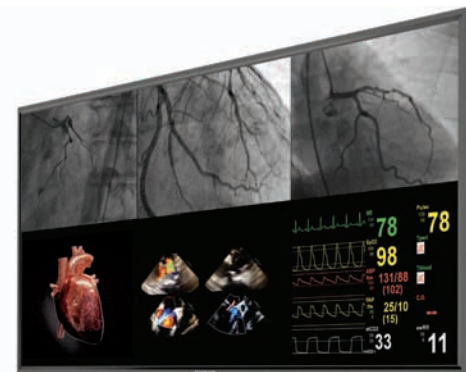


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Hospitals use Imagia's AI platform to find answers to clinical questions

BY JERRY ZEIDENBERG

MONTREAL — Imagia, one of Canada's leading AI companies, announced that six hospitals in Canada and the United States are now using its Imagia EVIDENS platform to apply machine learning to healthcare and to create better therapies for patients.

The hospitals now signed on to use the EVIDENS platform are:

- Centre hospitalier universitaire de Québec – Université Laval
- CIUSSS de l'Estrie – Centre hospitalier universitaire de Sherbrooke,
- University of Montreal Hospital Centre (CHUM),
- McGill University Health Centre (MUHC) and its Research Institute (RI-MUHC),
- Jewish General Hospital (JGH), and
- Penn Medicine.

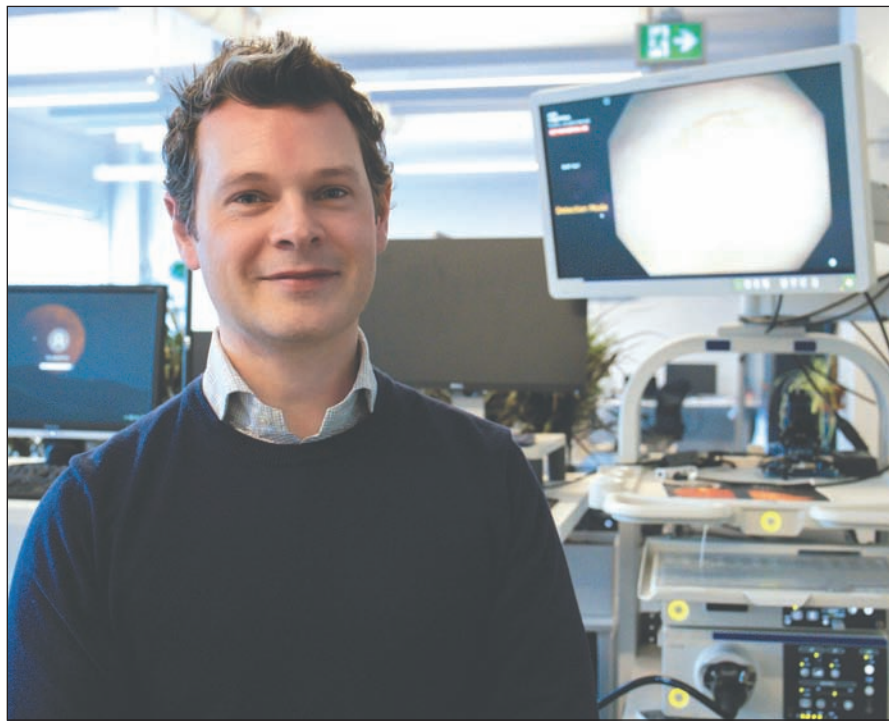
Together, the hospitals represent a pool of more than 4 million patients treated annually. It's important for AI researchers to have access to large amounts of data, as a larger data set is believed to be the key to achieving accurate results in personalized medicine.

Already, three of the hospitals have embarked on a collaborative project to improve medical outcomes for lung cancer patients by analyzing treatments and results with the EVIDENS platform.

The partners collaborating on the lung cancer project are CHUM, McGill and the Jewish General. They're studying tests, therapies and outcomes to find the best treatment plans for these patients, from mainstream chemotherapy to immunotherapy.

Florent Chandelier, CTO at Imagia, observed that the EVIDENS platform is enabling "federated learning," with researchers and clinicians at each hospital learning from one another.

An important feature of the "federated" system is that it allows users to share the AI results and insights of the work being analyzed and processed without divulging patient identifiers or raw patient data, as these remain inside of each hospital. That's



Imagia's Florent Chandelier: Three hospitals have already embarked on a joint AI project to improve care.

important for patient privacy; it enables researchers to collaborate effectively while respecting patient privacy rules across Canada and the United States.

It's not difficult for researchers working in different languages to use EVIDENS, as the system is designed for multi-lingual usage. Moreover, Imagia has strengths in natural language processing, Chandelier said, allowing the system to convert healthcare data into information that is searchable in a language of the user's choice.

He noted that researchers in each of the hospitals will be using EVIDENS with their own data and local projects. At the researchers' discretion, they are free to collaborate with other users of EVIDENS in federated learning.

"The principal investigators can invite other members," said Chandelier. "It's in the hands of the researchers to scale their discoveries across institutions."

For its part, Imagia will acquire any intellectual property that's created in the

projects, and in fact, the company hopes to commercialize some of the solutions. Chandelier said useful results in personalized lung cancer treatment are expected as soon as this year.

Additional hospital partners are to be added, said Chandelier: "This is just the start."

Dr. Michaël Chassé, scientific director of the CHUM Centre for Integration and Analysis of Medical Data, said the EVIDENS platform is enabling researchers at different hospitals to work in a secure way. "We're very conscious and careful of patient privacy," he said. "We want to make sure that all laws are respected. We can do this using EVIDENS."

He said connections have been built linking data at the three hospitals working on the lung oncology project. Pooling real-world evidence derived from each institution's healthcare data is achieved through federated learning.

This allows researchers to access and

learn from a wide variety of data without patient identification ever being disclosed. It includes all manner of radiological images and reports (e.g., X-ray, CT and MRI), lab data and pathology reports, as well as other information.

Dr. Chassé noted that pathology images themselves are just starting to be digitized, but the text reports are accessible to the researchers.

All of the AI discoveries can be shared using the federated system, which Dr. Chassé said is a fairly new technology.

And while help is available to researchers from Imagia when they need it, the company says its EVIDENS platform is designed to be user-friendly. "We are the first to combine automated AI model discovery and federated learning in a hospital setting for researchers to undertake different discovery processes and validate clinical intuitions, without requiring a team of AI experts by their side," said Chandelier.

Imagia was launched in 2015 by long time friends Alexandre Le Bouthillier and Nicolas Chapados. Yoshua Bengio, known as the "godfather" of Deep Learning, joined them early on as Imagia's scientific advisor.

Three years later, Imagia acquired Chandelier's company, Cadens Medical Imaging, with the objective to design Imagia's EVIDENS platform. In 2019, a consortium led by Imagia and The Terry Fox Research Foundation (TFRI) was awarded up to \$49 million by the federal government to establish a Canada-wide health data platform to find personalized cures for diseases.

The award, together with \$108 million in cash and \$165 million in-kind contributions from 97 consortium partners, will combine Canadian expertise in artificial intelligence and precision medicine to improve healthcare for Canadians and stimulate global commercialization of home-grown research discoveries.

The partners are located across nine provinces and include 31 healthcare institutions, 19 companies, seven universities, 22 research foundations, granting agencies and non-government organizations, as well as all four major Canadian AI research labs.

Lights On Network cuts number of alerts to pharmacists and physicians

Alert fatigue can drive clinicians batty, reducing their ability to focus on the task at hand and eventually causing them to ignore many of the alerts.

In response, staff at London Health Sciences Centre and St. Joseph's Health Care London in Ontario, began reducing unnecessary drug alerts for pharmacists across London and regional partner hospitals. The total number of drug alerts has fallen by 41.5 percent.

To help determine which drug alerts didn't need to fire, staff turned to Lights On Network, which provides health organizations data to discover how clinicians utilize Cerner solutions.

"We used the data in Lights On to

determine which alerts were firing for whom and how often," said Carrie Milligan, performance measurement consultant. "We used it to optimize our alerts so our pharmacists and physicians using the system see more value-added alerts, in order to reduce alert fatigue."

Staff responded by adding several filters to suppress unnecessary drug alerts that hampered workflows. Some of the suppressed alerts included ones that would fire multiple times when a physician would place multiple orders for the same drug at the same time.

For example, when a physician ordered a medication with decreasing doses, the pharmacist previously would receive multiple alerts, not just one.

Staff also suppressed alerts for drugs ordered on a regular schedule as maintenance medications. Other changes included suppressing alerts when physi-

Using Lights On, the total number of drug alerts at London-area hospitals has fallen by 41.5 percent.

cians would sign multiple orders at the same time.

"We had alerts firing that were nearly always overridden," said Milligan. "They took that alert, brought it to our pharmacy team, and used that information to make decisions as to whether or not

that alert should still be firing."

With the number of drug alerts pharmacists saw dropping by 398,000, pharmacists don't need to override alerts as often, and the number of drug alerts they did override dropped 42 percent.

Milligan and her team intend to continue looking at data from Lights On Network not only related to alerts, but electronic health record usage as well, to improve efficiency and the clinician experience.

"Our team is always looking for new ways to engage with clinicians and end-users to improve the system," said Milligan. "I'm always surprised that every time I go into Lights On, there's something new. It's not a stagnant solution; it's always changing and improving."



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Bow Valley College nursing students assess virtual patients in new lab

A new lab at Bow Valley College in downtown Calgary allows nursing students to identify respiratory conditions using a virtual stethoscope. The virtual reality assessment tool was developed by the School of Health and Wellness and Calgary-based technology company ICOM Productions as part of the Practical Nurse Diploma program. Students have started using the lab this term.

The tool features nine different avatars ranging in age, ethnicity, and respiratory conditions. Learners are required to complete assessments on the virtual patients and to recognize normal from abnormal findings, which can sometimes take months in the work environment to develop proficiency.

The tool provides a realistic and complete experience, simulating patients in the hospital room. It also includes a grading component on infection protection and control techniques such as handwashing.

"The system uses a rubric that will track each learner's assessment and generate a report of what was completed and what was not," said Kim Hogarth, associate dean in the Practical Nursing program for the School of Health and Wellness.

"For example, if the learner misses certain landmarks while auscultating with a stethoscope, or does not listen to each full breath, the report will document this."

Learners are required to complete documentation at the end of the evaluation to identify their findings and create a care plan for the patient.

Hogarth said the department is working with ICOM to integrate artificial intelligence into the virtual reality to enhance the grading process.

"Using AI to mark charting at the end of the scenario will allow for complete



Practical nurses are using VR as part of their training at Bow Valley College for more realistic simulations.

consistency throughout the entire scenario for all learners," she said.

A recent pilot of the virtual reality assessment tool produced "very positive" findings, with learners becoming comfortable with the technology in about 10 to 15 minutes, Hogarth noted.

"It is very user-friendly, and ICOM was able to use innovative ideas to reduce some of the common issues with VR, such as dizziness," she said.

Hogarth said the new lab gives learners a chance to react to abnormal respiratory findings before they enter the clinical setting.

"With this technology and assessment,

we can expose learners to abnormal findings earlier. We believe this will increase their confidence and competence earlier in the clinical setting," she said.

The virtual environment combines factual aspects with audio clues, like the sounds that would be audible with common respiratory conditions.

"We can replicate tactile fremitus (psychomotor) using vibrations on discrete locations through the hand controllers," Hogarth said.

Kristen Cameron, a second-year student in the Practical Nurse Diploma program, took part in the pilot project and

found the assessment tool useful – particularly the chance to recognize abnormal sounds through a stethoscope.

"(The) majority of our nursing classmates that we practice on have healthy lungs," she said.

"However, that is not the reality for some of our patients and we need to be able to pick up on that. It was easy for me to recognize the abnormal sounds on auscultation, and I appreciated the experience."

Cameron was assigned an avatar of a male patient with asthma and was able to hear wheezing and coarse crackles (rales), when she listened through the virtual stethoscope.

"I have never been into video games or (been) much of a techie person, so I was nervous about learning to operate the VR. The instructor that I had was very helpful and I caught on quickly. Ensuring you are using the 'teleport' option and not moving or turning your body will help prevent dizziness."

Jeff Clemens, program chair in the School of Creative Technologies, said the college is starting to use virtual reality as a way to get students immersed more deeply into what they are learning.

"The hope is that with this immersion we can increase their retention on some very important subjects and skills," Clemens said.

The new virtual reality labs are located on the 6th and 7th floors of Bow Valley College's North Campus. One features 11 dedicated learner-facing stations, in addition to two instructor stations, and another is a dedicated space for faculty development.

The five-term Practical Nurse Diploma program is offered over a continuous 20-month period.

For more information, visit bowvalley-college.ca/VRlab.

BC-built platform shows walk-in clinic wait times in your neighborhood

BY NEIL ZEIDENBERG

Why can you go online to book a reservation at a restaurant, but you can't check wait times at the nearest walk-in clinic? As patients, we typically head to a familiar walk-in clinic nearby completely unaware how long we'll wait upon arrival, or what other clinics are nearby. However, many Canadians are now using Medimap to get a heads up.

"It allows people to easily compare wait times at walk-in medical clinics in their community," said Blake Adam, CEO and Co-Founder of Medimap. "We make it easy for you to find a doctor when you need it."

In 2019, the company launched a mobile app for patients so they can track their favourite clinics for quick reference, and set alerts to be notified when a clinic updates their wait time.

Blake Adam and his friend and co-founder – a software developer – were looking to solve a problem using technology. "Initially, it was just going to be a

resource for same day access to care in White Rock, BC," said Adam. "But as we grew, we realized this is something that patients need in other cities as well."

Medimap is for individuals seeking care close to home; someone without a family doctor, or someone who is unable to get an appointment in a timely manner. It's also for medical office staff at clinics. Registered clinics are currently updating their wait times every half hour throughout the day.

The platform is simple to use. By visiting medimap.ca and keying in an area close-to-home, in seconds you can see all of the walk-in clinics in the immediate area, and the current wait times. You can also see which clinics are closed or at capacity. At some clinics, patients may be able to pre-book an appointment.

Government health agencies can use this information as evidence to determine where walk-in clinics are in short supply. "The power of Medimap is that it can indicate where the gaps in care are, so that decisions can more accurately match supply and demand," said Adam.

Medimap is free to end-users, and to clinics wanting to plug in and start publishing their wait times. However, premium features such as wait time analytics, and publishing of wait times on a clinic's own website are available for a monthly fee.

To-date, almost 1,200 clinics in six provinces (BC, Alberta, Saskatchewan,



Blake Adam, CEO and co-founder of Medimap.

Manitoba, Ontario, and Nova Scotia) have already registered – a number equal to two-thirds of all walk-in clinics in Canada. "At this point, if you're a walk-in clinic you need to be on Medimap," said Adam. "Patients are actively seeking out care online."

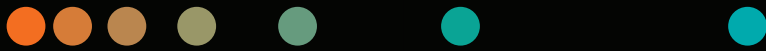
The one complaint commonly shared by clinics is they get inundated with calls inquiring about their wait times. Registering with Medimap can help alleviate this problem. "If even 10-percent of those callers go online to check wait times, it will make a tremendous difference," said Adam.

Moreover, due to the nature of walk-in clinics – the peaks and valleys during the day – it may even help to drive business during slower times and has a leveling effect throughout the day.

Medimap aims to have every walk-in clinic across the country using the platform so any Canadian who needs to see a doctor today can do so easily. "We also hope to continue expanding and to introduce innovative services, like online check-in, that make it easier for people to access care when they need it."

In 2020, Medimap will be introducing virtual care to its platform. For patients not requiring an in-person consultation, they can connect with a doctor at a walk-in clinic in their community over secure video chat and follow-up in-person, if necessary.

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Cardiac ablation technique reduces radiation when treating arrhythmias

BY KATHERINE NAZIMEK

Millions of Canadians experience irregular heart rhythms, known as arrhythmias; and, while many types of arrhythmias are harmless, others may be life-threatening. In the more severe cases where lifestyle changes and medications aren't enough to treat the irregularity, patients may undergo cardiac ablation to restore a normal heart rhythm.

Cardiac ablation is a procedure in which abnormal heart tissue is burned to create scar tissue that blocks stray electrical signals. Traditionally, during the non-surgical procedure, cardiac electrophysiologists use real-time, continuous X-rays (known as fluoroscopy) to guide their instruments into and around the heart. Now, a new technique using state-of-the-art technology is helping patients and medical staff avoid prolonged exposure to radiation during the procedure.

Sunnybrook Health Sciences Centre is one of few hospitals in Canada to adopt the new way of doing ablations using a three-dimensional mapping system called EnSite Precision cardiac mapping, which uses electrical sensors, not X-rays, to provide highly detailed models of the heart.

How it works: During the ablation procedure, thin, flexible catheters are inserted into the heart through small incisions in the skin. Diagnostic catheters record electrical information from the heart and display it on a screen in a three-dimensional model.



Cardiac electrophysiologist Dr. Benedict Glover is treating arrhythmias without the use of fluoroscopy.

The heart's electrical pulses twinkle throughout the three-dimensional image, allowing the cardiologist to see any abnormalities. Abnormal tissue is then targeted using another catheter that has a specialized tip.

The tip emits heat using high-frequency energy and creates a tiny scar that blocks the electrical signals causing the arrhythmia.

"When we move the catheters around the inside chamber of the heart, we build a map that allows us to see precisely - within a millimeter - what tissue we need to treat,"

says Dr. Ben Glover, cardiac electrophysiologist and director of arrhythmia services at Sunnybrook's Schulich Heart Program. "And because we are eliminating the need for fluoroscopy with this technology, we are eliminating the radiation that goes along with it."

Not only does the new approach reduce radiation exposure to the patient, it also helps protect the medical staff who may be doing three of these multi-hour procedures in a single day.

"Conventional ablations have an im-

mense effect on our health in the long-term. While there are strategies in place to ensure exposure is minimal, we - the physicians, the nurses, the anesthetists, the technologists - are all being exposed to X-rays to some extent during these procedures," says Dr. Glover.

Studies show that during a 30-year career, cardiologists and other staff who work in catheterization laboratories have a cumulative radiation exposure of 50 mSv to 200 mSv, which is the equivalent of 2,500 to 10,000 chest X-rays. The impact is an increased risk of cataracts, cancer and other conditions linked to radiation.

It's not just the radiation itself that affects the health of the medical team. Using traditional fluoroscopy, the staff within the catheterization lab need to wear heavy lead aprons for protection. These aprons can weigh up to 5 kg (11 lbs) and may be a contributor to orthopedic issues, like chronic back pain.

"There is considerable evidence that many electrophysiologists or cardiologists who perform these procedures report serious back problems and other musculoskeletal concerns that end up forcing them off work," says Dr. Glover, adding that with the new approach, lead aprons would no longer be required.

Dr. Glover hopes more centres across Canada will use the fluoroscopy-free approach for the good of the patients and the staff.

Katherine Nazimek is a communications advisor at Sunnybrook Health Sciences Centre.

PHOTO: KEVIN VAN PAASEN / SUNNYBROOK HEALTH SCIENCES CENTRE

Organizations fail to give security the attention it deserves, experts say

BY JERRY ZEIDENBERG

TORONTO - In recent years, healthcare organizations and individuals in Canada have been reprimanded, sued and fined for losing data or snooping on files. And yet, care-providers still aren't paying enough attention to securing their data, industry experts say.

"Many hospitals aren't taking it seriously until they have a breach - like a ransomware attack," said Harley Rodin, general manager of healthcare at Compugen.

Even those who have implemented security and privacy measures could be in trouble as the health sector continues to evolve.

In this province, for example, Rodin pointed to the new Ontario Health Teams, which will see various healthcare providers - acute care hospitals, long-term care organizations, home care agencies and doctors' offices - working more closely as partners.

"They're being encouraged to share information," observed Rodin. But if the weakest link in the chain is vulnerable to a hacker attack or breach of information, valuable patient information from all or any of the organizations in the OHT could be lost, he said. "We need to take this much more seriously."

Rodin was part of a panel discussion on security and privacy held at the MaRS Discovery District in October. Other members of the panel included Dr. Jeff Goldstein, healthcare specialist at HP Inc., Jodi Moore, enterprise sales director for central Canada at Aruba, and Patrick Lo, CEO of Privacy Horizon.

The panelists stressed that as healthcare becomes more networked, security becomes more difficult.

Said Dr. Goldstein: "80% of healthcare happens outside the hospital." He observed that security practices may be airtight in a hospital, but what if they're lax in a doctor's office or in a home care setting? When doctors in hospitals are working with colleagues outside their walls, "You have no control over their devices," he observed.

Ensuring the integrity of data is even more difficult as the world becomes increasingly connected.

"Many Canadians are snowbirds who go to Florida every year," Rodin commented. They're getting care in the United States and may be carrying data on USB keys or accessing files through por-

tals - opening themselves up to breaches.

And places like the Hospital for Sick Children, in Toronto, is an example of a world leader in pediatric care that treats patients from around the globe. "The information is transcending borders," said Rodin. "There's an internationalization of data that's going on."

Precautions must be taken, he said, to ensure that data is as secure as possible.

At the same time, Rodin noted, there must be easy access to information for those who need it. "You don't want to create an Alcatraz or a Fort Knox when it comes to your data," making it impossible to get at. Clinicians and patients,

too, need access to the data.

"You can't police everything," said Rodin. "You have to rely on people's responsibility and integrity."

In this situation, he continued, you want to conduct privacy impact and threat risk assessments, but you must also recognize that it's not a matter of "if" a breach will happen, but "when" it will occur.

Often, the breach isn't from an outside source - like a hacker - but from an insider, such as an employee who is looking at records that he or she shouldn't.

This takes place with alarming regularity in Canada - last October, for example, the privacy commissioner in Alberta said the agency was flooded with reports of privacy breaches after requiring mandatory reporting by healthcare providers.

Many of the breaches concerned healthcare staff who snooped and looked at records when they shouldn't have.

And yet, most hospitals assert that they train staff in privacy issues, as part of their onboarding processes and annually, during refresher courses.

That just isn't enough, said Patrick Lo, CEO of Privacy Horizon, a



Speakers at Compugen's round-table discussion of privacy and security.

CONTINUED ON PAGE 22

CAE donates \$500,000 to MUHC's new network for skills simulation

MONTREAL – CAE, a Montreal-based provider of aviation and healthcare training systems, is donating \$500,000 to the McGill University Health Centre's new Interprofessional Skills & Simulation Network. The contribution includes state-of-the-art training simulation equipment and curriculum systems.

The hospital is currently raising \$10 million to build the simulation network, with centres at the Glen "super-hospital" site and the Montreal General. They're being designed to continually refresh and upgrade the skills of clinicians to improve quality and reduce medical errors.

Medical simulation is now assisted by new technologies, including more life-like mannikins, as well as virtual reality and mixed reality hardware and software. Clinicians can wear specialized headsets to help visualize scenarios that may occur in hospital settings and learn the best methods of handling these situations.

CAE Healthcare has also devised analytics systems that can monitor and assess entire classrooms of trainees, showing how learners are performing and where more practice may be needed.

"New technology is disrupting medicine and the MUHC wants to take full advantage of it. We are transforming the way we teach using simulation as well as virtual and augmented reality, and AI-enhanced technologies to elevate lifesaving skills and teamwork," said Dr. Elene Khalil, Director of Education and Medical Co-Director Emergency Preparedness at the MUHC.

She added, "The MUHC is seizing the lead in developing tomorrow's essential healthcare skills, and in so doing we'll improve care not just for MUHC patients, we'll help to advance skills acquisition across Canada and beyond."

Recognized internationally as a leading teaching hospital, the MUHC trains thousands of medical students, residents, nurses, allied health professionals and researchers the essential skills to serve patients across Quebec, Canada and around the world. With the Interprofessional Skills and Simulation Network, all of these medical professionals will train together in their own clinical environment to create effective interprofessional healthcare teams.

The MUHC Foundation is raising \$10 million to create the MUHC Interprofessional Skills & Simulation Network as part of its Dream Big Campaign, co-chaired by Marc Parent, Suzanne Legge Orr and Jean Charest.

"This generous donation will allow the MUHC and Montreal to take the lead in transforming the education model to better respond to the new hospitals of the future," says Jean Charest, a former premier of Quebec. "With CAE's training expertise, the hospital will be able to set benchmarks, test emerging tools, and ultimately improve patient care."

The donation marks a unique partnership between industry and healthcare that represents a trend in hospital innovation.

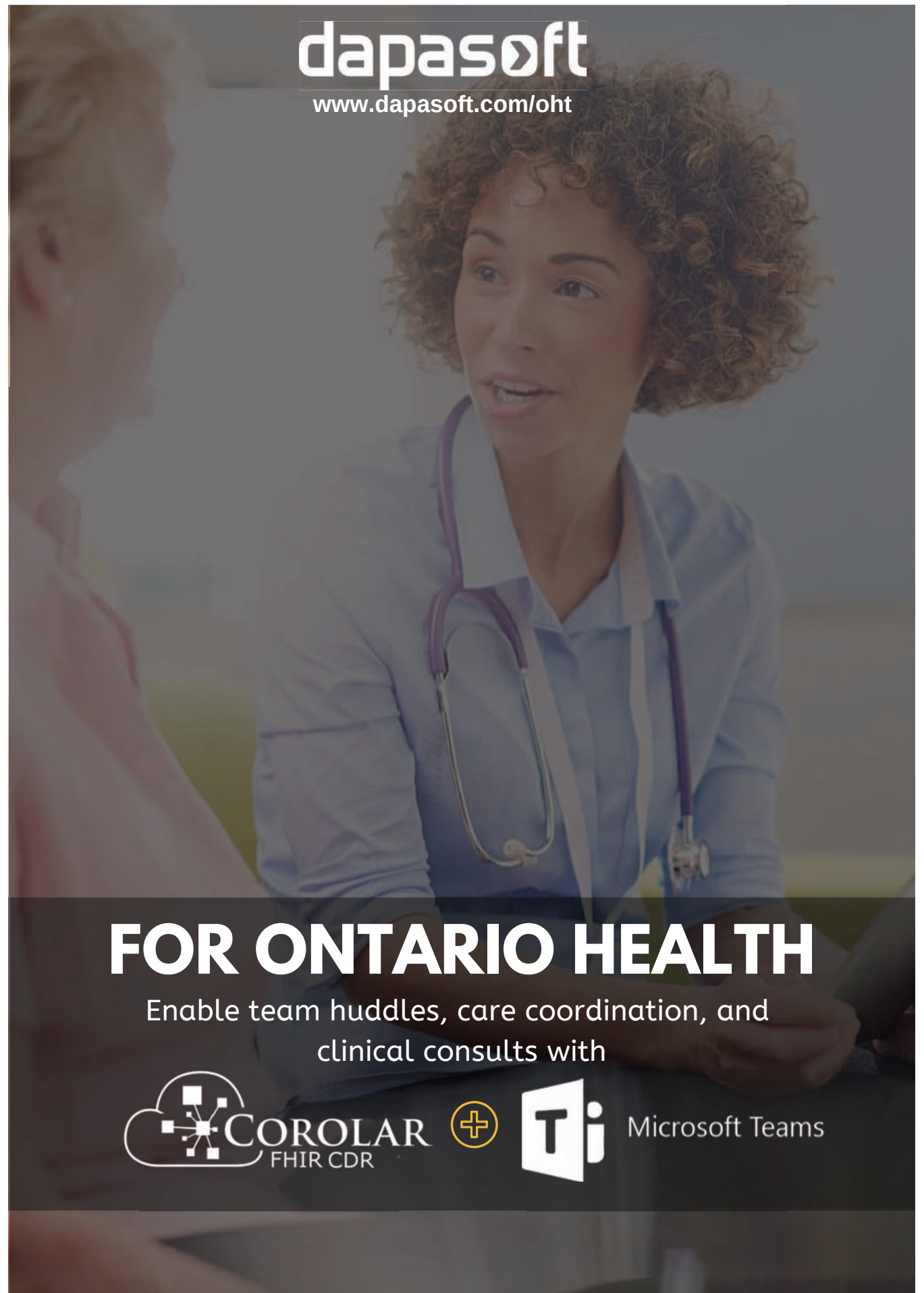
"CAE Healthcare's commitment to improving the safety of patients through simulation-based training is evidenced in this partnership," said Suzanne Legge Orr. "Our hospital, our patients, and our community are going to be the first to see the impact."

CAE's President and Chief Executive Officer Marc Parent, said, "At CAE, we are driven by our mission to make healthcare safer and are committed to improving clinical education and patient safety through simulation-based training solutions." Parent sits on the MUHC Foundation's Board

of Directors and is Co-Chair of the MUHC Foundation's Dream Big Campaign.

"We are honoured to help equip the MUHC with the best technology and tools they need so they can practice the most advanced forms of medicine and provide the best patient care in the country."



Norman Steinberg, Chairman of the Board of the MUHC Foundation, thanked CAE and Marc Parent for taking a leadership role in the Dream Big Campaign, which has already raised more than \$52 million to support clinical research at the hospital.



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Nova Scotia researchers using MRIs and AI to detect prostate cancer

HALIFAX – A project to diagnose prostate cancer by applying machine learning to MRI scans has progressed to the point where the developers – at the BIOTIC research centre – have created a working model and are now close to establishing small-scale tests of the system.

Over the past five years, the team at BIOTIC analyzed the MR prostate images from hundreds of patients with suspected prostate cancer and developed an algorithm. They also used the histopathology reports for additional clinical details and validation from those patients who were scheduled for radical prostatectomies.

“Our team recently filed a patent for the system, and we’re now at the stage where we can begin to test it,” said Dr. Steven Beyea, science director of BIOTIC. Based in Halifax, BIOTIC is an imaging research centre that’s embedded in the two major academic hospitals in Nova Scotia, the QEII Health Sciences Centre and the IWK Health Centre.

Not only is the team at BIOTIC ready to test the prostate-cancer detection system, but it also wants to further improve it by internationalizing the data set used to create the algorithm.

“We want to bring in additional data sets, annotate and curate them,” said Dr. Beyea. He explained that AI works best when it has a large repository of data to work with and with a wide range of variation in the data.

In that way, it can account for a greater variety of human pathology and avoid biases.

Interestingly, Dr. Beyea noted that it’s also important to obtain annotation from multiple readers, so that biases in the annotations are also minimized.

The work in Halifax benefited from the



Pictured: David Hoar, a student working on the project, with Dr. Alessandro Guida, BIOTIC research scientist.

skills of a team of researchers at BIOTIC – short for Biomedical Translational Imaging Centre. They included Dr. Sharon Clarke, a physician-researcher, and Dr. Alex Guida, an expert in bioinformatics and AI.

And although the working model produced by the group is based on the records of hundreds of patients – a relatively small sample in the AI world – Dr. Beyea explained that the data sets are quite high-dimensional and consist of many image slices and three-dimensional pixels.

“There’s enough data to reach interesting conclusions,” he said.

Still, it’s the nature of the machine learning that such system can be refined by additional data, and that’s the goal of internationalizing the research.

“We’d like to take it worldwide ... with collaborators in hospitals around the world,” said Dr. Beyea.

One way of doing this is to move the system and data collection into the cloud. BIOTIC is currently in discussions with GE Healthcare to potentially use its Edison AI platform for this purpose.

In addition to providing a platform that could be accessed by researchers around the world, Dr. Beyea said that a solution of this sort would also supply the necessary privacy protection.

He observed that it can be difficult for hospitals around the world to share healthcare data outside their jurisdiction because of privacy laws. That’s acceptable, said Dr. Beyea, because one can avoid moving the personal health data and instead, bring the model inside of the hospital, where the data are collected. The model weights – that is, the results of training the model – are what is really needed to develop the computer-aided di-

agnosis system on the MR images of their patients.

“It’s these model weights that will improve the quality and usability of the system,” said Dr. Beyea.

For its part, BIOTIC has many image-related research projects under way. Perhaps one of the most interesting is the plan to install an MRI scanner, for imaging the head, in the emergency department of the QE II Hospital. It will be the first hospital in Canada to make use of an MRI in the ED.

The specialized MRI, called EvryTM, has been developed by Toronto-based company Synaptive Medical Inc. Dr. Beyea said that work is currently under way at the hospital to install the machine in the ED. The Nova Scotia Health Authority and BIOTIC have a four-research agreement to test and refine the EvryTM MRI scanner.

Of course, speed is of the essence in emergency medicine, and traditional MRI scans can take a fair amount of time. That’s why BIOTIC is working with Synaptive to further develop software for the system to reduce the time needed for scanning while obtaining high-quality results.

BIOTIC is also exploring other areas of machine learning, in addition to the work on the prostate cancer CAD system. Dr. Beyea said BIOTIC is benefiting from its location in Nova Scotia, where there is one health authority for all adult hospitals, and a single PACS for the collection of diagnostic images.

“From the research point of view, it eases our work, because there is just one research ethics board approval that’s needed,” he said.

Once that is obtained, the researchers have access to a relatively large pool of images and data. “For us, Nova Scotia is like a living laboratory, and we can create large and diverse data sets,” said Dr. Beyea.

Intelerad deploys both clinical and workflow AI to help imaging centres

BY JERRY ZEIDENBERG

Intelerad has been using artificial intelligence and machine learning to improve the “human dimension” of radiology departments and clinics. The latest iteration of its Clario Smart Worklist uses AI, not to maximize the reading of studies, but to produce the best interpretations while balancing the workload among a group of radiologists.

“You don’t want to simply push out as many exams as you can, because that won’t work over the long run,” said Chris Wood, chief technology officer at Intelerad. When routing exams to radiologists, he said, “You don’t want to burn them out, and that is a big issue right now.”

Indeed, with the volume of DI exams steadily growing, and mounting demands to reduce wait lists and increase productivity, radiologists may feel like they’re on a treadmill that’s moving faster and faster. And it’s getting harder for them to stay on track.

Smart Worklist is using rules and AI to send the right number and types of studies to the right radiologist, at the right time, said Wood.

This can involve many different factors – not all of which are obvious. So, for example, radiologists working in a hospital environment often have different duties and responsibilities than radiologists who are embedded in independent clinics.

“In a hospital, the radiologist may be answering a lot of questions from clinicians and working with patients,” said Wood. “That’s a big part of the job that radiologists in clinics may not be doing as much, and it’s time-consuming.”

As a result, Smart Worklist accounts for the type of reading environment the radiologist works in and balances the workload appropriately.

And while one might think it best to route chest X-rays or abdominal CT studies to the person with the best record of reading them, this too isn’t the best practice for the long run.

“If you load up a person with just one kind of exam, like chest X-rays, pretty

soon they won’t be so good at reading MRIs,” observed Wood.

At the same time as you’re trying to obtain the best readings from the most skilled radiologists, you’re also trying to keep up the skills of your team, to keep them sharp while challenging them and promoting continuous learning.

Smart Worklist is using rules and AI to send the right number and types of studies to the right radiologists.

Smart Worklist can also monitor turnaround times to re-route exams when logjams are developing, and to prioritize urgent cases.

Soon, the system will be able to predict patterns in radiology departments and clinics, said Wood. The company is on the cusp of releasing software that analyzes the reams data in DI departments to forecast busy periods – which means that managers can schedule radiologists, tech-

nologists and staff with greater accuracy.

New features will also include the ability to comb through a facility’s cases to determine which patients were scheduled for follow-up exams and should be reminded. This work can be routed to radiology assistants, who can contact patients, their families or the relevant caregivers.

For its part, Intelerad is a fast-growing company based in Montreal that’s winning customers – including large hospitals and clinics – around the world based on the quality of its products. In 2019 it added 33 new customers to its client roster of several hundred sites.

It has software R&D labs in Montreal and Toronto, where most of its product development takes place.

Of note, Intelerad announced that MIC Medical Imaging, a partnership with 96 radiologists at 13 clinics across Alberta, is set to adopt Smart Worklist across the practice. The organization announced the contract with Intelerad in 2019, and implementations will start this year. The system will also be

CONTINUED ON PAGE 22

Montreal's Aifred is applying AI to problems of mental health therapy

A Montreal start-up called Aifred is using machine language technology in mental healthcare, to determine which type of therapy would best help particular patients. To start, the company is focusing on depression, which it says affects over 300 million people worldwide.

According to the company, currently available treatments are not well-differentiated and physicians have few tools to help them effectively select and manage mental health treatments based on the unique characteristics of their individual patients. This can lead to an arduous and lengthy "trial and error" approach to treatment.

Instead, Aifred uses best-evidence guidelines, together with AI-based insights, to support better treatment management, and matching of individual patients to the right treatment.

The solution uses AI to learn from thousands of patients to help tailor treatment, reducing the time it takes for a patient to reach remission.

Specifically, Aifred uses deep-learning to perform treatment selection, which allows it to capture complex relationships within patient data. The company has built a clinician-patient application that allows patients to answer questionnaires about their mental state and quality of life. It visualizes this data for both the patient and clinician while providing key decision support for treatment.

Aifred tracks patient symptoms and test results to monitor outcomes or make new predictions. Banks of standardized questionnaires and data visualization can be tailored to clinicians' needs.

"Right now, [it is designed] for depression, with plans to expand to other conditions such as anxiety and schizophrenia in the future," Dr. David Benrimoh, Aifred Health's Chief Science Officer and a Resident in McGill's Department of Psychiatry, told the McGill Tribune in a recent article.

Despite the huge potential of this technology, the model still poses many challenges. According to Benrimoh, the biggest obstacle is adoption of the technology. Thus, it is essential that the tool they build is one that doctors and patients actually want to employ.

"If no one uses it, it could be the best model ever, but it's not going to do anything," Benrimoh said.

Still, Aifred Health has a few steps to complete before worrying about consumer reactions. The company is currently conducting a feasibility study in which they are using the technology for the first time in real clinics.

Computer simulations and tests at McGill's Arnold and Blema Steinberg Medical Simulation Centre have already yielded promising results.

The Steinberg Medical Simulation Centre simulates authentic healthcare settings using the latest technologies to enhance the skills of healthcare professionals. Indeed, most doctors that participated in tests at the Simulation Centre found that the AI model was useful and were willing to use it in their practice, though they will have to wait a few years.

"Within roughly two to three years, the full AI tool will be market ready," Benrimoh said.

Benrimoh told another journal, *Robotics Business Review*, "The biggest problem in depression treatment is that it takes a long time for people who do seek care take to get better. It can take seven to nine months to get better with some combination of psychotherapy, exercise, and medication."

Patients often go from one therapy to another, so the approach of helping doctors to better evaluate routes to treatment has huge potential. Working with multiple universities and researchers further validates the thinking that there's not one single solution. "We're working with a range of experts,

from business and neuroscience to psychology," Benrimoh told RBR. "We're focusing on helping physicians make better decisions in mental health. There are particular decision points that need to be improved, and we're doing something that's not currently possible without AI."



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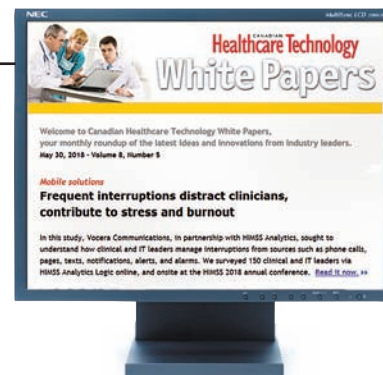


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Thinking outside the box to improve surgical safety for patients

BY ANA GAJIC

How does an operating room's team culture impact a patient's surgical outcomes? What about the number of times the OR door opens during a procedure? Or the types of distractions the team experiences while performing surgery?

The International Centre for Surgical Safety – a research and innovation centre within the Li Ka Shing Knowledge Institute at St. Michael's Hospital in Toronto – aims to answer these types of questions to enhance safety for patients around the world. It breaks down barriers within the OR to understand how complex factors can impact patients and team members.

"The operating room is one of the most secretive environments in our society," says Dr. Teodor Grantcharov, surgeon and director of the ICSS. "Throughout the years we've created false expectations of perfection in the OR. This is the biggest limitation for learning. By studying what we do right and wrong, we can see opportunities to improve."

With innovative technology that extracts the digital footprint of every surgical procedure through audio-visual data, physiological data and data from devices and sensors, the ICSS team uses human and artificial intelligence to analyze these metrics and make suggestions for improvements.

Though everything is captured, no information is used punitively. All data goes towards understanding how a surgery can be enhanced to create an optimal environment for teams to work in and for patients to thrive.



St. Mike's Dr. Teodor Grantcharov: "All data goes towards understanding how a surgery can be enhanced."

"Traditionally, we research the patient experience before surgery and after," said Dr. Vanessa Palter, a cancer surgeon and scientist at the ICSS. "For any surgical patient, what happens in the operating room is probably the most important part of their experience but it has been significantly under investigated."

The centre started with a vision to address this gap. Dr. Grantcharov's first lab at

St. Michael's focused on surgical simulation and education. From there, he and his team developed the now commercialized OR Black Box concept, which is the technology that monitors operating rooms.

The team behind the OR Black Box has spun off this technology and others into a company called Surgical Safety Technologies and the St. Michael's Hospital Foundation secured funds to transition Dr.

Grantcharov's research lab into the International Centre for Surgical Safety.

The technology of the OR Black Box, which captures everything that happens in the OR, has spread to other hospitals in Canada, the United States and Western Europe. Time Magazine featured this innovation as one of the best inventions in 2019. At St. Michael's, 10 ORs will be equipped with the Black Box. This all means more data for the team to analyze in their research.

"The collaboration with other centres is key to the success of the ICSS," said Amy Dionne, managing director of the centre. "Not only do we have a team that's diverse in skill set – spanning from engineers to clinicians to computer scientists – but our partners' diverse environments help us ensure our evidence is grounded in reality."

In a recent example, the research team published a study in Surgical Endoscopy that looked at distractions in the OR. They found that irrelevant conversations in the OR were a modifiable factor that was associated with the surgeon feeling distracted. This, Dr. Grantcharov said, is one example of a small but important shift to improve surgical safety patients.

As the key stakeholders, patients have been great supporters of this work. In fact, many are surprised that the idea of observing ORs to improve on surgical processes is novel.

"Patients feel like we offer them the characteristics of a healthcare professional they want to see," Dr. Grantcharov said.

"Teams that are open, transparent, accountable and good communicators are teams that create the best care experiences for our patients."

Surgeons testing virtual care system for follow-ups receive high marks

BY DUNCAN ROZARIO, MD

The ability to provide healthcare via a technological interface which provides an audio and video component is an existential pivot to our current model of care. In 2016 Kaiser Permanente in the U.S. reported that 52% of its 110 million physician-patient interactions took place virtually.

In contrast, in Ontario last year the Ontario Telemedicine Network (OTN) reported 770,000 virtual visits out of a total of 124 million patient visits representing only 0.62% of total visits.

In Canada, 86% of us have a smartphone, and the same percentage have broadband access at home – two key requirements for virtual care. This has the capability of increasing the number of touchpoints between caregivers and patients and adds to the patient experience.

In the US, the United Healthcare group has demonstrated that while virtual visits take the same patient-clinician interaction time, they save the patient on average 106 minutes compared to an in person visit and that 92% of issues were resolved on the virtual visit.

In a 2018 Canadian survey, 47% of respondents wanted to have virtual ac-

cess to their caregivers. This is about giving patients choice, and has the potential to reduce the expensive "bricks and mortar" infrastructure we currently require in healthcare.

There are numerous barriers to our current model of healthcare – time off work, parking, transportation, weather, childcare and language of service. Virtual care saves millions of kilometres of unnecessary driving resulting in huge reductions in greenhouse gas emissions.

Rapid access to care can reduce the delay in diagnosis and treatment, improve quality, and reduce the need for hospital care.

Unlike a phone call, for a physician to be able to see a patient allows a much more profound degree of communication, assessment of nonverbal cues, the ability to read body language, and the ability to make the decision whether the virtual visit has served its purpose, or whether an in-person visit is necessary.

In Canada, at times, traveling in poor weather may be inconvenient or dangerous, patients may have mobility issues, be in poor health, frail, or may be immunosuppressed from chemotherapy.

Imagine in one's office being able to do with a video chat, routine follow-up

visits, review pathology or other tests, discuss mammograms, ultrasounds, or directly visualize an incision after surgery, all from the comfort of the patient's chosen venue.

Seeing patients in person, physical examination, and the therapeutic touch will never be completely replaced but virtual care would be just another care modality in our healthcare system.



Dr. Duncan Rozario

the Ontario Telemedicine Network (OTN) are allowing care providers to test a variety of modern virtual care solutions and receive standard fees.

In Oakville, we are using the Reacts system (<https://reacts.com>), developed in Canada by Dr. Yanick Beaulieu, an intensivist in Québec, to provide virtual care to a wide variety of patients using readily available smartphones or a personal

computer. This next-generation application allows not only virtual care, messaging, and sharing of images, but also the use of augmented reality to enhance care provider training.

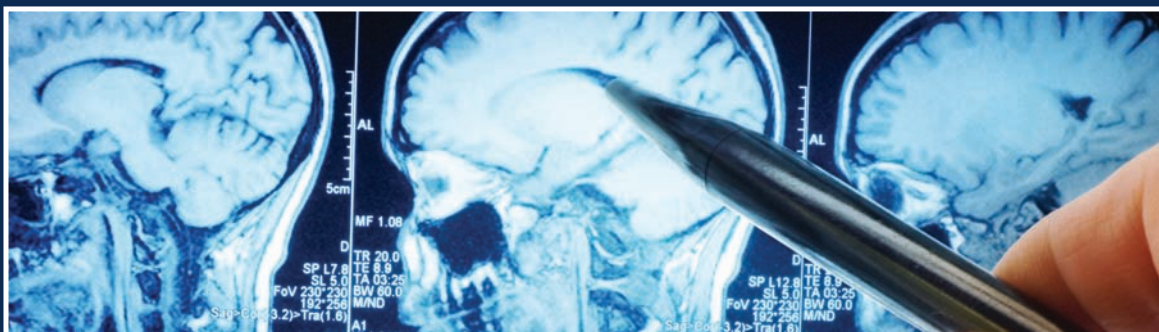
Unlike many other virtual care solutions, Reacts allows providers to call and message patients similar to apps like Apple's FaceTime, instead of using a cumbersome chat-room model where both participants need to enter a virtual chat-room to communicate.

In my office, my secretary books a virtual appointment over a 30-minute time range and asks them to be logged into the app and keep their smartphone with them or be near their computer. This gives me needed flexibility in a busy office.

Patients are sent a reminder email with details of the appointment and are referred to our pilot website (<http://oakvillesurgery.com/evisit.html>) which explains how to have a virtual visit using Reacts.

At some point over that time range I call my patient, complete the virtual visit, view incisions as needed, and then document the visit in my EHR. Patients are then invited to complete a patient

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Delivering high-quality care is a team event, much like a relay race

The best team, not the fastest runner, will win the race, says Dr. Narinder Paul.

BY DAVE WEBB

If you do not change direction, you may end up where you are heading.” Radiologist Narinder Paul used this cautionary quote from Chinese philosopher Lao Tzu to illuminate the risk of maintaining the cultural status quo in healthcare at Canon’s recent International Imaging Symposium at Hotel X in Toronto.

Dr. Paul is Chair/Chief of medical imaging at the Schulich School of Medicine & Dentistry at Western University, in London, Ont., and at its teaching hospitals – London Health Sciences Centre and St. Joseph’s Health Care London.

He opened with the caveat that his presentation, “Cultural Transformation: The Pain and the Gain”, was unlike the preceding technical sessions at the symposium.

“This is based on personal experience, observation and assumptions,” Dr. Paul told the audience in the hotel’s 250-seat theatre. That experience crosses the emergency room, internal medicine and the radiology department, research and academic environments.

“Everywhere you go, you find good people who want to do the right thing,” he said, “but they’re often hamstrung by a culture that is not supportive, or that’s even downright toxic. Dr. Paul asserted: “(The phrase) ‘we’ve always done it that way’ is a killer.”

Changing demographics: “Decade after decade, we’re paying more and more for healthcare, and it’s not sustainable,” Dr. Paul observed. One reason is demographic. In 1971, Canada’s population was 22 million, with a pyramid-shaped age distribution – youngsters outnumbered seniors. By 2011, the population hit 34 million, with a demographic bulge in the middle. By 2035, the population is projected to reach 42 million, with the aging population as the fastest growing component.

The inversion of the demographic pyramid plays a role in increased costs, healthcare costs in Canada have risen from less than 6 percent of GDP in 1960 to over 10 percent today.

The pattern will also lead to an increase in complex, multi-system and chronic illnesses. That’s a



Dr. Paul: Leaders need to pay attention to the concerns of all.

challenge for the existing patient journey, which might entail using a GP or clinic, then a community hospital, an academic hospital, community rehabilitation services and home care. The problem, said Dr. Paul, is that individual parts of the health care system may be excellent but the system is not well integrated – and the journey is prone to breaking down.

He emphasized that organizational culture must focus on the patient journey, not on equipment and processes. Dr. Paul compared the journey to a relay race: The best team, not the best runners, wins the race.

Changing culture: People and infrastructure are the two primary barriers to cultural change. But wanting change is a very different question from wanting to change, he said. “It’s always someone else’s problem, it’s always someone else that needs to change, not us” Dr. Paul said.

On the topic of flexibility and change, Dr. Paul grouped individuals into three distinct personalities. • “Eager beavers” make up about 20 percent. They

are enthusiastic early adopters of new technologies and processes and can be instrumental in achieving change. However, they can also be the earliest to be disappointed if change does not materialize or is too slow.

• “Cautious and careful,” about 60 percent, are late adopters, with a more cautious approach but once convinced will be supportive of positive change. The enthusiasm will be muted.

• “Steadfast resisters,” the remaining 20 percent, are comfortable with familiar routines and practices and will be resistant to change.

Leaders need to pay attention to the views of all three groups as they can provide valuable feedback and try to engage all team members in the journey of transformation. However, often, a choice needs to be made as to where the energy and focus needs to be directed.

What change looks like: Organizational change often hinges on leadership, said Dr. Paul. Bosses say “Go”; leaders say “Let’s go.” Leaders share credit and take blame; they support their employees, rather than taking a “my way” approach. (And, by the way, Dr. Paul added, “If you ever have to say, ‘I’m the boss,’ you’re not.”)

In London, where Dr. Paul heads up imaging, change has been focused on four priorities:

• Safety for both patients and the team. This includes minimizing exposure to ionizing radiation for patients, who may be briefly exposed, but also to team members who could be exposed on a daily basis.

• Speed. Providing state of the art imaging equipment and developing workflow processes that allow the team to work smarter and more efficiently, not necessarily work harder. Improving efficiencies leads to better access for patients.

• Specialization by focusing on providing functional and physiological imaging in addition to high resolution structural or anatomic details.

• Special patient experience. Imaging technology and the environment can be intimidating to patients. Even the design elements of equipment can contribute to the patient experience. It is important to focus on the patient experience and to engage patients and their advocates in improving their journey in health care.

Mr. Hockey: Gordie Howe was a medical marvel

Dr. Murray Howe, the radiologist son of NHL legend Gordie Howe, shared some of his father’s X-rays and medical history in a presentation at the Canon’s recent International Imaging Symposium at Hotel X in Toronto. It paints a picture of a man immune – or at least injured – to pain.

Mr. Hockey’s medical imaging profile reflects the toll of nearly 40 years in a professional sport that is renowned for its ruggedness – and sometimes for its out-and-out brutality.

• In Howe’s rookie season with the Detroit Red Wings, in 1946, he suffered tears to the meniscus in

both of his knees. Arthroscopic surgery didn’t exist at the time, so doctors simply removed them. He continued playing until 1980.

• The scaphoid bone in his left wrist was at some point broken and not reset. Since the bone is dependent on its own blood supply, it literally disintegrated over time.

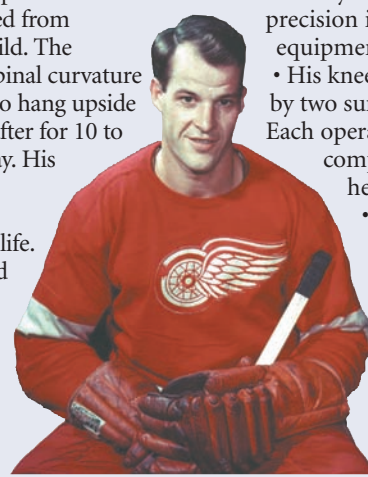
• Once asked how many times he had been knocked unconscious, he replied: “About 100. How would I remember?”

• Howe played his entire career with a hernia suffered as a teenager. On a construction site, his father bet a number of co-workers his son could lift a 300-pound boulder into the

back of a pickup truck. Gordie did.

• Howe suffered from scoliosis as a child. The treatment for spinal curvature in the day was to hang upside down from a rafter for 10 to 15 minutes a day. His spine remained uncorrected throughout his life.

• His skull had a burr hole from a trepanning procedure to relieve cranial bleeding. The fact that there



was only one reflects uncanny precision in an age with no imaging equipment beyond X-rays.

• His knees were eventually replaced by two surgeon friends of Murray’s. Each operated on one knee. It was a competition to see whose work healed faster.

• Under miscellany, Dr. Howe listed his father’s many rib fractures, gall stones, arthritis in his shoulders, and “an elbow that was out of this world,” according to the younger Howe. Gordie Howe died in 2016.

To optimize performance, integrated data becomes ever-more important

BY DR. SUNNY MALHOTRA

Healthcare interoperability is a holy grail that we have been trying to discover for over 25 years. The most fervent searchers can be found in diagnostic imaging and I.T. departments, where there's an ongoing effort to connect these systems.

It's still hard to believe that your ATM card can work in a developing nation but we cannot solve the problem of how to access our medical records from one healthcare institution to another just down the street!

There are some people who believe this lack of interoperability results in competitive advantages for vendors, who retain the data, as it adds to the companies' value. However, this lack of interoperability costs the healthcare system significant amounts of money through duplication and lost productivity. And this is true in both the United States and in Canada.



Dr. Sunny Malhotra

Unfortunately, many digital imaging and EMR solutions have created data islands. In response, we may see large players such as Amazon, Apple, Google, and Microsoft enter the market by providing data exchange through a web-based open-architecture solution called Representational State Transfer (REST). It will consist of a single, cloud-based online database for users and healthcare systems.

There are some pretty tough problems to solve, including data exchange in the new Ontario Health Teams and Patient Centred Medical Home Model.

As well, there is a rise in the use of video among healthcare providers, for example, virtual visits, as well as in sending messages or asking for a second opinion.

And there's a definite need to "ax the fax" when it comes to communicating. This will require the implementation of new, interoperable communication systems in doctors' offices, hospitals and many other medical organizations.

It would be worthwhile for many to take a closer look at Alberta's Netcare system, which integrates a large proportion of Alberta's sources of health information. The province is also a leader in the use of optimized eReferral systems.

The integrated Alberta Netcare system consolidates:

- 96% of all dispensed medications
- 92% of all laboratory test reports
- 92% of all diagnostic images and reports

The system, powered by Orion Health Suite, also offers case management, cancer screening, e-referral, and messaging. And it is easily accessible to clinicians.

In the area of radiology, something worth taking a close look at is Arterys, an Artificial Intelligence start-up and Stanford University spin-off known for its internet platform for medical imaging. Arterys is resolving many of the interoperability problems found in radiology by making greater use of the cloud. The com-

pany has also put AI tools into the cloud, to automate some of the quantification tasks performed manually by radiologists – reducing many of the rote jobs they're doing and leaving them able to focus on more valuable work.

Moreover, using traditional software,

radiologists have had to jump from one system to another to do measurements; but with Arterys, the solutions are available in one place, meaning that clinicians don't lose time switching from one application to another.

Interestingly, the company has created

the Arterys Marketplace, which makes medical imaging AI available to users worldwide.

Dr. Sunny Malhotra is a cardiologist, entrepreneur and health technology investor. Twitter: @drsunnymalhotra



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Physicians are using analytics on their desktops to provide improved care

The data helps doctors identify, flag and contact patients in need of screening or follow-ups.

BY DIANNE DANIEL

Family physician Dr. Karen Seigel, a member of the Crowfoot Village Family Practice in Calgary, is on a mission to improve screening for kidney disease among her diabetic patients. How did she identify the gap? By accessing her Primary Healthcare Panel Report, a free analytical resource provided to family physicians in the province by the Health Quality Council of Alberta (HQCA).

"When I first started practice there really wasn't a lot of thinking about panels and quality improvement," said Dr. Seigel, who started out in family medicine in 2004 when health records were on paper. "Now it's not only encouraged, but we have the resources to do it."

In Alberta, HQCA panel reports are considered an invaluable analytical tool to support quality improvement at various levels of the primary health-care system. They contain as many as 55 measures from 12 different administrative sources, providing family physicians access to data about preventative care, chronic conditions, pharmaceuticals and laboratory test utilization – information they'd have difficulty discovering on their own.

Collaborating partners who help to generate the reports include Alberta Health, Alberta Health Services, the Alberta Medical Association, the Physician Learning Program and Choosing Wisely Canada among others.

In recent years, the HQCA transitioned its reporting system to a digital platform based on the cloud-enabled SAS Viya analytics engine from SAS Institute Inc. Instead of accessing as many as six different software programs to collect and curate terabytes of data, HQCA staff now perform database management, data analytics and reporting in one tightly integrated environment.

Static PDF panel reports were replaced with interactive digital reports that enable family doctors to quickly identify quality improvement areas with a few clicks on a keyboard.

Dr. Seigel logs into her digital panel report – which provides information based on her confirmed patient list – on an annual basis to identify priority areas for the coming year. A printable summary page provides a good snapshot of her patient data compared to the performance of her peers in the wider Primary Care Network of 400+ physicians so that she can quickly see where there's room to improve.

She can also dive deeper into specific patient populations, by gender, age or condition for example, to identify gaps or variances.

However, she stresses that simply identifying patients isn't enough; it's what's done with the information next that is the important part. For example, after spotting that her diabetic patients were falling behind in meeting the recommended screening for kidney disease, Dr. Seigel took action by ensuring her EMR now has a reminder that pops up in patient charts to alert her and her staff when those patients are due for testing.

Similarly, if she identifies at-risk patients who haven't been getting their flu shots, she'll share that information with administrative staff who can follow up with targeted patients.

One of her favourite measures in the report is how many times a patient visited the Emergency Depart-

ment when they didn't need to. "It's a little bit about, 'Why did you go to Emergency?' But it's also about, 'Was I not open and they had to go somewhere?' And that would make it an access issue," she said.

The move to digital reports is intended to make it easier for family physicians like Dr. Seigel to build data analytics into their practice, giving them an opportunity to routinely reflect on system-level data that's extremely relevant to them.

As HQCA CEO Andrew Neuner points out, the council isn't intending to "turn physicians into analysts." Rather, council staff perform the heavy analytical legwork, staying in close communication with

patient list, including a provincial health number (PHN) for each patient, receive a proxy report based on an estimation of who their patients are. In the absence of the PHN, physicians aren't able to drill down to identify individual patients, but they still receive informative indicators to show them where their practice can improve.

HQCA Director of Health System Analytics Markus Lahtinen said it's difficult to draw a direct correlation between providing the analytical capability at the family physician level and improved patient care. But an evaluation indicates physicians who are using the new digital system are benefitting, with 70



ILLUSTRATION: LINDA WEISS

physicians and other provincial partner groups to determine what data should be in the reports and how they can improve on an ongoing basis. The data is already organized and relevant before it is sent out.

"There used to be a time when the feedback we received would be, 'the numbers aren't right or those aren't my numbers,'" said Neuner. "We don't have those conversations anymore. The numbers are right and it's: 'What can we do to make the numbers better?'"

He maintains the HQCA is the most appropriate body to create and disseminate the reports because it doesn't play the role of regulator or funder. Instead, the primary intent is to help physicians become proficient in understanding and acting on their own data by giving them a curated, easy-to-use and customizable tool.

"We're trying to create awareness among physicians and hoping they will come to some improvement measures on their own, based on having a better understanding of how their patients are using the system," said Neuner.

Approximately 1,400 of the 4,000 family physicians in Alberta have signed up to receive the free reports, with the numbers increasing every year.

Doctors who aren't able to provide a confirmed

percent reporting that the data helped them to identify a quality improvement for their practice.

"Sometimes seeing the information challenges their assumptions about how well they know their patients and how well they know what their patients are using the health system for," said Lahtinen. "The easier we make it for them to understand and get insight, the more impactful of a partner we can be."

A benefit of moving to the SAS Viya platform, is that HQCA staff can update the information provided in the panel reports more frequently as new priorities are established or as screening protocols change, and the council is looking at providing reports every six months in the future. Another advantage is that physicians are now performing their own analysis, whereas in the past, they would reach out to council staff to tweak their reports or devise new ones, putting pressure on the council's limited resources.

"We're allowing them to play in the data themselves, to get to know their patients and look at those populations that are clinically relevant to them," said Lahtinen.

In Ontario, the number of family physicians using OntarioMD's Insights4Care (i4C) dashboard to gain access to relevant, actionable patient data has doubled

from 500 to 1,000 following completion of a successful proof of concept in 2019.

OntarioMD reported several key findings to indicate that using the tool led to quality improvements, such as more accurate coding of patients with diabetes, patients who smoke and patients with hypertension, as well as increased screening compliance for colorectal cancer and breast cancer.

Family physicians also said they find value in having a user-friendly analytical tool that integrates with their EMR and the dashboard is now undergoing a second, more in-depth analysis at Women's College Institute for Health System Solutions and Virtual Care.

In a comment, family physician Dennis DiValentino said the dashboard "is significant because it gives clinicians real-time access to a population view of the wealth of patient data they have collected in their EMRs for the first time. As clinicians, when we are provided the ability to drill down to patient-level data, we can identify trends, provide better follow-up and most importantly, provide improved outcomes for our patients."

The OntarioMD approach differs from Alberta's use of panel reports in that the dashboard relies on real-time data obtained directly from a family practice EMR.

Data analysis is performed on the server where the EMR resides and only the dashboard is presented to the user. OntarioMD provides the tool's specifications and refer-

ence model to EMR vendors who add the functionality to their systems at no cost to the physician users.

Funded by the Ontario Ministry of Health and Long-Term Care, the dashboard initiative was conducted in partnership with Health Quality Ontario, the Association of Family Health Teams of Ontario, the Canadian Institute for Health Information, the Alliance for Healthier Communities and EMR vendors Telus Health and OSCAR.

As i4C continues to rollout across the province, OntarioMD is working to validate more EMR vendors. The dashboard was accepted by the Ontario College of Physicians and Surgeons as a quality reporting tool and OntarioMD is also working with the University of Toronto to get it included in core family medicine training.

The over-arching goal, said OntarioMD Chief Medical Officer Dr. Darren Larsen, is to build an impactful change management and quality improvement framework that goes beyond "simply giving them a bright, shiny tool that's going to show them their data."

"Clinicians are encouraged to engage the i4C Advisory service, field staff who have the know-how and expertise to assist them in developing insights and quality improvement activities. As Dr. Larsen points out, it's not only physicians who are using i4C but the entire family practice team, including administrators, nurses and others depending on how a practice is structured.

"There's so much room in the primary care space for looking at data because we haven't had the opportunity before," said Dr. Larsen.

"This isn't something we've been trained to do generally as family doctors; it's not something we've had in our funding models or our bandwidth, so we're actually trying to create a system where it becomes normal."

The first 30 indicators analyzed and presented in i4C primarily addressed chronic disease management, preventative

tients who require screening or testing. Depending on how a practice is organized, it could be a member of the administrative team who accesses the dashboard to generate a list of patients requiring call backs, or it could be the physicians themselves who want to identify their outliers or compare themselves to their peers.

"We hear the conversation that physicians are flooded with data," said Dr. Larsen. "We're reducing the noise ... We've curated this, we've made it consumable, and we've allowed doctors to go where they think they need to go for their practice."

Early users of the dashboard who participated in its evaluation reported several benefits, with just over 64 percent saying it helped to identify patients requiring follow-up and more than half saying it prompted their practice to update information to improve data quality.

As the Ontario Health Team model rolls out, teams will be expected to improve performance across a range of outcomes, including patient and population health outcomes. OntarioMD CEO Sarah Hutchison said i4C is being positioned as an important analytical tool in the primary care space and will complement other resources aimed at population health analysis.

"The early value of the dashboard is that it's really helping practices to use data in a more meaningful way," said Hutchison. "It's not just about the physician, but the whole practice view of the patient."

i4C is being positioned as an important analytical tool in the primary care space and will complement other resources.

cancer screening, opioid management and immunizations.

The next 60 indicators will be published in batches throughout 2020 and will incorporate predictive measures to identify at-risk populations, particularly among the elderly and including concurrent use of multiple medications or polypharmacy. All indicators are vetted against a physician panel who examine them with a critical eye to ascertain how they might help with quality improvement, said Dr. Larsen.

The information in i4C is presented in easy-to-read charts and graphs, and doctors can drill down to identify those pa-

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Kaiser Permanente using visual analytics with its diabetic patients

BY DIANNE CRAIG

When Kaiser Permanente's Orange County, California group wanted to improve care processes and outcomes for their 42,000 diabetic member patients, they implemented advanced visual analytics as an important management tool.

"By visualizing and pinpointing trends, I can address issues in my diabetic patients before they worsen," said care manager Marie Hernandez, RN. Kaiser Permanente is one of the largest healthcare organizations in the United States; it operates in eight states and has 12 million members.

Speaking at the Tableau Software Conference in Las Vegas last November, Michael Shen, senior data consultant at Kaiser Permanente, described how as part of the Business Intelligence and Transformation Group for Orange County, he and his team helped revamp and improve the management of diabetes care with visual analytics.

For diabetic care in Orange County, said Shen, "We have 27 care managers, including nurses and pharmacists who work in 17 different locations with our 305 primary care physicians and take care of our 42,000 diabetic patients." He explained that care managers are key to diabetic care.

"They are the primary point of contact with our diabetic members; they guide the medication they take and also coordinate one on one with our primary care physi-

cians (PCPs) to strategize and provide a total care perspective for those patients," said Shen.

In 2016, Shen recalls, "Diabetes was a major challenge in Orange County. A1C control rates were stable, but stagnating. Also, our physicians were overburdened



and lacked support. So, our goal was, let's transform this from good to great," he said.

Kaiser Permanente decided to overhaul the way diabetes was managed in Orange County. It would include researching and designing completely new care workflows and by using Tableau Software visual analytics, they'd be able to track metrics more easily.

They also worked to enable tighter collaboration with PCPs. This included designing a closed loop workflow so nothing would be lost, and to keep better track of productivity and outcomes.

To get started, the group defined the types of visual analytics they wanted to view and the target audiences.

The first system, designed for the care leaders who oversee care managers, included Care Manager Operational Performance. It looked at two key metrics – A1C

status. "We wanted to identify bottlenecks in incomplete results," said Shen.

In Q3 of 2017, they deployed Care Manager Outcomes Analysis to relate those operational metrics to actual outcomes of the patients over time.

Shen said, "Are their control rates improving and can we track those over time? And are those workload changes resulting in a healthier population?"

Like most dashboards, this one has several different screen views, including A1C Control Churn so they were not just looking at control rates, but how each care manager's patients were changing to in or back to out of control, through a monthly trend of churn rate over time. Another of several screen views is a geographic view that shows all locations and which ones have better or worse control rates.

Next, in Q1 of 2018, they created dashboards for care managers with an Individual Care Manager View so managers could see how they were doing, said Shen. The visual dashboard is a scorecard that gives a high-level view of a care manager's patient list and how patients are faring.

Benefits of this, explained Shen, include giving care manager direct feedback, and allowing them to drill down to view areas of need. It also enables stronger collaboration with PCPs. Through monthly or quarterly meetings between care managers

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Converging imaging data with medical knowledge

BY JEFF VACHON

Patients are undergoing more medical imaging studies than ever before, which has resulted in a significant increase in the cost of healthcare delivery. This trend will likely continue as technological advances shorten scan times, reduce modality prices and cut radiation doses.

Added pressures will likely emerge from new, evidence-based guidelines that prescribe imaging for specific indications and follow-up examinations at set intervals.

To manage the growing demand, imaging departments will need to drive efficiencies and improvements in patient workflow and procedures.

Accomplishing this requires access to multi-disciplinary patient data from across all corners of the healthcare organization.

Unfortunately, 80 percent of this data is unstructured and the rest is often locked in information silos with proprietary data schemas and varying degrees of interoperability.

As a result, manual cross-referencing of requisitions and radiology reports is typically required to ensure appropriate indications are followed and that appropriate follow-up recommendations are communicated, scheduled, and performed. Manually extracting the data is, however, a highly labour-intensive and costly process.

If you could converge your imaging data with the information extracted from narrative text, reports, and clinical notes, you would be able to automate many of these processes. You could also provide clinicians and managers with a new level of clinical intelligence.

Medical imaging data combined with clinical knowledge goes beyond traditional operational and performance analysis to enable deeper insights and understanding of clinical procedures and outcomes.

In this model, medical data is a combination of clinical patient data, cohort studies and medical images, while medical domain knowledge encompasses clinical guidelines, side-effects of medications, causal relations, and so on.

By correlating and structuring data within and beyond radiology a new and significant breadth and depth of understanding can be achieved that has never been possible before.

The convergence of clinical and business data provides a new level of 'big picture' intelligence that enables the achievement of significant improvements in workflow efficiency, clinical outcomes and financial performance by:

- Proactively monitoring and reporting upon clinical follow-up recommendations and incidental findings to elevate care quality and protect against lost revenue.
- Providing improved awareness and

insight into imaging operations to drive continuous clinical and workflow improvement across the organization.

- Expand awareness into patient imaging populations, practice management and practice guidelines such as Choose Wisely recommendations.
- Curating clinical and technical data for later use in artificial intelligence (AI) and machine learning (ML) applications.

Mining radiologist's findings: It has been reported that between 8 percent and 15 percent of radiology reports contain clinically important follow-up recommendations. Unfortunately, the rate of adherence to these prescribed recommendations remains low, with some research reporting that more



Jeff Vachon

than 35 percent never occur. This is particularly true for recommendations related to incidental findings, and even more so for those patients who do not have a primary care provider.

There are a number of avoidable pitfalls that result in missed follow-ups, including the failure to appropriately communicate findings and recommendations to patients or their primary care

providers, failure to track less urgent follow-up recommendations during acute episodes of care, or failure to secure a scheduled appointment with the patient at the time the recommendation was made – and before the patient leaves the care facility.

Missed follow-up recommendations carry two significant consequences for both care-providers and patients. Most missed follow-ups introduce the opportunity for clinical and medico-legal risk should a malignant disease progress unnoticed. As well, this results in lost revenue opportunities when exams are not performed at all or are performed at an outside hospital or clinic.

Gaining a 'big picture' view across all corners of the healthcare enterprise is an essential requirement for hospitals and healthcare organizations to achieve truly transformative clinical and business results, which can only be achieved when imaging and business data converge with deep clinical knowledge.

Only then can you deliver cross-functional, multi-disciplinary insights that inform quality of care and efficiency improvements, drive cost reductions, and maximize reimbursement potential and ROI for clinical, technical, and operational initiatives.

Jeff Vachon is the President of Biologics, a company specializing in business intelligence and medical imaging analytics.

GE's Edison is a comprehensive platform for developing your AI apps

Properly managed artificial intelligence (AI) will be a boon to healthcare by helping automate the most mundane and repetitious tasks and allowing providers to focus more time on patient care. AI can also provide another set of eyes for busy professionals, providing them with a smart assistant and even an intelligent second opinion.

To achieve all of this, healthcare providers need solutions that span multiple modalities and seamlessly integrate applications or AI algorithms directly into their existing workflows.

GE Healthcare recognizes that a main challenge in realizing a “deep learning” and “data driven” healthcare system is the integration and execution of multiple algorithms and applications seamlessly into clinical workflows. Getting started is usually the hardest part. This entails extracting and curating data as the first milestone and is usually one of the most time-consuming and challenging steps to begin developing algorithms.

Typically, startups and researchers use several disparate tools and methods for curating data, which then creates challenges for training and testing algorithms on these different data sets. In contrast, GE has developed, and continues to refine, an ecosystem approach for curating, labeling and training supervised and unsupervised machine learning algorithms.

These development and vetting tools are intended to empower a consistent solution for developing Deep Learning AI solutions. The platform allows the sharing of data and/or algorithms, annotation of images, and strong cross-pollination of work amongst collaborators that are in completely different locations.

GE Healthcare believes that in a world where there are literally endless opportunities for AI to benefit healthcare – an industry made up of billions of images, terabytes of data and infinite use cases – we must adopt a platform mindset, and we must serve the possibilities with an ecosystem.

Welcome to Edison: You’ve heard the phrase in many contexts – “it starts with a solid foundation.” As Artificial Intelligence continues to proliferate healthcare, this phrase has never been more important.

At GE Healthcare, our solid foundation is Edison. A holistic and integrated digital healthcare platform, Edison enables developers to easily build, validate and seamlessly deploy compliant algorithms. It includes services like a tool that tracks the source and usage of data in AI development and tools designed to reduce the time of essential healthcare-specific annotation tasks. It is supported by a network of technology, clinical and innovation partners. And it is guided by ethical principles, because safety and efficacy are always paramount.

Edison is not simply for research, nor is it about disconnected bolt-on solutions. Edison is about real technology designed to address the four major forces affecting healthcare today: cost, quality, access and patient and provider experience. Edison allows clinicians to address those forces by embedding AI into devices and applica-

tions to improve consistency, support more accurate measurements and make healthcare more precise.

We feel confident about this foundation – hardware and software working seamlessly together to help improve outcomes without a disruption to the workflow. Now, it’s a matter of scaling the AI work.

Edison enables GE Healthcare to integrate and assimilate data from disparate sources, apply advanced analytics and AI to transform the data, and generate insights to support clinical, financial and op-

erty come when silos are broken, but data veracity will only be realized when information is reviewed by top clinicians and researchers. Expert annotation helps ensure you’re training algorithms with accurate information.

Build an ecosystem. Like in other industries, a platform is only as strong as the network it fosters. In healthcare, this network defines the quality of the algorithms as well as the ability to rapidly validate and scale the work.

Make ethics central. The ecosystem

new healthcare applications, services and AI algorithms. Over the next few years, we expect the platform to become central to the healthcare ecosystem and an important hub for innovation with thousands of applications and healthcare services available. While there is no shortage of projections on what a healthier world looks like thanks to more precise, predictive, prescriptive, efficient and preventative care, we are already making tangible progress toward that vision.

For example, we launched Edison Data-
logue, a new enterprise data management solution that connects data systems, devices, applications and clinicians to give health systems a more holistic view of their data, ultimately to help improve clinical and financial outcomes. Customers like the U.K.’s NCIMI National Consortium for Intelligent Medical Imaging use our vendor neutral archive, a key element of Edison Data-
logue, to have a more complete picture of a patient’s imaging history.

What are we doing in Canada? Leveraging our expertise as a leading global medtech and diagnostics innovator, GE Healthcare Canada is building a digital innovation co-development network across the globe to democratize these tools and collaborations.

GE Healthcare Canada is proudly contributing to this global network through active collaborations with healthcare authorities and providers on a number of digital health and AI-related fronts.

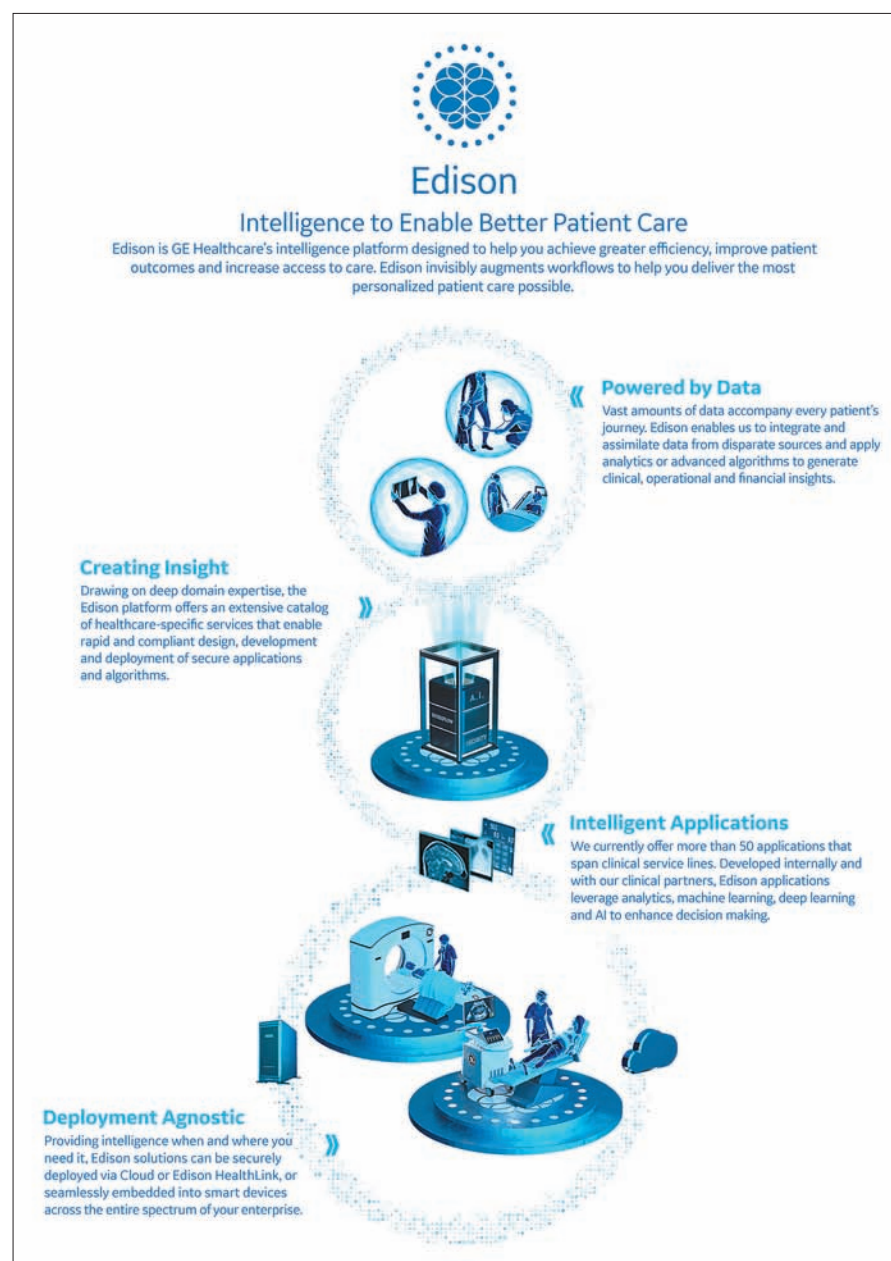
Numerous clinical collaborators are using our predictive analytics by leveraging real-time data to augment point-of-care/point-of-decision making. From anesthesia data, to echocardiograph data, to X-ray repeat & reject analysis, these applications are automating processes and shifting towards predictive and prescriptive decision support tools.

Similarly, GE Healthcare’s clinical command centres are designed to serve as a central node for healthcare operations, combining the information, authority, and analytical and AI technologies to anticipate, identify and resolve patient bottlenecks, delays and risks in real-time.

Canada’s very own Humber River Regional Hospital was one of our earliest AI collaborators. Their contribution was cited in the recent FDA approval for Critical Care Suite’s pneumothorax algorithm.

GEHC Canada is actively working with multiple hospitals and researchers to develop comparable AI technologies across the diagnostic imaging spectrum including women’s health, CT and MRI and to bring the new Edison Workbench platform into the hands of many of the new and emerging digital technology companies across Canada.

We know that investment in healthcare startups is exploding – but implementing new innovations effectively can be cumbersome and complex, slowing adoption. For instance, deploying a one-off clinical AI application is currently a manual and disjointed process. Clinicians are looking for a single solution that can span multiple modalities and seamlessly integrate applications or AI algorithms directly into their existing workflows to harness the power of these technologies.



erational decision-making. The Edison portfolio unleashes analytics, Big Data and AI holistically – build not just one tool but an open platform; develop not just one application but an entire library; integrate the technology not just into one hospital or health system but into every imaging machine and every health data repository, designed to help achieve greater efficiency, increase access to care, and improve patient outcomes.

Break down data silos. Healthcare has become good at generating data but bad at using it. A good healthcare platform must combine globally diverse data from across modalities, vendors, healthcare networks and life sciences settings.

Secure experts. Data volume and vari-

should be connected by not only technology but also a shared commitment to compliance and ethics. Ingraining compliance and ethics into the platform itself prevents development from veering outside these standards.

Deploy agnostically. When algorithms can be deployed via edge, cloud, smart devices or intelligent applications, AI is enabled at the point of maximum impact for better care.

One of the key features of Edison is that data can be traced throughout the development of an algorithm, which could radically simplify the healthcare community's ability to create compliant AI applications.

GE Healthcare developers and our strategic partners use Edison to develop

Kaiser Permanente makes use of visual analytics with diabetic populations

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and PCPs they can view and discuss detailed patient data. Previously, PCPs “would spend a lot of time trying to collect information about their patients and would have trouble getting it,” said Shen.

In Q3 of 2018, dashboards designed specifically for clinics provided Clinic Outcomes Performance metrics, including a clinic scorecard, key demographics breakdown, PCP and clinic comparisons, and detailed patient reporting. “This allows each of our clinics and their leadership to see how each location is doing,” said Shen.

Operational improvements since implementing the workflow transformation with visual analytics include huge time savings. “We’ve eliminated 12 hours per month collecting data and building reports,” said Shen.

Care manager performance improvements include reducing A1C turnaround time from five or more days to one day, a 10 percent increase in message volume completion, and they are maintaining an average momentum (the time when care managers are actively doing something, like ordering lab reports, titrating medication, etc.) of 40 percent.

“It is one of the most important tools we have to hold care managers accountable and increase quality of lives for our diabetic

Kaiser Permanente wants to create predictive analytics, which will show which diabetic patients may lose control.

patients,” said Irene Hsieh, Director, OC, Complete Care and Pain Management.

Shen said, “We’re showing a multi-year trend of improving control rates in Orange

County. Since 2016 we’ve increased A1C control rates by 9 percent, which equals about 4,000 diabetics who are now in control,” he said, revealing that translates to cost savings of \$1.9 million.

Asked about next steps for their Tableau visual analytics, Shen noted the project is ongoing. “It will never end,” he said. Next, they want to create a Patient Snapshot View – a single view to bring in disparate data regarding patient status.

“It will let our care managers save time preparing for patient visits without having to dig around the EMR system,” he said.

They also want to create Predictive Analytics, which will enable them to assess whether and when a patient currently in control of diabetes is likely to go out of control. Adding predictive modeling will let them predict risk of churn showing which patients are likely to go out of control first so they can prioritize patients.

Asked if they are also going to look at patients who do not yet have diabetes, Shen said yes, they plan to look at what they can do for non-diabetic patients who are at risk.

Organizations fail to give security the attention it deserves

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privacy consulting firm and developer of software solutions.

“The healthcare sector is doing a poor job of educating staff,” said Lo. “They may use a checklist approach each year and check off various topics. But how do we know that people have really absorbed it?” Chances are, he said, they haven’t.

Instead, employees must be given more interactive training. As well, the training shouldn’t be limited to once a year.

Jodi Moore, enterprise sales director at Aruba, noted that organizations should regularly run tests and stage simulations. “Do a phishing attack on your own organization,” she said. If people see that they can fall for a staged attack, they’ll be less likely to succumb to a real phishing attack.

“This learning can be invaluable,” she said, and can help change the behaviour of staff so they’re more careful about clicking on links in unusual-looking e-mails.

Moore also pointed to the growing number of devices in organizations, through which hackers can stage attacks and obtain data. The amount of data flowing through these devices makes it nearly impossible to monitor using older techniques, which ultimately rely on human intervention.

Her company, Aruba, has instead created a system that uses artificial intelligence and “User Entity Behaviour Analyt-

ics” to monitor devices for unusual activities. “We can look at a user, and factor in the people he or she normally speaks to, the devices he normally touches, and even the countries he regularly talks with. If something odd happens, like unusual activity or downloads, we’ll spot it.”

Moore said various devices can be given risk scores, with different actions taken when various levels of risk are breached. “You might have an IV pump that starts talking to different devices. If it breaches its risk score, it can be automatically quarantined.”

Surgeons testing virtual care system receive high marks

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experience survey online to provide us with feedback on how we can improve.

I use this system to assess all patients within 48 hours of surgery to answer questions about their procedure and assess pain control on our multimodal pain system. Reacts also has a virtual waiting room, and has tremendous flexibility in workflow that can be adapted to many use cases.

In our completed pilot study of March 2019 to October 2019 we completed 1,097 virtual visits and have enrolled 35 physicians. Our patient experience survey data over the same period gave our Reacts pilot a 9.47/10 rating for overall patient experience.

When asked if the Reacts visit was superior to an in-person visit, 77% strongly agreed. Having successfully completed

our pilot we believe the Reacts system is ready for wide-scale use in the province of Ontario.

Dr. Sacha Bhatia and William Falk in their 2018 report for the C.D. Howe Institute propose a “virtual first” philosophy

The healthcare of the future does not exist in the past; virtual visits may become the primary way of interacting.

that uses virtual care and secure email to provide care whenever possible. They emphasize the importance of adopting secure email to communicate between care providers and with patients. Appropriate remuneration needs to be in place to fairly compensate these changes.

As many different secure and effective

market solutions are developed, we will soon have an abundance of effective options to provide virtual care. The Ministry of Health and Long-Term Care is reviewing technology options at this time and will need to approve widespread changes before the telemedicine market is open to a variety of solutions.

Conclusion: I believe we have a right to greater quality healthcare, where we need it, how we need it, and when we need it so that we can live to our greatest potential. This is fundamentally about choice, putting patients in the centre of their care, and reducing costly bricks and mortar service when clinically appropriate.

The healthcare of the future does not exist in the past and an integrated system using virtual visits and secure email may ultimately be the primary way for us to interact with our caregivers in the not too distant future.

Caregivers concerned with market-share should improve the care and its delivery, and then encourage the payment systems to support that, which we are already seeing with bundled care programs. Physicians, patients, and administrators must understand the value of virtual care and secure email, and address issues of privacy, security, compensation, technology development, EHR integration, licensure, government regulation, local culture, and research to provide an integrated solution that places patients in the centre of their care.

Broadband internet access must be accessible to rural communities. We must develop secure encrypted email solutions that allows communication in healthcare to move into the 21st century.

Patient experience must be at the core of our vision as healthcare providers, understanding that patient expectations are fluid, and the best of class experiences one receives in other business interactions are now expected in healthcare..

Duncan Rozario, MD, is Chief of Surgery, Oakville Trafalgar Memorial Hospital.

Intelrad

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adopted at hospitals in Edmonton, where MIC’s radiologists provide reading services.

In addition to Smart Worklist, MIC has also contracted for Intelrad’s newest product, called Odyssey.

Odyssey makes use of clinical AI to analyze diagnostic images and alert radiologists of unusual findings. When this happens, the system can route cases to the top of all radiologist’s list, so they’re read with greater priority.

On the clinical AI side, Intelrad has partnered with Zebra Medical of Israel – which is regarded as one of the world’s leading developers of medical AI systems.

There are currently four different AI solutions available on the Intelrad platform from Zebra, Wood said. They in-

clude detection of intra-cranial hemorrhaging, or bleeding of the brain; pneumothorax and pleural effusion; spine compression fractures; and coronary calcium scoring.

These solutions are FDA-approved in the United States and are currently

Intelrad is offering free usage of the Zebra Medical apps until December 2020 for users of its Smart Worklist.

awaiting the green-light from Health Canada, which should happen very soon, Intelrad said.

Wood noted that four more algorithms from Zebra Medical will be made available in the near-future, and additional ones are in the works.

Interestingly, the company is offering free usage of the Zebra Medical

clinical apps until December 2020 for customers who are deploying Smart Worklist. This gives radiologists a chance to experiment with AI and to see how it can add value to their day-to-day operations.

The clinical AI system can automatically scan diagnostic images for the four different types of problem areas, and if they choose, users can configure its usage in any way they like.

Whether its workflow or clinical problem-solving, AI is going to be used increasingly in the years to come, said Wood. “It’s such a useful tool, and there’s so much data being generated by radiologists.”

But Wood noted that AI isn’t perfect – at least not yet. “It’s extremely helpful, but you always want a person checking what it comes up with. AI and radiologists seem to have complementary skills, such that the combination nearly always scores the highest accuracy.”



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