

CANADIAN Healthcare Technology

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Improved bed forecasts

Trillium Health Partners has devised a cloud-based algorithm that allows it to more accurately forecast occupancy rates. It worked with UBC and AWS on the project.

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A study by Will Falk analyzes how patients and providers have experienced virtual care. To sustain and strengthen virtual care, he offers some bold prescriptions for the future.

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Innovative radiology

The Joint Department of Medical Imaging, comprising five downtown Toronto hospitals, has launched a new MRI centre that enables researchers to work alongside clinicians. More projects are in the works, as the JDMI continues to invest.

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PHOTO: WEENEEBAYKO AREA HEALTH AUTHORITY

Mini-MRIs arrive in Canada, assist at point of care

The Weeneebayko General Hospital, in Moose Factory, Ont., has become the first in Canada to clinically test and use a portable MRI system for neuro exams. Instead of sending patients to another hospital for an MRI, the exams can be done right on site, with the images sent to radiologists in Kingston, Ont. Above: Dr. Elaine Innes, chief of staff, (l) and Queens' medical student Chloe Des Roche. **SEE STORY ON PAGE 4.**

HumanCare project aims to improve patient experience

BY DIANNE DANIEL

TORONTO – If you're one of the nearly seven in 10 Canadians who believe our country's health system is in need of an overhaul, it's time to put on your imagination cap. After commissioning a survey that showed the majority of people feel there is room for improvement, Toronto's St. Michael's Foundation has launched a \$1-billion-dollar, decade-long campaign to reinvent the patient experience, and the end result is expected to look very different from what we're used to.

"Our vision is really, over 10 years, to design everything we do around the patient," said St. Michael's Foundation president Lili Litwin, in announcing HumanCare, a mission to "humanize" every aspect of healthcare.

What the Leger Canada survey showed is that even though 81 percent of Canadians surveyed are confident with the technical care they receive, 68 percent are unhappy with their overall healthcare experience, re-

Satisfaction with the healthcare system is lowest among the marginalized and disabled.

porting they don't feel "safe, comfortable, listened to, accepted or connected" as patients.

The results are worse for those experiencing marginalization, including those living with a disability, those belonging to the LGBTQ2+ community and those who identify as Black, Indigenous or People of Colour, who add that they also don't feel respected.

"We already have a research facility called the MAP Centre with the largest number of scientists studying health equity and caring for those who are disadvantaged," said Litwin, "so we were already in a position to look at the care experience, and this idea was really born through the leadership at the hospital."

The goal of HumanCare is to help patients feel comfortable when they're at their most vulnerable, connected to their care team and involved in decision-making, and confident that they are receiving the best care possible, no matter who they are or where they come from.

The new patient experience will include: easier access to care and shorter wait times; equitable care; seamless care that allows patients to flow through the system without

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\$1 billion HumanCare project aims to improve the patient experience

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needing to repeat information or travel to multiple locations; built spaces that are about wellness, not illness; health teams who treat patients as individuals, not categories; and, personalized care that reflects individual needs.

"We're going to start with a centre for measurement, which has never been done before, and we're going to measure the patient experience from the patient point of view," added Litwin.

The movement includes the creation of a first-of-its-kind Care Experience Institute which aims to rethink healthcare design and delivery by challenging old ways and developing new, innovative approaches.

The institute's 11 specialty centres – including Centres for Food as Medicine, Substance Use and Mental Health and Healthy Aging – will focus on developing new research, education and programs throughout all facets of the healthcare experience, supported by digital technology and analytics.

Instead of pigeonholing technological advances into an existing system, with a focus on bricks, mortar and machines, the

idea is to always put the patient first and ask: How does this impact them and their loved ones?

"Right now, patients have to conform to hospital buildings, monitors and processes. Maybe we should shift our thinking and try to conform what we do and how we're structured to what the patient wants," explained Dr. Muhammad Mamdani, vice-president of Data Science and Advanced Analytics at Unity Health Toronto, whose team will be leveraging data and artificial intelligence to help form the reinvented patient experience.

For example, one of the biggest frustrations identified by patients is long ER wait times. Dr. Mamdani's team is working to disrupt the entire experience, by applying advances like individualized wait times, virtual triage and wearable sensors.

Instead of waiting for eight hours in an uncomfortable waiting room not knowing when they might be seen, patients would be told their expected wait time based on their specific condition.

If the wait is lengthy, they'd be given the option to go home and return later, or to book a clinic appointment the following



Lili Litwin



Dr. Muhammad Mamdani

day. They might also be provided with wearable technology so that their heart rate, temperature or other vitals could be remotely monitored by an ER nurse while they wait at home. Another option is to incorporate a virtual triage process, where patients are assessed by phone or video in the comfort of their own home, perhaps avoiding a trip to the hospital altogether.

The innovative approach will enable hospitals to "completely flip around" wait room designs, to create smaller, more comfortable, visually appealing spaces that both look good and feel good, said Dr. Mamdani.

"I don't think it's a matter of decades away. I think it's a matter of a few years away," he said, noting that the transformation requires tough problem solving but is not impossible. "It's about rethinking that process of brick and mortar and having people wait on these uncomfortable chairs. How do we revise that? That's what HumanCare is about."

Another goal of HumanCare is to provide equitable care that takes into account each person's life circumstances. One group of patients often disregarded or dismissed in the current health system are IV drug users who are at a high risk of mortality and yet typically don't identify themselves for fear of being stigmatized.

Dr. Mamdani's team is working on an AI algorithm that uses natural language processing to rapidly pore through clinical notes, lab values and other data to flag vulnerable patients, so that a highly skilled addictions team member can discreetly intervene.

"You can imagine a specialized team who really understands how important it is to be compassionate, courteous, to approach things in a much more sensitive manner," said Dr. Mamdani. "If we can get the team to coordinate with the patients, it would be a much better experience for them."

The four main pillars of change involved in HumanCare are Care, Research, Education and Digital Transformation (CRED), and advances in each area include: removing the need for travelling from appointment to appointment by providing one-stop care; extending the reach of world-class surgeons by using remote robotics to perform complex surgeries at community hospitals; replacing one-size-fits-all ventilators with smart units that can be customized for each patient to give them the best chance of recovery; using patients as teachers to help medical students better relate to the patient experience; and, offering food that is sustainable, and respects a patient's culture, health conditions and dietary preferences.

Some achievements – like St. Michael's innovative early warning system that is reducing mortality rates by 20 percent by automatically assessing 100 different variables in a patient's chart every hour – are already implemented; others will be developed as the HumanCare movement evolves.

"I think the big difference is the leadership of our hospital. They are behind this 110 percent," said Litwin. "We're not just saying it. We're measuring it, studying it, simulating it, practicing it and then we're going to perfect it, measure it again and teach it ... in 10 years, the care will be patient centred."

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The smiles start at ukg.ca

MRI at bedside speeds up diagnosis for rural and urban hospitals

BY JERRY ZEIDENBERG

MOOSE FACTORY, ONT. – The Weeneebayko General Hospital, serving patients at James Bay and Hudson's Bay, has become the first hospital in Canada to implement a portable MRI scanner for a project assessing the technology in a clinical setting. The hospital went live with the Hyperfine Swoop, a scanner that can be wheeled to the bedside and plugged into a standard electrical outlet. It is operated remotely through an accompanying iPad.

The Hyperfine Swoop was recently approved for use by Health Canada and is designed for neurological exams. It can detect in minutes whether the patient has suffered a stroke, can identify the type of stroke – ischemic or hemorrhagic – as well as other problems, such as swelling of the brain.

“We’re using the scanner so that we can care for patients right here on our site, instead of sending them for MR scans by Medevac to Timmins,” said Dr. Elaine Innes, chief of medical staff at Weeneebayko Area Health Authority. While the hospital offers many services, from emergency care to surgery, it doesn’t have an MR scanner and has needed to transport patients to Timmins or Kingston when this kind of exam was required.

That’s disruptive for the patients and their families, and expensive for the healthcare system. Now, with the portable MR scanner, patients with neurological issues can stay in Moose Factory and the surrounding area.

As there are no radiologists at the Weeneebayko General, the hospital has established a partnership with Queen’s University and the Kingston Health Sciences Centre for neuroradiologists there to interpret the exams. The files are sent over a secure, high-speed network without any trouble and are received by the doctors in Kingston within seconds.

Dr. Omar Islam, head, Department of Diagnostic Radiology at Queen’s University, said the Weeneebayko General Hospital expects to scan up to 200 patients in 2022, with the exams read by radiologists in Kingston, about 500 miles away. Not only will that save these patients the disruptive trip to another city, but the diagnosis will be made much faster and any treatment required can be instituted immediately.

“Once we receive the images, the exam can be read in a few minutes,” said Dr. Islam. “There is an approximate 10-to-15-minute turnaround time.” Neuroradiologists in Kingston are available, moreover, to read the images day and night.

Knowing the diagnosis, doctors at the Weeneebayko General Hospital can then treat the patients much faster – with results coming back in minutes instead of waiting for the patient to be transported by aircraft to another medical centre.

Dr. Islam noted the Hyperfine Swoop is a low-field MRI, with a field strength of 64 milliTesla. That compares with the 1.5T and 3T field strength of the magnets used in conventional MRIs.

“This won’t replace a conventional MRI



The Hyperfine Swoop MRI can be wheeled to the bedside and plugged into a power outlet on the wall. In minutes, it can determine if a patient has suffered a stroke.

machine,” he said. “But it does give you images that allow you determine whether there is a stroke or swelling of the brain. It’s a very useful tool, and it enables earlier diagnosis.”

Dr. Innes said the hospital has been training its doctors to use the Hyperfine MRI with patients. It is also training nurses, in case physicians are unavailable.

The Weeneebayko General has most other imaging modalities, including a CT scanner, as well as ultrasound, mammography, and general X-ray. These images are read by radiologists in Timmins.

For the new MRI system, the readings are being done in Kingston, which also has a long-standing relationship with the Weeneebayko region. “Many of their patients come to us for care,” said Dr. Islam.

The Swoop portable MRI was created in the United States by Hyperfine, a company led by entrepreneur/inventor Dr. Jonathan Rothberg. He is also behind the Butterfly iQ, said to be the world’s best-selling point-of-care ultrasound (POCUS), and is the creator of a form of high-speed DNA sequencing.

Dr. Rothberg was awarded the National Medal of Technology and Innovation by U.S. President Barack Obama. He earned his PhD at Yale University.

The Hyperfine Swoop exams take five to 30 minutes to complete, depending on how many sequences are conducted. It’s not difficult for adults to remain still for this long, but it is challenging for pediatric patients, said Scott White, chief commercial officer for Hyperfine.

However, he said the company is working to reduce the time needed for exams. It’s implementing artificial intelligence, as well, to speed up the reconstructions of images.

Casey Newhouse, the business development manager for Hyperfine, noted that

the low-field Swoop is not a replacement for standard MRIs. But he said it’s a valuable and affordable tool that can reduce wait times for MRI exams in many hospitals, both rural and urban.

Hyperfine is working with a Canadian commercial partner, UpCare Partners & Associates, to provide delivery, training, and support of the Swoop. “We needed someone with experience in neurosciences,” said White. “UpCare understands the rural and metropolitan hospital markets, and we believe they will be a great partner for us.”

UpCare was launched by Benoit Sai and Olivier Poitier, both of whom have worked

The Weeneebayko General expects to scan up to 200 patients this year, using portable MRI exams.

in the medical imaging sector for many years. “We’ve been in healthcare for 20 years and in neuro for 10 years,” said Sai. “We’ve both seen so many bottlenecks that we want to alleviate.”

To this end, UpCare has been bringing innovative technologies into Canada in the areas of neurology, cardiology and women’s health.

The Hyperfine Swoop could be a game-changer, Poitier believes, as it has the potential to dramatically speed up access for patients with neurological pathologies and reduce wait times – which have become alarmingly high for MRIs.

He pointed to a recent Conference Board of Canada study which predicts the average wait time for an MRI in Canada to rise to 133 days in 2022 from 89 days before the COVID pandemic. For reference

the Canadian Wait Time Alliance recommendation is a 30-day wait time.

A device like the Hyperfine Swoop, he noted, can be used to quickly provide extra capacity in the healthcare system, at much lower cost than a conventional MR scanner.

“We estimate that a standard, 1.5T MR scanner will cost over \$4 million to acquire and operate over 10 years,” said Poitier. He said this type of equipment requires substantial renovations – overall, the acquisition is a long and elaborate process which involves a significant amount of human resource.

By contrast, the Hyperfine device can be up-and-running in half a day. “Swoop is free of renovations and shielding, with limited human capital,” said Poitier.

UpCare is providing a complete suite of services with the Hyperfine Swoop from the installation to the forward-looking customer service support, as well as continued education.

In December, UpCare and Hyperfine showcased the Swoop at St. Michael’s Hospital, in Toronto, providing doctors, nurses and other clinicians with a look at the machine. They also provided an educational session about the device’s capabilities and operation.

“It attracted a crowd of doctors and nurses,” said Sai. “In all my years of doing presentations, I’ve never experienced such a welcoming and heartwarming event.” Clinicians from the ICU, surgical department, radiology and others came to see the unique machine, and at one point, began clapping. “They saw this as a real solution to their challenges.”

Following this event, doctors began to identify a large number of head exams that have the potential to be done at the point-of-care, diverted from conventional MR and freeing time for other patients, said Sai.

Ending cervical cancer in Canada is within reach with new technologies

It's critical that we aggressively root out HPV wherever possible using early detection and treatment.

BY DOUGLAS DONOVAN,
VP GENERAL MANAGER, HOLOGIC INC.

Canada has an ambitious, but achievable goal: to eradicate cervical cancer by 2040.¹ With the advent of human papillomavirus (HPV) vaccines, this goal seems more within our reach than ever, but there are still miles to go – and we need to take advantage of technological advances to get us across the finish line.

Cervical cancer is primarily caused by persistent genital infection with high-risk HPV. The arrival of HPV vaccines 15 years ago was a game-changer, and of course, vaccines are an enormous part of the solution to changing the course of cervical and other genital cancers – the next generation of Canadian women could be cervical cancer-free. But for many women, it is too late for prevention. HPV prevalence has historically been 70 percent² – prior to the introduction of HPV vaccines, three out of four sexually active Canadians would have contracted a form of HPV at some point in their lives.³

It's still critical that we are aggressively rooting out HPV wherever possible for early detection and treatment – the health of millions of women in Canada still depend on it. Not only is there a large population that needs regular screening, but during the COVID-19 pandemic, screening rates have dropped precipitously, increasing the likelihood of undiagnosed cervical cancer. Health care professionals have raised the alarm that many cancers may be going undetected due to lack of screening and diagnosis.⁴

Governments have recognized this backlog and are investing in screening and diagnostics to help make up for lost time, but it's a good time to pause and ask how effective our cervical cancer screening



methods truly are, and what more we could be doing to end this disease.

We continue to rely on the Pap smear, a nearly 100-year-old technology that has seen little innovation despite its near-ubiquitous use.⁵ While the pap smear has been one of the most successful cancer screening tools, there are newer approaches that could be more broadly adopted in Canada to help us reach our goal.

Hologic ThinPrep® Pap Test is a more recent innovation that provides sensitive testing of the cervix cells and can more accurately identify abnormal cells that may lead to cervical cancer. It produces fewer false-negatives and false-positives, reducing the need for repeat testing⁶ and allows for easy HPV reflex testing. Yet across Canada, only a handful of provinces have implemented liquid-based cytology to improve their cervical cancer screening programs, including Saskatchewan, that made the switch right in the middle of a pandemic.⁷

And when it comes to HPV testing, new technologies can also help to root out the main cause of cervical cancer. As recently as just two years ago, mRNA was a little-known method of fighting disease. Now thanks to the widespread adoption of mRNA vaccines to fight COVID-19, we know it's capable of carrying important information to the body. This technology can also be used to identify HPV.

In fact, a new health economic model developed by Aquarius Population Health and recently published in *Preventive Medicine Reports*, shows that if an mRNA HPV test such as Aptima® HPV were implemented in Ontario as part of a cervical cancer screening program in place of a DNA test, it could save the province over \$4 million annually and avoid unnecessary colposcopies and additional screening test.⁸

This kind of program could be implemented to similar effect in provinces across the country and save scarce health care dollars overall while reducing the burden of screening on both Canadian women and the time spent by overworked health professionals.

As women start to return to regular testing and screening for cervical cancer, we have the opportu-

nity to take advantage of these technological advances. Ending cervical cancer is within our grasp – now let's finish the job.

Douglas Donovan is the VP and General Manager of Canada and Latin America, Hologic Inc, an innovative medical technology company primarily focused on improving women's health and well-being through early detection and treatment. For more information on Hologic, visit www.hologic.com.

About Cervical Cancer in Canada

Each year in Canada, more than 1,300 women are diagnosed with cervical cancer and over 400 die from the disease.¹ Almost all cases of cervical cancer are caused by HPV², which is preventable through the HPV vaccine. The publicly funded vaccine is provided to male and female students in every province and territory through school-based programs.³ Regular screening of adult women is also vital as cervical cancer caught at an earlier stage has a high survival rate.⁴

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Virtual care can help the system, but further collaboration is needed

BY MICHAEL GREEN

Many Canadians have found themselves stretched to the limit by COVID-19 – and so has the health system. Patients and providers continue to manage unprecedented challenges like postponed diagnoses and treatment for medical issues, longer wait times and overburdened hospitals.

The disproportionate effects of the virus and inequities in vaccine access across different populations have also illuminated the social and economic disparities that affect Canadians' health.

While the COVID-19 pandemic brought far-reaching changes across the globe, pandemic recovery has the potential to transform Canadian healthcare just as profoundly. As Canada looks towards a post-pandemic future, we have a unique opportunity to create the modernized health system that Canadians deserve.

Virtual care is poised to be one element in the long-term future of health care in Canada, but realizing its potential rests on three pillars: collaboration across sectors, change management for patients and providers, and connecting health system silos.

Throughout the pandemic, virtual care has proven itself an essential tool for patients and providers as another option alongside in-person visits for most routine appointments.

In addition to helping deliver timely, quality care, virtual care also helps to ensure that health system resources are being used effectively. In a Canada Health Infoway (Infoway) study, 81 percent of respondents agreed that virtual care services helped them avoid an in-person visit to a clinician or emergency room.

By offering another option for accessing care, virtual solutions can help ensure that in-person services remain available for those who need them.

But the wide-scale deployment of virtual care requires substantial collaboration. We've already seen the success these partnerships can bring. Immediately after the COVID-19 pandemic was declared, Infoway began working with Health Canada and the provinces and territories to help provide urgently needed virtual care programs and services.

In total, 17 projects were deployed across all jurisdictions in four focus areas: virtual visits, e-mental health, remote patient monitoring and access to COVID-19 test results. As

of March 31, 2021, 3.5 million Canadians and more than 91,000 health care providers had logged more than five million uses of virtual care solutions as a result of these projects.

Effective as it was during a time of crisis, this virtual care infrastructure can be leveraged and further refined after the pandemic ends: not a bandage solution, but an integrated, essential part of our post-pandemic health system.

We also have the duty to ensure that our post-pandemic health system is an equitable one. The disproportionate effects of COVID-19 on different demographic groups showed how social inequities can exacerbate health disparities. Virtual care can help improve access to care for underserved populations, but we must ensure that no one is left behind by a digital divide.

And so, the infrastructure we must consider isn't just digital. It's human, too. With our partners, Infoway is already developing programs to support Canadians with change management. Clinician toolkits and resources will ensure that our health workforce has the training, tools and knowledge to provide appropriate care, while digital health literacy programs will help Canadians develop the skills and understanding they need to effectively access and use virtual care services.

Alongside collaboration and change management, connection is the third pillar to heal an ailing health system. We won't realize health care's full potential unless we can bridge the silos that plague it.

Just as a circulatory system cannot

have blockages, health data needs to flow within and between different solutions. Any virtual care infrastructure needs to be interoperable; ensuring that different parts of the health system can communicate enables better coordination and continuity of care.

Initiatives to enhance interoperability are already underway with a national effort to develop pan-Canadian specifications for patient summaries and secure messaging between solutions.

Rebuilding and recovery will take work, but there is appetite for change. According to the 2021 National Survey of Canadian Physicians, 94 percent of Canadian physicians currently use virtual care, with the majority planning to use it after the pandemic ends.

Similarly, nearly nine in 10 Canadians report that COVID-19 has demonstrated that virtual care tools can be important alternatives to in-person care. Another Infoway study found that 90 percent of Canadians were satisfied overall with their most recent virtual visit.

The COVID-19 pandemic has created unprecedented challenges for healthcare. It has also provided a critical catalyst for change. Now is our chance to reimagine the health system, bring it into the present, give it the flexibility to adapt quickly in the future and ensure that it serves all Canadians equitably. While the pandemic has exposed our health system's weaknesses, virtual care can help heal them and build a better health system for all Canadians.

Michael Green is President and CEO of Canada Health Infoway.



Michael Green

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Cloud helps improve occupancy planning

BY NEIL ZEIDENBERG

MISSISSAUGA, ON - Since the start of the pandemic, it's not uncommon for Ontario hospitals to operate at occupancy rates above 100-percent. That's why finding a way to match bed supply with patient demand is key to improving overall patient care, safety, and operational costs. The solution to this challenge may lie with 'bed occupancy forecasting', a process that involves analysis of admission and discharge data - often done manually.

At Mississauga-based Trillium Health Partners (THP), Canada's largest community-based hospital system, their research and innovation arm, the Institute for Better Health (IBH), is using cloud technology to improve the hospital's two-to-seven-day capacity forecasting by analyzing bed-use data to identify patterns and anticipate capacity requirements more accurately.

"Our analytics lab developed a prediction algorithm to help improve hospital capacity forecasting and better

match bed supply with patient demand," said Jonathan Ranisau, project lead, Data Discovery, The Institute for Better Health (IBH).

THP created a data lake - a solution that imports data from multiple sources into a centralized repository, then automatically extracts the data and identifies its schema to create a data catalog. From there, the data team can identify any gaps in the data. Centralizing the data in the data lake helps simplify collaboration between researchers, data scientists and any other members of the team.

THP is one of the first healthcare organizations in Canada to apply cloud computing and analytics to develop a predictive occupancy planning model. The model will help hospital administrators predict demand for hospital beds and plan for potential instances where surge capacity is required.

The model was developed in collaboration with the University of British Columbia (UBC) Community

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The business case for a fully converged medical imaging platform

Integrated imaging platforms, reaching across the enterprise, are proving to save valuable time for radiologists.

Physicians who can see diagnostic images and instantly connect them with other test results, notes, and patient reports are better informed to make decisions and diagnoses. They can also make faster decisions, which translates into more time available for patient care. So, the more than 6,000 hospitals as well as the over 120,000 healthcare practices owned by hospitals and corporate entities in the U.S. are at a distinct disadvantage if healthcare providers don't have every piece of patient information in the same place at the same time. The same issue – rapid access to disparate sources of information – applies equally to physicians at Canada's 700+ hospitals and thousands of clinics.

In an April 2018 study, the Journal of Digital Imaging quantified “the impact of implementing picture archiving and electronic medical record (PACS-EMR) integration on the time required to access data in the EMR and the frequency with which data are accessed by radiologists.” The results showed that the time it took for radiologists to access data and images in the EMR after unifying the two decreased from 52 seconds to six seconds. Researchers also discovered that such integration was associated with a “significant increase in the proportion of studies for which radiologists obtain additional clinical data.”

Despite the benefits that such time efficiency helps produce – from improved care to lower costs for that care – there remains a deep gulf between wanting more data management in healthcare and achieving it. Of the 742 healthcare leaders surveyed globally in April 2019 by Harvard Business Review Analytic Services, 95% said it is important to manage data across care settings, but only 19% reported being able to do

Of the 742 healthcare leaders surveyed by Harvard Business Review Analytic Services, 95% said it is important to manage data across care settings

so effectively. To be sure, PACS and specialty imaging tools are mostly separated and siloed. Industry experts say complexity, lack of internal expertise, and a willingness to stick with the status quo are holding the consolidation process back. “Healthcare executives recognize the importance of imaging integration but don't have the background or experience to make it happen,” says Christopher Roth, a neuroradiologist who is the vice chairman of radiology, information technology, and clinical informatics at Duke University and the director of imaging IT strategy for Duke Health in Durham, N.C.

For healthcare executives who want to tackle integration, there are plenty of advocate organizations championing the wedding of PACS, enterprise imaging systems, and EHRs. For example, the Healthcare Information and Management Systems Society, a non-profit organization that promotes the best use of IT and management systems in the healthcare industry, in 2016 introduced the Digital Imaging Adoption Model (DIAM) in conjunction with the European Society of Radiology. The model is designed to support healthcare organizations planning for and implementing imaging IT. The eight-stage DIAM provides goals and milestones, creating a maturity model for healthcare organizations.

Bill Phillips, a senior vice president and chief in-



formation officer of University Health, a county hospital system based in San Antonio, Texas, is seeing the benefits of convergence firsthand. The healthcare system in 2017 had multiple PACS, isolated by department. In some cases, PACS even within the same department lacked interoperability, he says. The healthcare system hired a consultant, who was charged with identifying and cataloging every imaging repository across the hospital system's properties, including at its Level 1 trauma center, ambulatory care network, and non-profit provider group practice.

The consultant also spent time one-on-one with healthcare providers, interviewing them about their imaging concerns. University Health executives were surprised at how much work needed to be done before the organization could achieve convergence. They had more systems than they expected, and healthcare staffers stored and saved data independently and, oftentimes, on local drives.

“They found disparate systems all over the place,” Phillips says. “They found systems we didn't even know that existed in departments. We had staffers saying, ‘Hey, I'm dumping pictures from this [system] and throwing them on my desktop.’ Physicians said they didn't want to have to keep clicking and loading and asked us, ‘Can't we do it easier? Can't you make it faster for us to see studies? Can't it be easier to exchange imaging?’ They wanted one platform.”

Armed with these facts, the organization launched a three-part, multi-year project to integrate all its PACS and imaging technologies within its EHR. It was good timing since the EHR was coincidentally scheduled for a \$170 million upgrade. The entire process – from getting buy-in from multiple stakeholders and medical professionals to creating a project plan to rolling out new software – took more than three years. It's paid off, though. The organization reduced the number of disparate systems it has, improved patient care, and raised employee satisfaction and efficiencies.

The University Health executive team started its work by setting performance metrics so that its members would know where the lowest-hanging fruit was when it came to getting started, as well as which benchmarks they should strive to attain. With such a long-term project plan, the organization wanted to start seeing benefits as early in the process as possible.

One of the first tasks in the project was docu-

menting the number of steps a physician had to go through in the hospital's disparate systems before gaining access to an image. This included quantifying how long the original process took and, using data, setting realistic goals for how long access should actually take. Although the healthcare system is still working on the project, it is already seeing impressive benefits and results, Phillips says. Today, University Health has achieved “significant” cost savings due to the phaseout of software licenses and maintenance contracts.

The county system is also recouping time now that its IT support staff isn't rushing around from department to department when something goes wrong, he says. “Multiple systems, multiple systems' support, maintenance contracts. Every disparate system you have around imaging, you're paying a maintenance fee on it, and you're providing servers and you're providing patching and cyber updates and system updates,” he explains. “When you really add them up, you're spending a lot of money to support them. When you have all your imaging housed in one location, it's more cost effective, it's easier to handle, it's normally faster, and it's easier to integrate with [the] EHR.”

Nothing is thus lost or misplaced, either. Plus, security is enhanced since healthcare providers aren't storing images and files on personal devices or systems that lack direct network connectivity, and there are simply fewer systems to keep track of and fewer entry points into the systems, Phillips says. Limiting disparate systems is a compelling benefit considering the cost of a single healthcare breach was \$9.23 million in 2021 – a \$2 million increase over the previous year, according to a July 2021 report, “The 2021 Cost of a Data Breach” from IBM Security and the Ponemon Institute.

This article was excerpted from the Harvard Business Review Analytic Services briefing paper, “The Business Case for a Fully Converged Medical Imaging Platform.” To download the full briefing paper: <https://bit.ly/HBRBizCase>

AGFA 
HealthCare

U.S. makes strides in interoperability, opening systems for better communication

Access to Information has become a primary focus with the new interoperability mandate.

BY DR SUNNY MALHOTRA

Robotic process automation has provided a new solution to an interoperability problem plaguing healthcare for decades. To understand the problem, it is important to understand the healthcare facility interface structure. To share, exchange, and retrieve information from one EMR to another, Health Level Seven (HL7) is the current international not-for-profit organization that provides interface standards. HL7 makes the transfer of laboratory results, pharmacy data, and other medical information possible across various computer systems.

The U.S. Centers for Medicare and Medicaid Services finalized a requirement for the use of FHIR among many CMS-regulated payers and providers by July 1, 2021. The RPA FHIR API interface allows us to standardize connectivity within and between organizations to simplify and expedite coordination of care.

HL7 produced several standards to facilitate sharing of healthcare information over the years, in which HL7 V2 became the most widely implemented healthcare standard. HL7 V2 works by allowing different systems like EMRs, radiology imaging archives, and billing systems to transmit information utilizing ASCII text-based messages as a means of communication.

This has allowed HL7 V2 flexibility and a customizable solution without complex software interface requirements. However, this limits its functionality as the lack of messaging models and specifications compelled organizations to utilize custom coding and interface engines in order to be interoperable.

In response, HL7 released V3, a standard with stricter specifications and a more defined framework. Although HL7 V3 overcame many of the shortcomings of HL7 V2, it lacked backward compatibility and required more time and cost to be implemented, which kept it from being widely adopted by healthcare industries.

The CMS interoperability rule: Healthcare organizations within the United States are required to

support increasing interoperability and access to patient-level health data. The CMS interoperability rule mandated FHIR as a specialized standard that has compliance implications with financial penalties for those who are non-compliant.

The Act supports customers' admittance to their patient-level information, and in turn, supports API access to the information. The final rule entails that all Medicare Advantage, Medicaid, CHIP, and ACA plans give a Patient Access API, available utilizing third-party applications.

The CMS Interoperability and Patient Access final rule has presented specialized guidelines that require

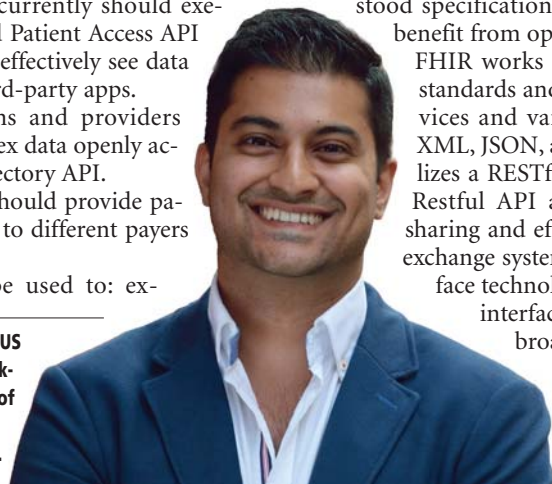
US government organizations, such as Medicare and Medicaid, are starting to demand interoperability between the systems used by providers.

most public payer entities and healthcare organizations to receive FHIR. This includes:

- CMS-directed payers currently should execute and keep a protected Patient Access API permitting the patient to effectively see data about claims utilizing third-party apps.
- Medical services plans and providers should make supplier index data openly accessible in a Provider Directory API.
- CMS-directed payers should provide patient clinical information to different payers when patients' require it.

RPA solutions may be used to: ex-

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change data between disparate systems. For example, between two different EMR/EHR systems or between a PACS/VNA and an EMR/EHR.

The solution facilitates the ability of two or more systems or components to exchange and utilize the information; data migration to a cloud platform to be used as a managed repository to expose data to patient- and provider-facing apps; allows for ease of a cloud platform to ingest data and export data into data warehouses for analysis, machine learning (ML) model training, and many other apps.

"RPA 'bridge to FHIR' approach will reduce the cost of data sharing between health organizations by producing reports with information from the Hospital Information System (HIS) and EMR/EHR," says Jason Warrelmann, Global Director of Healthcare and Life Sciences UIPath.

Using FHIR for API: More recently, HL7 created Fast Healthcare Interoperable Resources (FHIR), an emerging standard to enhance the interoperability of healthcare systems. FHIR simplifies implementation compared to previous standards. It improves communication efficiency and provides easily understood specifications that enable developers to benefit from open web technologies.

FHIR works by building upon previous standards and employs RESTful web services and various data formats such as XML, JSON, and RDA. In addition, it utilizes a RESTful API approach, which the Restful API approach streamlines data sharing and efficiently onboards new data exchange systems with one-to-many interface technology instead of a one-to-one interface, creating the potential for broader interoperability among various systems and devices, including mobile apps, medical devices and wearables, proving advantageous to patients as well.

The COVID crisis is accelerating the transformation of acute care

BY RIKKI JENNINGS

While COVID-19 may be the most significant global public health crisis of our time, it certainly will not be the last.

Moving forward, the goal is to develop smarter, more connected hospitals to encourage the enhanced communication, agility, transparency, and resiliency needed to succeed even in times of uncertainty. All clinical, non-clinical and patient workflows need to be well-orchestrated – even automated.

Healthcare supply chains, hospital supply rooms, and critical care environments must also be better managed than they are today.

To effectively harness resources – including patient, staff, assets, and

data – hospitals must first increase their operational visibility and virtual collaboration capabilities. So, the focus for the next year or two lies squarely on three unique but interrelated priorities: real-time intelligence, expanded clinical mobility, and improved asset monitoring and tracking.

Supercharging hospital operations with real-time intelligence: Every minute counts in a hospital environment, and staff have little time to waste. With so many patients to serve and not enough clinicians to do so, knowing exactly where staff, patients, assets, and inventory are located is crucial to making in-the-moment decisions.

But according to Zebra Technologies' Global Healthcare Vision Study, 65% of clinicians currently

feel staff spend too much time searching for medical equipment and supplies. Additionally, 52% of decision-makers admit accessing information and patient data in real-

Healthcare supply chains and critical care must be better managed than they are today.

time is a challenge at their hospital.

The smart hospital of the future will lean heavily on locationing and automation to keep up with increased demand without compromising the quality of patient care.

As the Internet of Things (IoT) becomes more sophisticated, tech-

nologies like radio frequency identification (RFID) and real-time location systems (RTLS) are becoming more accessible. All hospitals can now track the movement of staff, patients, and equipment, along with the availability of rooms and supplies if they want to – and they do.

Around 75% of decision-makers say they plan to implement locationing technologies to keep a closer eye on everything from patients and their specimens to staff compliance.

When integrated with mobility solutions and other intelligence-driven technologies, hospitals can achieve an optimized information ecosystem, improving operating room and emergency room orchestration, automating patient flow to

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Report offers recommendations for strengthening use of virtual care

In March 2020, the COVID-19 pandemic upended Canada's healthcare systems," notes health sector analyst Will Falk in a 2021 report. "In just one-month, virtual care went from 2-3% of ambulatory care visits to more than two-thirds." While in-person visits have resumed to a great extent, virtual care is still being used far more than before the pandemic struck.

That's because it suits the needs of patients and providers. The balanced shifted during the pandemic because of the increased need for infection control.

As one rural family physician told Falk, "Patients don't want to come into the office. They are very resistant to that if it isn't clinically necessary."

His report, "The State of Virtual Care in Canada as of Wave Three of the COVID-19 Pandemic", examines the impact of this change on patients and providers, and shows how it resulted in real, patient-centred care. The study also looks at what should be done going forward. Put another way, how do we ensure that virtual care continues to be used?

Falk interviewed over 100 people, including clinicians, academics and govern-

"Every person has the right to receive their healthcare data in a usable digital format by April 1, 2023."

ment officials; the study was done for Health Canada. (The full text can be accessed at: <https://lnkd.in/g4YMV3jt>)

Unlike many other reports, however, Falk's actually makes concrete recommendations. The recommendations come with a timeline, and to be honest, they'd be difficult to implement. But given the proper resources and political will, they could all be done.

Here are some of the recommendations in summary:

- Every person has the right to receive their healthcare data in a usable digital format by April 1, 2023. This should include a simple-to-administer ability to delegate control to a family member and to share information among a circle of care. Improving both public health and patient-centred care through robust health information systems.

- Canada's current health data infrastructure is still weak, threatening our communicable disease surveillance and response systems. The experience of the past year has confirmed that it is a matter of public safety that we do a better job on disease surveillance and infection control monitoring in our public health systems. A more robust data infrastructure will also improve our ability to provide excellent and well-organized virtual care to Canadians.

- Lab Requisitions and Results. We must know who is at risk of COVID-19 infection and who is immune. Patients' results have been digitally available for decades in Canada, but through imperfect mechanisms and often not accessible to the patient. Consumer expectations changed in the last two years. They now expect their test results to be available online for at



Will Falk led the national survey, which examines the impact of virtual care on both patients and providers.

least one important test: COVID-19. All tests should now be made digital. All requisitions/results for standard lab tests should be sent/received in a usable digital format by April 1, 2023. No payment should be made for requisitions or results sent/received by paper.

- Prescriptions. All prescriptions should be sent/received digitally by April 1, 2023. Because of the crisis in opioid usage in Canada, all opioid prescriptions should be sent/received digitally by April 1, 2022. The added recommendation on opioid prescribing is long overdue and given the available services could occur immediately.

- Unlike hospitals, long-term care and home care providers often lack robust electronic record systems. A pan-Canadian healthcare organizations should work with the two major Canadian eldercare software companies to redesign institutional and home care reporting systems. Home Care: Canada now has a serious national champion in AlayaCare that allows caregivers to collect patient-reported outcome and experience measures – PROMS and PREMS. This software is built primarily as a logistics and scheduling platform and has a light health record that is focused on activities of daily living.

- Canada has the number one long-term care software system on the planet based in Mississauga. PointClickCare (PCC) employs 1,300 people in North America and is worth about US\$5 billion. PCC is a huge Canadian success story and a national asset. Yet, there has been little discussion about using PCC as a reporting tool to assess quality of LTC homes and to track pandemic progress and vaccination. By current estimates, PCC already has more than 70% of the LTC market. They should be invited, among others, to co-design a standard reporting infrastructure. Note: this will require an aggressive translation program as PCC does not currently have an available French language version.

- All hospitals should provide a discharge or encounter summary to patients upon request in a usable, machine readable and searchable, digital format as of April 1, 2023. An appropriate small fee should be paid by government on behalf of requesting consumers.

- All Primary Care EMRs should provide a summary upon request in a usable, machine

readable and searchable, digital format as of April 1, 2023. An appropriate small fee will be paid by government on behalf of requesting consumers.

Primary care is an excellent place to collocate patients' records and to provide a communications hub for patients about their healthcare. They have increasingly evolved from being databases and billing systems to multimodal communications systems.

Input Health (now owned by TELUS Health) and other innovative software developers have changed the game. Rather than building billing systems first, they started with communications and collection of validated information from patients. This patient-first, virtual care-first approach is being widely replicated in employer-based and on-demand virtual care. Some public healthcare systems are now also collecting automated data, as are the Ontario Virtual Care Clinic (OVCC) and 811/telehealth lines.

- A small monthly fee (Falk mentions 25

cents as an example) should be paid each month to providers as an information fee for providing a personal health record service (aka portal) that is being actively used by consumers. This fee should have a sunset period of five years as it becomes a normal part of the workflow of the health service providers (declining by 5 cents per month each year).

Current consumer access to information in Canada has relied on 20th century portal technology first developed in other countries. At last count, there were more than 90 portals in Ontario alone. Many hospitals have implemented these patient portals with mixed success during the pandemic. Separate personal records also exist in many of the healthcare segments listed above, including lab systems and pharmacies. LTC and home care provide patient summaries to family members. We have provincial immunization systems with portal like "yellow cards" that will be more important after the last two years.

Broader enrollment and use of such personal health record services should be encouraged to create an information rich system. These payments will also serve to reward players who have already started addressing this need and to encourage others to do so. The "push" recommendations above will create costs; our policy in this area should create a "pull". A small payment of about 25 cents per active user each month (\$3 per year) should be paid to each provider who has an active consumer portal.

- Canadian health information services and communications providers must publish and support usable application programming interfaces (APIs). Infoway should set tough standards for basic APIs and should have the power to enforce them.

APIs are ubiquitous in our everyday lives. Each time we pay for something with

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Cloud helping improve occupancy planning

CONTINUED FROM PAGE 6

Health and Wellbeing Cloud Innovation Centre (CIC), a public-private partnership between UBC and Amazon Web Services (AWS).

The UBC CIC, powered by AWS, supports student teams tackling real-world issues and challenges, where application of novel and emerging technology or computing approaches are essential.

"This is the type of project that the UBC CIC set out to do when we launched in 2020 and it's always exciting to see our students and staff build solutions that have societal impact," said Coral Kennett, Head of Education & Digital Innovation Lead, AWS Canada. "While this solution is purpose-built for THP, it can be adopted by other organizations to solve similar challenges."

Funded by a donation through the Trillium Health Partners Foundation, the project represents a major step forward for THP's technological and data capabilities. Moving forward, the goal is to enable the algorithm to accurately predict bed occu-

pancy 'daily' rather than the traditional 2-7-day cycle. Once refined and fully rolled out, THP will make the model available to other hospitals, to continue to help increase operational efficiency and patient care across Ontario's healthcare system.

Launched in January 2020, UBC CIC's mission is to solve real-world challenges that benefit British Columbia, Canada and communities beyond, by engaging and

The goal is to enable the algorithm to predict bed occupancy daily rather than on 2 to 7 days cycles.

collaborating with stakeholders in community health and wellbeing innovation challenges.

The UBC CIC is a first-in-Canada public-private partnership between UBC and Amazon Web Services (AWS), and one of only twelve currently in operation in the world. For more about UBC CIC, visit www.cic.ubc.ca

Toronto's Joint Department of Medical Imaging continues to innovate

Most recently, it has launched an MRI Centre where researchers and clinicians will work closely.

BY NORM TOLLINSKY

The Joint Department for Medical Imaging (JDMI), an alliance of medical imaging departments encompassing five hospitals in downtown Toronto, is blazing a trail of imaging excellence and innovation with the launch of the new Slight Family Centre for Advanced MRI Centre at Toronto Western Hospital. There, its clinicians and researchers are producing ground-breaking competencies in artificial intelligence and they're pioneering new procedures in interventional radiology. They've gotten a big assist, moreover, with the recruitment of Dr. Kamil Uludag, an internationally renowned physicist and MRI methods specialist.

Originally established as a joint medical imaging department for the three University Health Network sites – Toronto Western, Toronto General and Princess Margaret Cancer Centre – the JDMI expanded in 1999 to include Mount Sinai Hospital, and in 2007 welcomed Women's College Hospital. Together, the JDMI boasts a staff of 700, including 91 radiologists, and has a shared backbone and PACS, allowing clinicians at any one of the member sites to view imaging results regardless of where the tests were performed.

"It's a confluence of departments that have come together under one joint administrative leadership with specialized centres of excellence aligning with the expertise of the respective hospitals," explained Paul Cornacchione, the JDMI's senior director for Imaging Operations.

Toronto Western, which specializes in neuroradiology, celebrated the commissioning of four new MRI scanners in November, including a Siemens 3-Tesla Vida and two 1.5-Tesla Solas for clinical imaging, and a 3-Tesla Prisma scanner dedicated for research but co-located with the clinical devices.

The addition of the 3-Tesla Prisma will greatly enhance JDMI research capabilities, while its co-location with the clinical scanners will create an environment where researchers and clinicians can work together on projects.

The proximity of the research and clinical scanners will promote interaction, "So when researchers develop new ways of acquiring images, they can also be used for patient care," said Dr. Uludag, who held prestigious roles with Maastricht University in the Netherlands and the Max Planck Institute for Biological Cybernetics in Germany prior to joining the JDMI.

A methods specialist with expertise in novel ways of acquiring images, Dr. Uludag is building an MR physics team to apply fundamental methods research to clinical research and ultimately to clinical practice.

Research projects will be determined by the clinical scientists but are expected to focus on neurodegenerative diseases like Parkinson's and epilepsy, as well as cancer.

The new clinical scanners at Toronto Western's MRI Centre will improve throughput and reduce wait times. Previously, Toronto Western averaged 1,593 clinical exams per month resulting in an average wait time of 79 days. With the three new clinical scanners, the centre is confident of performing 2,000 tests per month.

Bariatric patients will be easier to accommodate with the new MRIs and patients experiencing claus-

trophobia will be able to use a recently donated In-vision in-bore infotainment system.

Artificial intelligence: The JDMI is also leading the way in exploring the potential for artificial intelligence (AI) in medical imaging. At the urging of Dr. Heidi Schmidt, the JDMI's department head and program medical director, the JDMI AI Centre was established in January 2019 to support radiologists, researchers and computer scientists with a shared human and physical infrastructure to accelerate their work. A call for proposals issued in December 2020 netted 15 submissions, four of which have been selected.

AI scientist and chair in medical imaging and AI

The fourth project selected is led by radiologists Vivianne Freitas and Masoom Haider at Mount Sinai Health System and is geared toward determining whether chemotherapy, surgery or radiation is the best treatment option for breast cancer patients. They are devising AI algorithms to define breast MRI imaging features along with pathology/molecular and clinical parameters to predict response to neoadjuvant systemic treatment (NST).

"The work we have been doing in the AI Centre has not yet been clinically implemented, but what makes us unique is that we are determined to ensure that the work we do will not just be an academic ex-



Dr. Kamil Uludag, an internationally renowned physicist and MRI specialist, was recently recruited to the University Health Network.

Dr. Chris McIntosh is working on two such collaborative projects, amongst other initiatives, to bring AI to patients. With clinical lead Dr. Kate Hanneman, they are developing AI to evaluate calcium scoring in coronary arteries using chest CTs to estimate the risk of a major cardiac event down the road. Calcium scoring is usually only performed as part of a cardiac-specific CT scan, he explained. The goal of this project is to perform calcium scoring on a default basis for any patient undergoing a chest CT.

"That would open the door to being able to passively monitor risk without additional invasive harm to the patient through extra imaging and identify patients we need to schedule for follow-up," said Dr. McIntosh. Another project he's working on with clinical lead Dr. Sangeet Ghai aims to reduce the need for thyroid biopsies by using ultrasound imaging and AI to improve the quantification of malignancy.

AI Centre program manager Duoaud Shah describes two additional projects, one of which is a collaboration between Dr. Felipe Torres and Altis Labs, which aims to use AI to quantify pulmonary function without performing a pulmonary function test – something that can be quite challenging for patients suffering from non-small cell lung cancer. "The other part of this project is to use imaging to predict the outcome of a patient with non-small cell lung cancer," he said.

ercise," said Luke Brzozowski, executive lead, UHN Research & Innovation Cores. "We are working on a pipeline to put AI into clinical practice."

The idea of the AI Centre, said centre co-director Dr. Steve Herman, is "to co-ordinate all of the various AI activities going on at JDMI. That includes research funded by our program, as well as other research projects funded separately. We also have a lot of companies coming to us for help with their algorithms because we do a large volume of radiology work, and all of that needs to be coordinated."

"Instead of each individual radiologist doing everything themselves, we decided to make it easy for them to get through the drudgery work that is necessary to make these projects successful."

In addition to the team's human capital, noted Shah, the centre has secured the necessary computing resources, including dedicated data storage and graphics processing units (GPUs) for our scientists and researchers.

"I don't want to brag, but I think we have the strongest faculty by far. We have an extremely strong faculty at JDMI," said Brzozowski when asked how the JDMI AI Centre ranks in Canada.

Interventional radiology: Interventional radiology (IR) is another area of excellence for the JDMI with multiple innovative procedures being performed. One of them, prostate artery embolization is a minimally invasive procedure used to treat benign

prostatic hyperplasia, a condition that affects many elderly men.

"We started off with a research project as a proof of concept to replicate some of the work done in Portugal and Brazil and we were able to publish our data in the Canadian Association of Radiology Journal," said interventional radiologist Dr. Arash Jaber. "There is no expertise for this procedure elsewhere in Canada, so we're treating patients who are flying in from across the country. This is another area where we stand out."

"Our technical success rate has been approximately 90 percent and we have done more than 100 cases with very few complications."

JDMI is the only centre in Ontario performing the procedure, which has recently been recommended as a standard of care by the Ontario Health Technical Advisory Committee.

Another ground-breaking procedure, balloon pulmonary angioplasty, is used to treat chronic thromboembolic pulmonary hypertension, a rare, progressive condition caused by blood clots that clog up the small blood vessels in the lung.

"Dr. KT Tan, a JDMI interventional radiologist, did a mini-fellowship in France, where the procedure was originally developed and began performing the procedure at UHN," said Dr. Jaber. Historically, these patients have undergone pulmonary thromboendarterectomies, an invasive surgical procedure.

"There was great literature coming out of Japan as well as France, where this technique was starting to be used and, since then, it has opened the floodgates," said Dr. Jaber. "There is no expertise for this procedure elsewhere in Canada, so we're treating patients who are flying in from across the country. This is another area where we stand out."

JDMI interventional radiologists are also looking forward to performing a geniculate artery embolization for osteoarthritis of the knee, which reduces blood flow to the lining of the knee in order to reduce inflammation.

"This is work that's coming out of Japan, where Dr. Sebastian Mafeld went to look at the practice. We are now in the preliminary stages of setting up a research project for this procedure and we recently received our first referral from an orthoped," said Dr. Jaber. "There is some data on this procedure, but it has never been done in Canada. We would be the first. That's our goal. We're doing a proof-of-concept study first to get a sense of whether it's actually practical and works."

JDMI interventional radiologists also perform approximately 20 thoracic duct embolization procedures for patients who have a post-operative leak following a lymphatic resection. This procedure is performed by Dr. Dheeraj Rajan. "These patients," said Dr. Jaber, "have a mortality rate of 50 percent within one or two years because they keep on losing their nutrients."

The JDMI is the only centre in Ontario performing this procedure and, like so many other state-of-the-art IR procedures, there is no dedicated funding for it. "Patients are covered by health insurance, but we have to use very expensive equipment for this and there are no special codes for it," said Jaber. "We use other generic embolization codes that kind of apply, but they don't capture the length of time required to do one of these very complex procedures,

which can take between three and six hours." Catherine Wang, UHN's vice-president, clinical, said "the challenge we face is having a publicly funded system keep up with the innovation that gets generated through academic hospitals such as ours and an interventional radiology group that is at the forefront of developing new procedures."

The Ontario Health Technical Advisory

Committee first has to acknowledge a new procedure as a standard of care, following which the Ontario Ministry of Health and Long-Term Care has to fund it.

All of that takes far too long, and "it's particularly problematic in interventional radiology, where they're always at the leading edge of new procedures and treatments," said Wang.

To support all this innovative work in

interventional radiology, the Joint Department of Medical Imaging is in the process of issuing a request for proposals to replace all of its aging equipment, according to Wang. "It's a pretty significant purchase," she noted. "We're replacing all of our interventional suites, all of our CT machines and all of our ultrasounds. It's the largest purchase I've been involved in. We anticipate installs to begin in 2022."



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Analysts at Signify Research spot the trends at recent RSNA meeting

BY ALAN STODDART

RSNA 2021 saw vendors, providers and radiologists travel to Chicago's McCormick Place under very different circumstances than at the time of their last visit in 2019. Back then, the SARS-CoV-2 virus, had not yet been discovered, and for those in the medical imaging industry, it was business as usual.

In the years since, healthcare, like almost every other sector, has felt unprecedented disruption, leaving vendors with the unenviable task of balancing their original, longer term strategic goals, with the requirement to address providers' short-term challenges.

Despite the reduced footfall at the show, and the absence of some major vendors, there was excitement in the halls, as attendees once again met in person to have both serious structured conversations and quieter off-the-record catchups.

These discussions centred around the products that will help mold radiology's future for years to come, with cloud capability, AI enhancement and breakthrough imaging technologies, as well as the products that will help providers efficiently and economically deliver care to patients today. Moreover, RSNA this year felt like a transitory year, where the harsh lessons of recent disruption were manifested in a more assured and brighter future for the industry.

Here, a selection of Signify Research's analysts who were in attendance at the conference, share their impressions of how these priorities were dealt with at the show, and how they manifested themselves in the exhibition hall.

Steve Holloway,
Executive Director
Healthcare IT

It is often hard to distil down the diverse whirlwind of information garnered from a major international show, such as RSNA, into concise trends. However, three key themes underpinned most of the main announcements and innovations.

Firstly, imaging has got serious about efficiency. COVID-19 and overstretched radiology resources have driven innovation towards greater focus on automation, integration and cost-efficiency. Whether in the technology of scheduling, image acquisition, radiologist workflow, reporting and dissemination of diagnosis to the wider health system, service line performance of radiology is going to be measured and focused on more than ever before.

Secondly, unprecedented public and private funding is buoying the imaging market and driving renewed R&D spending in the sector. Competitiveness is perhaps at an all-time high, even with the yawning gap left in the tradeshow floor from recent high-profile disruptors (such as United Imaging) and established global vendors (Canon Medical).

With imaging market sub-sectors still fragmented (ultrasound, radiography, imaging IT, AI) it feels as though the market is readying itself for a period of consolidation. Major vendors are sizing up potential acquisition targets, trying to find

the right balance of ensuring market traction from potential assets, yet not waiting too long and losing out to the competition or having to overpay.

Thirdly, digitalization in imaging is finally starting to reach maturity, with a growing understanding of the diagnostic power that digital imaging brings. While still nascent in deployment, growing confidence in the value of AI, cloud technology and analytics is starting to re-shape the role of radiology in broader diagnosis.

Integration of richer, more diverse data into the radiology workflow is already underway, as is the broader dissemination and potential benefit of imaging data into new parts of the health system, especially notable at the show in pathology, oncology, pharmaceuticals and life sciences.

Above all, there is a growing realization that a medical image is no longer a snap-



shot of a patient's condition at a specific time; instead, new digital technology has the potential to use the image as a means of predicting outcomes in the future.

Dr Sanjay Parekh,
Senior Analyst
Author of *AI in Medical Imaging Market Intelligence Service*

There are always myriad of talking points around AI, especially at RSNA. This year the following themes recurred throughout interactions with vendors exhibiting at the show.

Firstly, consolidation has not yet happened. Although expected, there is limited evidence of a thinning of the field via M&A (e.g., Nanox acquiring Zebra Med). Furthermore, we noted several new vendors exhibiting at RSNA this year, further adding to a crowded sector.

The strength of some vendors is becoming more evident, on the back of strong funding rounds in 2021. For example, Viz.ai (\$152m VC funding, March 2021) Aidoc (\$140m, July 2021) and Infervision (\$215m, August 2021) all now have substantial firepower. Most recently, at RSNA, Lunit (\$134m) and Annalise.ai (\$129m) also joined the "over \$100m in funding" club. While funding alone is not a marker for long-term success and category leadership, new financial firepower will allow these firms to build new products, attract new talent and build channel more quickly.

This should create a clearer differentiation in the near term between vendors that are commercially scaling, versus those that remain stuck in "pilot" mode.

Secondly, partnerships between AI vendors were more prevalent, suggesting that collaboration is becoming increasingly important in this highly competitive market.

Vendors are acknowledging that they cannot do everything alone, with partnerships a quicker way to expand their product portfolio, rendering them more attractive to healthcare providers than those with solitary products. Less established were partnerships between AI vendors and imaging IT vendors, most of whom are still only working with a very small and select group of AI vendors so far.

Thirdly, vendors targeting acute conditions were increasingly focused on delivering value beyond image analysis, such as

Amy Thompson
Market Analyst
Co-Author of *Imaging IT Market Intelligence Service*

Operational workflow proved a clear theme at RSNA this year. Many imaging IT vendors released products to support providers' focus on efficiency and productivity for imaging service lines; whether through workflow orchestration and the triage of radiology cases, patient engagement and the ability to reduce appointment no-shows, or image acquisition with remote support from modality vendors.

From these releases, there was a notable shift in positioning within the market, with the products and offerings centered around operational outcomes and directly advertising ROIs based on saving money or radiologist's time. This trend is expected to remain prominent in the market, as providers' budgets are constrained and investment in new tools will become under higher scrutiny to justify value.

The focus on operational outcomes also creates a change in dynamic between the provider and vendor, from transaction to partnership. Operational workflow and service line offerings create a broader opportunity for vendors to deploy professional services and software tools as part of broader service-line focused partnerships.

Providers theoretically gain improved operational outcomes and more efficient imaging services; vendors can entrench with major customers in longer-term deals.

Bhivita Jani
Senior Market Analyst
Author of *X-ray Market Intelligence Service* and co-author of *MRI and CT Reports*

Within the medical imaging market, leading global vendors had heightened focus on their MRI and CT portfolios, with not only increased presence of onsite prototypes but more notable product launches being showcased. It was clear that CT and MRI were at the forefront of innovation with the newest features primarily focused on workflow optimization, automated protocols, and image reconstruction.

Imaging vendors also demonstrated how AI-powered workflows can be used to increase workflow efficiencies and maximize patient throughput resulting in a higher return on investment. Expansion of high-end features and software tools to the more affordable performance imaging systems, to make them more scalable, was also a prominent theme.

The recent pace of innovation within the CT market was demonstrated at RSNA 2021, spearheaded by cloud computing, artificial intelligence, and expansion of modern engineering.

The latest leaps in technology were highlighted, including both the world's first photon counting CT system and the world's first spectral detector-based CT, both of which empower greater clinical confidence due to higher spatial resolution, as well as a reduction in dose, to provide first-time-right diagnosis.

Improvements in the scalability of CT installations, by the increased number of upgradable options for CT detectors with-

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ILLUSTRATION: LINDA WEISS

Radiologists, imaging experts, look to RSNA as a source of DI innovation

BY JERRY ZEIDENBERG

CHICAGO — Technology vendors showed off many of their latest innovations at the annual RSNA conference, with new solutions in ultrasound, CT, MR, cloud, AI and more. Here is a sampling of what could be seen on the show floor. Note that not everything is FDA or Health Canada approved, as these technologies are very new.

Ultrasound: GE Healthcare this year announced a new generation of its handheld ultrasound scanner, called the Vscan Air. The wireless, pocket-sized device is said to have much-improved clarity, with whole-body scanning capabilities and intuitive software.

GE came out with its first handheld ultrasound in 2010; since then, it has sold 30,000 of the units worldwide. With its new features, the Vscan Air will enable clinicians to work more efficiently and provide faster and better diagnoses. The company cited several studies showing lung ultrasound to be comparable to both X-ray and CT when examining the lungs of COVID-19 patients.

Interestingly, the Vscan Air allows whole-body scans, both shallow and deep exams, with a flip of the two-sided probe. The clinician doesn't have to switch probes in-between or during clinical exams.

GE says the Vscan Air incorporates chips that have been adapted from high-end ultrasound systems, resulting in high-resolution imaging with lower power consumption.

The company quoted Dr. Yale Tung-Chen, chief of ultrasound in internal medicine at the Hospital Universitario Puerta de Hierro, in Madrid, Spain: "The images you can get of the heart on this handheld device are similar to what you'd get from a full-sized, high-end ultrasound. Vscan Air is a well-designed, powerful tool that's easy to clean and easy to use."

The Vscan is ready for Canada, with Health Canada having given its approval in January.

Interventional radiology: Philips announced at the RSNA its vision for interventional medicine with a system that combines spectral CT and real-time fluoroscopy, creating a hybrid Angio CT suite. The solution gives interventionalists immediate table-side access to these two imaging modalities, so they can perform procedures requiring both CT and angio guidance in one room.

The company is working closely with the Mayo Clinic in Rochester, Minn., and Baptist Health's Miami Cardiac & Vascular Institute, in Miami, Fla., to further develop this system.

Philips is incorporating its Spectral CT 7500 system and its Image-Guided Therapy System known as Azurion with FlexArm in the one-room solution. When not in use, each modality glides smoothly away from the patient table in a parking position, giving the interventional team more access to the patient.

For interventionalists, it enables efficient workflows without the need to move the patient from one imaging suite to another.

Spectral CT, also known as dual energy or dual source CT, is a computed tomogra-

phy technique that uses two separate X-ray photon energy spectra, allowing the analysis of materials that have different attenuation properties at different energies.

"There has been a tremendous evolution in the image-guided therapy environment," said Dr. Barry T. Katzen, founder and chief medical executive of Baptist's Health's Miami Cardiac & Vascular Institute. "We are really excited about the

cation of a workstation or client computer with the 'right' software on it."

Agfa says that anyone who interacts with, produces, consumes or uses images can be empowered, with the same depth of workflow, use of artificial intelligence in workflows, etc. as from their in-hospital desktop computer or workstation.

The company's FHIR-based, web technology has taken advantage of remote gam-

needed to find an appropriate workstation.

"With our web technology for the remote diagnostic imaging workflow, the cardiologist can do all that from any computer. A barrier to mobility has been brought down, delivering deeper, intelligent workflows, accessible anywhere." Agfa says it's at work creating other specialty solutions for remote reading and reporting.

Artificial intelligence: Most of the major



A new scanner from Philips combines spectral CT and real-time fluoroscopy in the same suite, giving fast access to both modalities without having to move the patient.

merger and integration of these technologies in that it might allow us to look at the treatment of a number of diseases in very new and innovative ways, potentially offering new treatment opportunities and improving patient care. I am looking forward to investigating the possibilities of this promising innovation."

Remote reading and reporting for radiology and cardiology: Radiologists have been able to read exams remotely for some time. But to gain access to the tools found in their PACS, they needed to install software on the remote workstation. Moreover, to obtain decent resolution, they needed special monitors. Now, monitors have vastly improved — a 4K monitor for home use has higher resolution than some screens used in DI departments. And web technology has improved to the point that no special software has to be added to a remote workstation.

At RSNA 2021, Agfa HealthCare announced a new web technology for Enterprise Imaging that enable true remote diagnostic imaging workflows. "You can take your diagnostic workflow with you, using your own computer. Not just viewing images, but producing them, interpreting them with all the tools you need, collaborating on them, and making quality decisions around them, wherever you are. Your ability to work is no longer tied to the lo-

ing technologies, which combines streaming and client technology in a way that delivers fluidity of interacting with the image.

"To handle 'lag', we turned to the gamer world. As one radiologist expressed: 'Think of me as a high-performance gamer. When I am trying to use my sword, I don't want to miss out on killing the monster in the game because of click lag, latency or problems with internet connection.' So we put remote gaming technolo-

Agfa has produced a platform that enables clinicians to view images from anywhere, with little lag and a full set of tools.

gies to work to deliver the fluidity needed for a comfortable, productive workflow.

Because it is cloud-ready, it can handle high or low latency and high or low bandwidth conditions, eliminating connectivity issues."

Agfa says that each diagnostic or clinical specialty has its own needs, and that it is approaching them individually. The first to be launched is cardiology. Cardiology is an image-intense, point-of-care specialty: the cardiologist goes wherever the care is needed. But to work with images, create reports, collaborate with colleagues, the cardiologist

radiology vendors are incorporating AI technologies in their solutions. For its part, Canon Medical announced the launch of Altivity, a new AI innovation brand, that consolidates machine learning and deep learning technologies to deliver higher quality and value across the entire care pathway.

Canon Medical says it has been steadily redefining the role of AI in healthcare, starting with its Advanced intelligent Clear-IQ Engine (AiCE).

Initially developed for CT, this de-noising deep learning technology was soon deployed across MRI and PET/molecular imaging to help speed up scan times and improve image quality. Next came the launch of Automation Platform and AUTOSTroke solution, both of which were designed to enhance clinical confidence and streamline workflows with the power of deep learning technology.

More recently, Canon Medical has transformed the ultrasound space with AI innovations, which enhances clinical workflows. One of the most time-consuming aspects of an ultrasound exam is the care that must be taken to ensure serial measurements are done in a standardized and highly reproducible way.

By leveraging the power of AI, Canon Medical has been able to automate these routine tasks to increase clinical productivity and reporting accuracy.

Photon counting CT will introduce a vast improvement in image quality

BY JERRY ZEIDENBERG

CHICAGO – There’s a race on to develop the next generation of CT scanners using photon-counting technology, and several vendors have been actively promoting their activities in this area. A number of them made announcements about their progress around the time of the annual Radiological Society of North America (RSNA) conference, held each fall at Chicago’s vast McCormick Place.

Photon counting technology promises to improve the resolution of CT images, enabling radiologists to provide better diagnoses and ultimately, enhancing the health of their patients. The technology directly detects each X-ray photon and its energy level instead of measuring the energy levels contained in many X-rays at once, as in conventional CT imaging.

These new systems will enhance the visualization of minute details of organ structures, and provide improved tissue characterization, more accurate material density measurement, with lower radiation dose.

According to one vendor, the technology will allow lung scans without patients having to hold their breath. And with lower radiation doses, more cancer screenings will become possible with a greater margin of patient safety.

There are benefits for oncology, cardiology, neurology and many other areas.

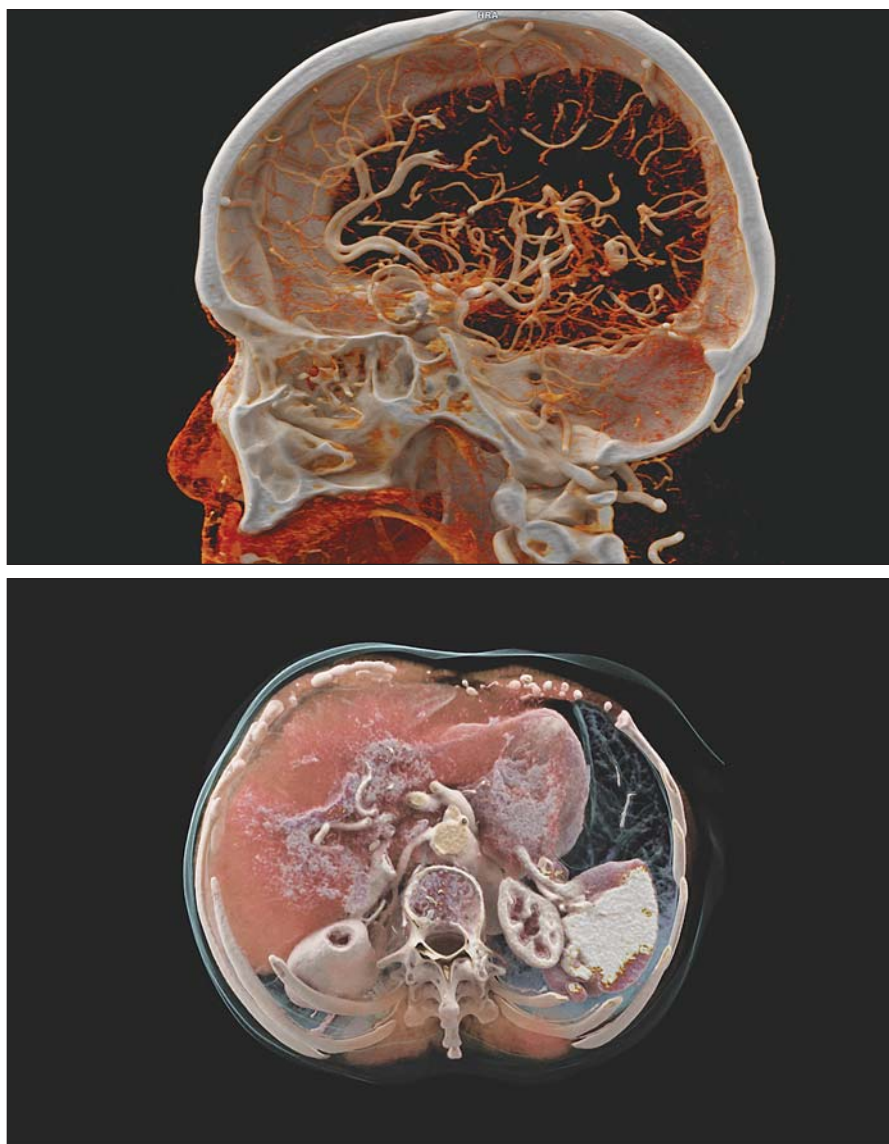
For its part, Siemens Healthineers said it has launched the first commercially available photon counting CT system, which it calls the NAEOTOM Alpha. According to the company, more than 20 of the units have been installed and are being used in clinical settings; more than 8,000 patients have been scanned.

The University Hospital Augsburg in Germany installed its NAEOTOM Alpha CT in April 2021. “We are very impressed by initial results,” said Thomas Kröncke, MD, head of the Department of Diagnostic and Interventional Radiology, University Hospital Augsburg. “We can see better and see more due to the enhanced iodine visualization, artifact reduction and high special resolution – all with using less radiation and less IV contrast material.”

The new technology helps especially when fine structures have to be evaluated. “In oncology, we can break down more precisely which tumor types we are dealing with and thus treat them in a more targeted and effective way. It is like a veil that is now lifting. The new technology is a radical improvement on previous imaging. This will redefine our clinical decision-making right from scan one,” said Professor Kröncke.

The Siemens device has gained clearance in the U.S. market, as the U.S. Food and Drug Administration (FDA) approved the Naeotom Alpha on Sept. 30. Both FDA and CT experts say this is the start of a revolution in new CT scanner technology and is the biggest shift in technology for this workforce radiology modality in years.

The FDA sent out a rare press release on



The images above were produced by Siemens' NAEOTOM Alpha, the first available photon counting CT.

the approval, noting its importance to medical imaging.

“Computed tomography is an important medical imaging tool that can aid in diagnosing disease, trauma or abnormality; planning and guiding interventional or therapeutic procedures, and monitoring the effectiveness of certain therapies,” said Laurel Burk, Ph.D., assistant director of the Diagnostic X-ray Systems Team in the FDA’s Center for Devices and Radiological Health. “Today’s action represents the first major new technology for computed tomography imaging in nearly a decade and underscores the FDA’s efforts to encourage innovation in areas of scientific and diagnostic progress.”

Siemens has been collaborating with the CT Clinical Innovation Center, at the Mayo Clinic in Rochester, Minn., on the development of photon counting CT technology. Mayo Clinic in Rochester installed the world’s first photon-counting-detector CT system capable of human imaging in 2014. The first research studies in humans began in August 2015. Since then, the center has worked closely with the manufacturer to evaluate the clinical potential of the technology.

A second-generation prototype debuted at Mayo in 2020. This system addressed many of the design limitations of the first system. The third-generation research system – the first of its kind in

North America – has been up and running since April 2021 as part of the ongoing research collaboration. In April, Mayo Clinic performed its first cardiac scan on the new system.

GE Healthcare is also investing heavily in photon counting CT detectors. In November, it announced that Karolinska Institutet and MedTechLabs have started testing the company’s Deep Silicon detectors.

A year earlier, GE Healthcare announced the acquisition of Prismatic Sen-

The new systems provide more detail of organ structures, more accurate measurements, and lower radiation doses.

sors of Sweden, a start-up specializing in silicon detectors for photon counting CT. Various materials can be used in photon counting systems; in this case, said GE Healthcare, silicon has a number of advantages, including its purity, abundance, and broad manufacturing infrastructure.

Historically, the challenge of using silicon as a detector material is that it has been too thin to stop and collect a sufficient number of X-ray photons. But, by using a new approach that positions the silicon sensors “edge on”, the Deep Silicon detectors are able to handle the very

high photon flow from the CT’s powerful X-ray tubes.

Indeed, the silicon sensors absorb the energy quickly enough to count hundreds of millions of CT photons per second, creating sharper images than conventional CT scanners.

“While the system’s cover may look familiar, its potential capabilities are totally different – enabling us to image small blood vessels and vascular pathologies as well as see malignant changes at an earlier stage when treatment can be more effective,” said Staffan Holmin, professor at Karolinska Institutet, consultant at ME Neuroradiology at Karolinska University Hospital, and clinical evaluation leader responsible for testing and optimizing the technology.

“I’ve been fortunate to work with this technology for several years – back when it was being developed with Prismatic Sensors – and believe it has the potential to improve diagnostics and consequently the therapeutic outcomes for a whole range of conditions. CT scanners are standard in hospitals today, but this new apparatus represents a huge advancement for the future. It’s a real ‘quantum leap.’”

In a pilot study, the Karolinska Institutet and MedTechLabs will lead a clinical evaluation that compares GE Healthcare’s photon counting CT – with Deep Silicon detectors – to standard CT images.

In a subsequent study, the partners plan to conduct further comparisons, and to research pattern recognition using AI, along with data management and the optimization of visual information to meet the needs of radiologists when they’re assessing disease states for different parts of the body.

In late summer of 2021, Canon Medical Systems announced that it had begun testing its own photon counting CT system in collaboration with the National Cancer Centre in Japan and EAST Hospital, in Kashiwa, Japan. As part of the program, the partners will be using photon counting CT to evaluate the malignancy of tumour tissues, and to analyze differences in tissue characteristics.

Last September, Canon Inc. announced a US\$335 million plan to acquire Victoria-based Redlen Technologies Inc., which makes high-resolution, photon counting technology using cadmium zinc telluride (CZT).

The process generates diagnostic results in colour that are highly accurate, produce 10 times more information than existing CT scanners and require 40 percent to 80 percent less radiation dosing, according to the companies.

The B.C. company was already working with six of the world’s seven top makers of CT scanners, according to a report in the Globe and Mail newspaper, including Canon and Philips, to introduce its semiconductor and sensor system into their machines.

CEO Glenn Bindley, who joined the company in 2002 after co-founding semiconductor maker PMC-Sierra, said in an interview that Redlen had built 10 prototypes, and that two of its customers would be in trials by 2022.

RSNA meeting trends

CONTINUED FROM PAGE 12

out replacement of the gantry needed, were also exhibited, to enable radiology departments to remain up to speed on the latest technology developments and help streamline fleet management to reduce operating costs.

Some of the premium features displayed were motion correction and intelli-

For MRI, developments include reduced helium or helium-free systems, as well as AI-powered enhancements.

gent protocoling using patient demographics such as age, height, and weight.

For MRI, the underlying themes on show at RSNA 2021 include reduced helium or helium-free MRI systems, as well as artificial intelligence powered enhancements to improve image quality, workflow efficiency, and productivity. Key applications of this include automating clinical protocols or protocol suggestions using deep learning.

Improving the speed at which MRI scans are performed continued to be a core focus, to increase patient throughput. Leading MRI vendors not only launched high-end solutions, but also focused on their lower-end performance portfolio to improve access to MRI imaging. From a hardware perspective, improvements include making the MRI systems easier to install by making them lighter due to new magnet designs. As always, newer MRI systems also included larger bore sizes, with the latest features allowing the bore size to be upgraded without the need for reinstallation. Application of deep learning AI was focused on image reconstruction to reduce noise and artifacts to produce signal rich images.

A key theme for X-ray systems was ergonomic designs to reduce technician strain

and improve user experience. Hardware features, such as a collapsible column or easier positioning on mobile DR systems, aimed to reduce workplace injury which impacts 83% of radiology technicians.

Additional features focused on the technician include larger monitors, reducing the number of clicks per exam and increased sensitivity of touchpoints. As seen with previous years, a continued focus on making the systems more compact, lighter, and easier to install was also prominent to address the universal trend of increasing access to medical imaging outside of traditional settings.

Workflows within X-ray are increasingly adopting intelligent and automated positioning features, including AI-powered camera-based workflows and auto tracking features. Latest innovation included using depth cameras to obtain digital patient measurements. Flat panel detector companies exhibited glass free technology, flexible technology, newly launched long length detectors and the world's first curved detector.

Mustafa Hassan
Market Analyst
Co-Author of Ultrasound Market Intelligence Service

With the reduced footfall at this year's RSNA, the conversations the ultrasound OEMs had with customers was less in quantity, but higher in quality. As expected, there were not many new ultrasound product releases. Instead, vendors released products earlier in the year and when they were ready, rather than holding back the release specifically for RSNA, as was often the case in previous years.

This trend is likely to stick in the coming years, with vendors expected to place less emphasis on using the major conferences as a platform to launch new products. While there were no new flagship premium systems from the major vendors this year, some of the mid-tier vendors released new higher end systems, while the market leaders focused on offering a greater port-

folio selection for customers to take advantage of, depending on their budget.

Instead of new systems at RSNA 2021, there was instead an expansion on already available products, through the introduction of new features and software applications, such as tools for liver imaging. There were also new AI features introduced and in line with our predictions before RSNA for a focus on efficiency, the new AI features introduced were primarily for image capture and workflow automation, enabling faster scans. Surprisingly, however, there were not many tele-ultrasound plat-

Report offers virtual care recommendations

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PayPal in an eCommerce store, we are using an API. When we use travel booking sites, it's an API that aggregates thousands of flights and destinations to showcase the cheapest option. During COVID, with a proper API in place, the various vaccine scheduling systems would be able to "talk" to each, more efficiently booking second doses, and directing people to the most appropriate vaccination site.

Without an API, siloed information can still be shared by uploading information to a portal, but this is a clunky solution. APIs are a far more elegant way to do this. In a world in which foundational data elements were only created digitally, aggregating them into custom views would be the basis for competition among IT communication system providers. Said another way: in a virtual world it only makes sense that healthcare providers, labs, and others will continue to improve these products well beyond the traditional "portal".

Patients want one place to log in that can connect them to their information on the care they received in different clinics and hospitals, summarized in plain language. That starting point will be different for various patients given their differing needs.

forms showcased at this year's RSNA, to help hospitals with workflow challenges.

While still in the early stages, it is now clear that AI will play an increasingly important role in ultrasound in the coming years.

Signify Research conducts market research about healthcare technologies, including hospital information systems, diagnostic imaging solutions and medical devices. The company focuses on North America and Western Europe and is based in the United Kingdom. For more details, see <https://www.signifyresearch.net/signify/>

All patients who desire it should have same-day access to a virtual front door that connects them to the rest of the healthcare system. There are at least three ways that this should happen: provincial/regional front door, (large) group practice front door, employer-based assistance program.

Some clinicians will object to same day as unnecessarily fast for quality care. While this argument could have been credibly made before COVID, it no longer can be.

Patients want one site to log in that can connect them to the information on the care they received in different places.

Infection control and public health tracing alone require same day turnaround.

Falk's recommendations are very ambitious but practical. His report reflects his experience as an industry insider for many years; he helped build several of our current systems and understands the complexity of the system. In short, his report sets out a bold agenda for the post-pandemic healthcare system to modernize and realize the promise of digital healthcare in Canada.

COVID and acute care

CONTINUED FROM PAGE 8

better allocate resources for those with immediate needs, and freeing up staff to focus on the patient.

Greater visibility also offers a better handle on inventory and supply chain management, helping to safeguard against the shortages and expirations many hospitals have recently experienced.

Mobility's (now greater) purpose : Clinicians need powerful devices in hand to share and receive intelligence within the hospital's four walls – and to connect with care team members across the facility or in the field in ambulances.

According to Zebra's study, 55% of clinicians say connecting hospital systems for better communication between workers is a top challenge at their hospital. The answer, for many of these healthcare organizations, is enhanced mobility: 84% of clinicians and executives agree the quality of patient care improves with access to collaboration tools and healthcare applications.

As a result, hospital mobility priorities have evolved as much as they have expanded in the last four years. In 2017,

healthcare leaders were focusing investments on bedside nurses, lab technicians, pharmacists and others who frequently needed to access electronic health records (EHR) and coordinate care for hospital patients.

Today, the priority – at least in hospitals – is to give nurses providing urgent and critical care in emergency rooms, operating rooms, and intensive care units the tools they need to better execute time-sensitive tasks and manage patient surges.

The expectation is that all types of clinical staff will be almost equally equipped to support patients and improve the efficiency of hospital operations by 2022.

However, hospital leaders understand that every staff member must be reachable, responsive, and able to report the status of their tasks if hospitals want to better manage the supply chain, orchestrate room turnover logistics, ensure accurate billing, and more.

So, at least 7 in 10 executives say they plan to extend mobile device implementations to nearly every department in the next year, including IT, housekeeping, patient transport, supply chain/inventory management and food services.

They aren't just giving them any de-

vice, though. About half say they will be providing employees with hospital-owned devices intended specifically for clinical environments with healthcare applications.

While some hospitals have allowed staff to use their own devices at work in the past and several initially invested in consumer-grade smartphones and tablets to test mobile applications in clinical settings, many are discovering that these devices cannot stand up to the

Seventy percent of executives say they plan to extend mobile devices to nearly every department this year.

needs of today's acute care environment.

Zebra's Healthcare Vision Study revealed that healthcare-ready device usage is becoming preferred to consumer-grade alternatives, with almost half (49%) of surveyed decision-makers reporting they provide hospital staff with enterprise-grade devices.

This is encouraging news, as mobile devices purpose-built for healthcare give clinical and non-clinical staff the func-

tionality they need to tackle the task at hand without compromising on cybersecurity or patient privacy. These devices can also withstand the constant cleaning and disinfecting required to help reduce the risk of infection, which is of great concern among clinicians (75%) and hospital executives (81%).

Expanding the reach and impact of virtual collaboration: The COVID-19 pandemic was a critical call to action for hospitals: care models must change. Physicians and nurses must be able to consult with other clinicians who are physically distanced – whether outside an infectious patient's room or in an ambulance inbound to the emergency room. They must also be able to update more charts, issue more prescriptions, process more lab tests, and give every patient the quality care they deserve without burning out.

So, forward-thinking hospital decision-makers are exploring ways to make operations more predictive, rather than reactive, and they're turning to artificial intelligence (AI), prescriptive analytics, and other advanced technologies for help.

Rikki Jennings is Chief Nursing Informatics Officer, Zebra Technologies.



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