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INSIDE:

INFECTION CONTROL

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Early warning scoring (EWS)

A hospital in Brooklyn, N.Y., has surged ahead in the development of early warning system by automating both the collection of vital signs data and the transmittal of alerts to the most appropriate care-givers.

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AI in the operating room

St. Michael's Hospital, in Toronto, is making use of artificial intelligence to help spot medical errors



in the operating room. Awareness of the errors can then be used to educate physicians and improve surgeries in the future.

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An app for infection control

A team at St. Joseph's Healthcare, Hamilton, has produced an app that speeds up infection control audits, improves communication among teams, and allows photos to be included. The pictures often help tell the story.

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Radioactive control

A spin-off company at the University Health Network, in Toronto, has created software that dramatically reduces the time hospitals spend on quality assurance of their linear accelerators and CT scanners.



tals spend on quality assurance of their linear accelerators and CT scanners.

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PHOTO: SUMEET SAWHNEY

Kinark is among the healthcare leaders in Canada when it comes to the deployment of advanced technologies. The team includes (pictured above, l to r): Cynthia Weaver, VP Strategic Initiatives; Dr. Vicki Mowat, Senior Director; Dr. Laurel Johnson, Clinical Director; Karim Ramji, CIO; Lynn Holloran, Account Executive with TELUS Healthcare; Cathy Paul, President and Chief Executive Officer of Kinark. **SEE STORY BELOW.**

Kinark moves I.T. to the cloud to enhance care delivery

BY JERRY ZEIDENBERG

MARKHAM, ONT. – Kinark Child and Family Services, one of Ontario's largest providers of mental health services for children and youth, is in the midst of migrating all of its computerized clinical and administrative systems to the cloud. The transformation is expected to result not only in lower costs, but will also boost the ability of clinicians, clients and families to share information.

"More information will be available, so our clinicians will be able to make the best decisions," said Karim Ramji, Kinark's Chief Information Officer. "And parents will have access to information about their kids through a secure portal."

Kinark is one of the first large healthcare providers in Canada to transfer all of its computer and communications systems to the secure cloud. It's a transformation that will have benefits for clinicians, administrators and families, Ramji said.

He noted that over the past 30 years, Kinark built up an assortment of computer-

ized equipment and operating systems at its 25 sites across Ontario, where the agency's 850 employees work with over 10,000 children each year.

Not only was it getting difficult to access information on these systems from one site to another, but the equipment was getting rickety and in need of a refresh.

Ramji and his colleagues realized that a secure cloud solution, with state-of-the-art software solutions and communications,

Cloud computing improves communication, and also ensures that systems are up-to-date.

would keep the technology up to date. It would also enable staff, clients and families to stay better connected.

After an RFP was issued, they settled on Telus as their cloud and systems provider. "With their cloud solution, we're spending less on I.T. overall than we did before," said Ramji. He noted that staffing has actually contracted, as the need for in-house I.T. ex-

perts was lessened. "We're getting out of the business of managing technology," he said. "This is allowing us to focus on our kids, our data and our research."

As part of the solution, Telus is providing Kinark with an updated electronic client record system that can be easily shared among sites and clinicians. The Telus Clinical Information System offers a leading-edge charting system that works in the cloud.

At Kinark, the system has been rebranded as KIDS 5. It is a major upgrade from Kinark's earlier patient record, called KIDS 3 and 4.

The KIDS 5 system will also be integrated with the new Kinark telecommunications system. So, when the intake department or a clinician gets a call from a parent, the child's record will immediately pop-up.

Kinark plans to integrate its electronic charting system with a number of partners, so that encounter information at other sites is automatically fed into the KIDS 5 record. Ramji said this will likely happen first with major sites like hospitals, doctors' offices and healthcare centres, which also have busy prac-

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Kinark migrates its clinical and administrative systems to the cloud

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tices with children and teens and where patients are seen by multiple organizations.

As well, Kinark is doing pioneering work in the Internet of Things – it is planning to securely connect its systems to the devices that youngsters are using.

“If you ask teenagers how they’re feeling, they won’t always tell you,” said Ramji. “But they will talk about their feelings on social media. We want to talk with them this way.” Kinark is looking into the possibility, moreover, of linking to wearable devices to get even richer data that would help therapists and clients.

The entire system – clinical and administrative – is being deployed on mobile devices, including both Apple and Android tablets and phones. That makes it much easier for clinicians to securely access the information they need, anywhere, anytime.

On the administrative side, a sophisticated Human Resource Information System will be integrated with the Clinical Information System. Lynn Holloran, Account Executive at Telus, noted the human resource system was deployed by Telus at

another large Ontario health organization, and much of it will be made available to Kinark. “We can leverage the expertise and experience from our existing client,” said Holloran. The system can also log visits made by clinicians on their mobile device.

Pricing will be lower than if Kinark purchased this kind of system on its own –

Kinark is pioneering the Internet of Things, and is planning to securely connect its systems to the devices that youngsters use.

another benefit of a cloud-based solution.

Just as Kinark is making use of an administrative solution produced by another healthcare provider, it will itself make its own solutions available to partners who want to modernize their clinical systems. This may include smaller providers of mental health services across the province with antiquated and outmoded software and hardware.

“We’re taking it to the next level, and making it available to our entire network,”

said Ramji. He said the cloud system is segmented, so that partners could have their own secure portion of the cloud, using Kinark’s systems under licence.

It won’t be done to make a profit, he said, but to help other organizations get up to speed with solutions that can improve communications and lead to better outcomes for youngsters.

Kinark is currently in the first year of a five-year plan to overhaul its computerized systems and to move to the cloud and integrate the Internet of Things.

The new telecommunications system has already been deployed, and the organization is implementing the KIDS 5 charting system over the next year.

It’s a moderately paced rollout, to ensure that staff and clinicians are comfortable with the new systems. “We want to make sure our clinicians are well-trained on this,” said Ramji.

Kinark is also working on rules for data governance, including who has access to the information of its clients – which of course is highly sensitive and private.

There is also a parents’ portal in the works, something that will be extremely

useful to parents who are active participants in the care of their children. They will be able to communicate with caregivers more easily.

One more aspect of the systems being pioneered at Kinark: the organization is also a major researcher, and its work on best practices is often adopted across Canada and worldwide. It is now building a leading-edge data warehouse that will assist with business intelligence and analytics.

“We do fantastic research here,” said Ramji. “Our clinicians and researchers are thought leaders.”

He continued, “It’s all about evidence-based practices and data-driven decision making. We produce a lot of data about our clients. And it’s all in an effort to produce better outcomes for children, youth, and families.”

Tele-pediatric intensive care program launched

VANCOUVER – The recent launch of Canada’s first tele-pediatric intensive care service (tele-PICU) provides children with increased access to specialized care closer to their home community. The new service was established by BC Children’s Hospital’s Child Health BC in partnership with provincial health authorities – Vancouver Island Health Authority and Interior Health Authority.

Through the tele-PICU, healthcare professionals can assess children using real-time, two-way videoconferencing. High resolution cameras and digital stethoscopes enable physicians and nurses to see patients as well as to listen to and amplify sounds of the heart and lungs of seriously ill or injured children.

“This is just one of the many innovative examples of how healthcare providers work together to leverage technology to enhance medical care throughout our province,” said Dr. Maureen O’Donnell, executive director, Child Health BC, BC Children’s. “Through Child Health BC, a partnership with the BC health authorities, we collaborate to improve children’s health and healthcare services.”

The service is currently available at Kootenay Boundary Hospital in Trail, Nanaimo Regional Hospital and Victoria General Hospital, with intensive care teams located at both BC Children’s and Victoria General. Using the tele-PICU, intensive care teams can now collaborate with healthcare providers in several communities across BC to help children receive diagnosis and treatment sooner and often without leaving their communities.

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Address all correspondence to Canadian Healthcare Technology, 1118 Centre Street, Suite 207, Thornhill ON L4J 7R9 Canada. Telephone: (905) 709-2330. Fax: (905) 709-2258. Internet: www.canhealth.com. E-mail: info2@canhealth.com. Canadian Healthcare Technology will publish eight issues in 2017. Feature schedule and advertising kits available upon request. Canadian Healthcare Technology is sent free of charge to physicians and managers in hospitals, clinics and nursing homes. All others: \$67.80 per year (\$60 + \$7.80 HST). Registration number 899059430 RT. ©2017 by Canadian Healthcare Technology. The content of Canadian Healthcare Technology is subject to copyright. Reproduction in whole or in part without prior written permission is strictly prohibited. Send all requests for permission to Jerry Zeidenberg, Publisher. Publications Mail Agreement No. 40018238. Return undeliverable Canadian addresses to Canadian Healthcare Technology, 1118 Centre Street, Suite 207, Thornhill ON L4J 7R9. E-mail: jerryz@canhealth.com. ISSN 1486-7133.

Publisher & Editor

Jerry Zeidenberg
jerryz@canhealth.com

Office Manager

Neil Zeidenberg
neilz@canhealth.com



Contributing Editors

Dr. Sunny Malhotra
Twitter: @drsunnymalhotra

Dianne Daniel
dianne.l.daniel@gmail.com

Richard Irving, PhD
rirving@schulich.yorku.ca

Rosie Lombardi
rosielombardi@hotmail.com

Andy Shaw
andy56@telus.net

Art Director

Walter Caniparoli
art@canhealth.com

Art Assistant

Joanne Jubas
joanne@canhealth.com

Circulation

Marla Singer
marla@canhealth.com



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Hospital's early warning system dramatically lowers post-op mortality

BY JERRY ZEIDENBERG

By combining smart technologies with an Early Warning Scoring (EWS) system in its surgical department, a large hospital in New York City has reduced 'failure to rescue' deaths by a whopping 35 percent. Failure to rescue patients are those who have experienced a treatable complication and died in hospital.

It's an astounding achievement, and Dr. Ron Kaleya, director of GI surgical oncology at the Maimonides Medical Center, in Brooklyn, N.Y., recently spoke at a Philips-sponsored webinar about how the hospital accomplished this.

"We believe we have built a safer surgical service," said Dr. Kaleya, who was part of the team that devised the Brooklyn Early Warning System, or BEWS. The project was started in 2014, and involved Philips as a partner.

He noted that the BEWS crew at Maimonides Medical Center created a proactive early warning system to catch deteriorating patients before it was too late. The team automated the collection of six vital signs, and produced an algorithm that determined when experienced clinicians should be notified.

Further, they automated the notification process by sending wireless alerts using the Philips IntelliSpace Event Management (IEM) System to the smartphones of clinicians, so the right person could respond in a timely manner, without the delays of voice and pager systems that have traditionally been used in the healthcare environment.

According to Philips, the IntelliSpace Event Management (formerly Emergin) helps care teams manage and respond efficiently to multiple event notifications, alerts and alarms by providing useful information directly to communication devices, improving efficacy.

Numerous hospitals have created early warning systems, but they haven't tied them to an automatic alerting system. As a result, they haven't experienced an improvement in outcomes.

"It's what you do with the score that matters," said Dr. Kaleya. "You may have a parachute when you jump out of a plane, but unless you pull the ripcord, nothing happens."

It wasn't easy to create this system, said Dr. Kaleya, who noted that much of the computerized monitoring and communications equipment was technically incompatible and wouldn't talk to each other.

It included the Philips spot check vital sign monitors and Philips Guardian Solution, Voalte phones and servers, and the Allscripts electronic health record system. The BEWS team urged the vendors to integrate the various pieces of the system, so that seamless communication could take place – a process that took about a year.

Moreover, the team had to determine what signs to monitor, how they should be weighted, and at what point experienced physicians and nurses should be alerted.

The six vitals the team decided to collect are blood pressure, oxygen saturation, pulse, respiration rate, temperature and mental states. They're collected every four hours, re-



Maimonides Medical Center, in Brooklyn, NY, is one of the first hospitals to tie EWS to automated alerts.

viewed by a nurse, and then sent to a server; if a certain threshold has been reached, wireless alerts go out to care providers.

"Most patients have scores less than three," said Dr. Kaleya. "Patients with scores of up to four can be stabilized with fluids and oxygen therapy, and they can continue to be managed on the ward." Patients with scores of five or more tend to require more urgent care, sometimes including transfer to the intensive care unit.

Initially, the BEWS team decided that it would alert teams of experienced clinicians when post-op patients hit a score of five. This method was used in 2014 and 2015 without much change in mortality outcomes.

"When analyzing our 2015 results, we were unhappy," lamented Dr. Kaleya. "There was not the improvement we had predicted. We had chosen the activation threshold of five – and this was just wrong."

He asserted that the BEWS escalation trigger was then reduced to four – and a dramatic change occurred.

In 2016, there were 637 patients with a score of four or more, and rapid notification of care providers occurred. Only 21 of these patients subsequently died, and some of them were palliative care patients.

"Of 15 patients who were transferred from the floor [to the ICU], 14 were rescued and left the hospital," observed Dr.

Kaleya.

"Most of the others only needed adjustments in fluids, oxygen, diuretics and antibiotics."

The hospital's internal record-keeping showed a 30 percent drop in failure to rescue patients in 2016. "We didn't really believe our results, as they were our own internal calculations," said Dr. Kaleya. However, the New York City patient indicators for 2016 confirmed the breakthrough – there was actually a 35 percent reduction in risk-adjusted mortality.

"External validation is a wonderful thing," said Dr. Kaleya.

He also noted that BEWS is cost-effective. It requires an investment of \$850 per patient in hospitalist staffing – hospitalists are used to check on the status of patients with rising BEWS, but with scores less than the trigger threshold.

However, about \$900 per patient was saved in the reduction of complications, as the deterioration of patients was caught at an earlier stage.

This alone pays for the cost of the hospitalists, he said.

There is also an investment in technology, of course. Dr. Kaleya noted that \$250,000 was spent on the technology required, including 10 vital signs monitors at \$10,000 apiece. There was a large expenditure on communication systems, to perfect the integration and alerting solution.

He said to extend the solution to additional wards, each with 70 patients, would cost \$150,000 per ward.

At the same time, there are additional benefits. BEWS results in a shorter Length of Stay (LOS) for patients and reduced liability costs. It also produces better medical outcomes and patient satisfaction.

The BEWS project has been so successful at Maimonides Medical Center that the hospital now intends to expand the system to all parts of the hospital.

Moreover, the plan is to become even more proactive, and to start preemptive interactions at the BEWS score of three. This will catch complications at an even earlier stage.

Reflecting on the original project, Dr. Kaleya explained that the success of surgeries depends as much on the level of post-operative care as on what happens in the operating room.

He noted that in the past, in hospitals without early warning systems, nurses have often been afraid to escalate and to notify an experienced physician when post-operative patients deteriorate.

When they did notify a doctor, it was often an intern or resident they contacted. "The most inexperienced person was asked to assess the sickest patients. It just didn't make sense," said Dr. Kaleya. These inexperienced doctors were in turn reluctant to call their superiors, fearing they would be deemed inadequate.

As a result, patients on the verge of crashing often didn't receive the care they need.

A 2005 article in *The Hospitalist* journal estimated that 60,000 American Medicare patients under the age of 75 die each year in failure to rescue situations – episodes in which they have developed treatable complications, but did not receive appropriate care.

The traditional model of care leading to this situation has been dubbed 'track and trigger'. Nurses and other clinicians track patients on the floors, and determine when to trigger an escalation alert.

"This model is, and always was, a complete disaster," said Dr. Kaleya. "It had to go, and it did." More hospitals are now using early warning systems as a way of escalating the alerting process at an earlier stage.

However, as Dr. Kaleya noted, there are still problems, as the early warning systems used in most other hospitals haven't been automated. Nor have they been tied to an alerting system.

Studies have shown, he said, that when EWS scores are calculated by hand, only 20 percent are correctly tabulated. Further, the same resistance to escalate occurs when nurses and residents have responsibility to alert more experienced clinicians.

With BEWS, however, the vital signs are automatically collected and scored. When the threshold is reached, moreover, wireless alerts are sent out to experienced caregivers, without human intervention.

"Immediate wireless alerts are generated, according to the algorithm, without clinical input," said Dr. Kaleya. Experienced caregivers respond quickly, resulting in saved lives. "BEWS delivers the right care, right now," said Dr. Kaleya.

Guardian of the automated solution

The Philips Guardian System, with Early Warning Scoring (EWS), aids in identifying subtle signs of patient deterioration at the point of care, hours before a potential adverse event. As a result, caregivers and Rapid Response Teams can respond earlier – in time to make a difference. The Guardian solution automatically acquires vital signs, calculates an early warning score, displays it at the point of care, and notifies responsible caregivers to intervene quickly.

According to the company, Guardian automated EWS helps to reduce ICU transfers and readmissions, adverse

events, and length of stay. Plus the system can be tailored to a hospital's escalation protocols to improve clinical workflow, financial outcomes, and patient care.

For hospitals that do not have an Alarm Management Notification System, Philips says that it offers an enterprise event management solution called CareEvent. CareEvent includes a mobile application to send informative alerts directly to smartphones so that caregivers can make informed decisions and take action when required. CareEvent delivers alerts, including numerics, waveforms and associated data.



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'Black box' founders use AI, collaboration to improve surgical safety

BY KELLY O'BRIEN

The team behind the operating room black box is working to incorporate artificial intelligence into its reporting on surgical safety.

Dr. Teodor Grantcharov, a surgeon-scientist at St. Michael's Hospital in Toronto who specializes in advanced minimally invasive procedures, such as gastric bypasses, is the leader of the OR black box research project.

St. Michael's has one black box, used by Dr. Grantcharov. A second black box is at the Academic Medical Centre in Amsterdam and four more are to be added in Toronto and New York by the end of the year.

What continues to be the key to the success of the black box project is the post-surgery data analysis. The research team receives all surgical data from the two boxes and produces a weekly report summarizing each of the hospitals' procedures.

"The problems a black box detects in Amsterdam are going to be different from those problems detected in Toronto," said Dr. Grantcharov. "We have the ability to tailor it to the individual, to the specific team, the institution, the province, the country. That's the advantage of expanding the project. We can make educational interventions benefitting a wide range of people."

The black box team consists of 15 people, including eight data analysts who comb each case for errors or adverse events. It takes approximately two to three hours to rate, or log all the errors and events in each case. With interest in the black box increasing, the team has begun using computer vision to improve the effi-



Dr. Teodor Grantcharov and his team have started to implement AI to help identify surgical errors in the OR.

ciency of its reporting and meet the growing demand.

Computer vision, a form of artificial intelligence, is a science concerned with the automatic extraction, analysis and understanding of useful information from a single image or a sequence of images.

Dr. Grantcharov said the team was "teaching" the computer to identify an adverse event by feeding it existing clips of events from procedures that a human has already analyzed.

"Take bleeding for an example," he said. "Our library has thousands of clips of different types of bleeds. The human analysts are able to pinpoint what each bleed looks like, whether it's an inconsequential bleed,

or it's perfusing a bit more, making it more significant. Then we create what's called an event matrix, which allows us to identify and map out every different bleed."

"So we take that data and we enter it into the computer, which runs its own analysis, and then we're able to compare the human analysis to the computer analysis and see how accurate it is."

Karthik Raj, Dr. Grantcharov's research program manager, said each time the process is repeated, the accuracy of the computer report improves. The team has created a computer-aided framework for analyzing all the audio in a case with 62 percent accuracy.

"The more parameters we bring in,

such as error detection, bleeding detection, all of those things added together, the more accurate the computer analysis will be," he said. "When we reach 99 percent accuracy, we could actually allow the computer to help us."

Dr. Grantcharov was recently appointed the Keenan Chair in Surgery at St. Michael's for his research on surgical education and patient safety with focus on curriculum design, assessment of competence and impact of surgical performance on clinical outcomes—specifically his work with the OR black box.

Similar to the black boxes used in the airline industry, the OR black box is about the size of a PlayStation. It can record nearly everything that happens in the OR, including video of the surgical procedure, conversations among healthcare professionals, room temperature and decibel levels.

It works only for laparoscopic, or minimally invasive surgeries that insert video cameras in thin plastic tubes into small incisions in the body, allowing the surgeon to see what's going on inside the patient.

Until earlier this year, the team focused on improving safety by reporting on performance issues, communication and team dynamics. But in May, Dr. Grantcharov and his team hosted a retreat for 17 principal investigators from across Toronto, with areas of expertise ranging from art and design to engineering, to begin examining all the ways in which the data they collect can be used to improve surgical safety.

"We wanted to find out whether other researchers were motivated by the data, as

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IBM and ventureLab open new high-tech innovation hub in Markham

MARKHAM, ONT. — IBM and ventureLAB are unveiling the IBM Innovation Space - Markham Convergence Centre, an enterprise-led innovation hub in Ontario. Located at the IBM Canada headquarters in Markham, the space brings together developers, startups, entrepreneurs, funding agencies, researchers and experts and mentors from IBM and ventureLAB in one collaborative space to help companies scale up development faster and drive economic growth in York Region and the Greater Toronto Area.

This hub is part of the IBM Innovation Incubator Project, a \$54 million initiative of the Province of Ontario, IBM, and Ontario Centres of Excellence (OCE) to help propel 'made in Ontario' innovation by rapidly accelerating commercialization.

The IBM Innovation Space - Markham Convergence Centre enable ventures at all stages of their business life-cycle to excel and grow through technology innovation by providing easy access to the latest IBM technologies, including leading cloud and cognitive solutions.

"The IBM Innovation Space - Markham Convergence Centre will be an open environment where fresh ideas are

combined with the maturity of big business," said Pat Horgan, Vice President of Manufacturing, Development and Operations, IBM Canada. "By working shoulder to shoulder with young enterprises, developers and entrepreneurs, we are also helping to transform industries. These companies are identifying opportunities that will disrupt the status quo and ultimately improve the lives of Canadians."

In addition to the on-site support from IBM and ventureLAB, other organizations driving entrepreneurship and commercialization will work alongside more than 25 startups and entrepreneurs within The IBM Innovation Space - Markham Convergence Centre to provide networking, funding opportunities, mentorship, industry expertise, and support services, as well as links to researchers and connections with established businesses and local markets.

These members include OCE, The National Research Council-Industrial Research Assistance Program (NRC-IRAP), Markham Board of Trade, The Markham Small Business Centre, Innovation York, and Seneca.

"The newly created IBM Innovation Space - Markham Convergence Centre will allow ventureLAB to help accelerate

the growth of high-potential companies, while making more room for startups who wish to reside here with us to take advantage of the immense opportunity that exists for them by collaborating with our ecosystem partners," said Jeremy Laurin, President and CEO, ventureLAB. "By being inside IBM Canada, our startups



Start-ups benefit from IBM's extensive resources.

have unprecedented access to IBM tools, staff and an unrivaled ecosystem purpose built to help them go further, faster. Overall, it provides the foundation to meet our goal of helping to build 10 scale-up companies over the next 5 years."

Studio1Labs, a pioneer member of the innovation hub, is collecting and interpreting data collected from bed sheet sensors to help monitor and predict the

onset of clinical emergencies like Sudden Infant Death Syndrome (SIDS) for babies and infants. This local startup is also collaborating with Innovation York to establish further opportunities in the healthcare industry.

Peytec, another member of the space, uses IBM Cloud to support the company's Industrial Internet of Things (IoT) solutions that provide real-time physical asset management in industrial sectors for improving and automating supply chain, packaging, warehousing, and distribution processes in manufacturing and logistics sectors.

Businesses will tap into IBM's industry expertise, mentorship and global channels to help stimulate entrepreneurship in York Region and aid in the research, incubation, development and commercialization of business ideas in an effort to invigorate industries such as healthcare, energy, financial services, and transportation.

The Government of Ontario, IBM, and OCE invest in incubator ecosystems like the IBM Innovation Space - Markham Convergence Centre to help close the Canadian innovation gap and nurture research and development projects through collaborations with leaders

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IT and IPAC collaborate to develop an app to improve data collection

HAMILTON, ONT. – Healthcare is a fast paced environment and access to up to date, accurate data is key to ensuring patient and staff safety. St. Joseph's Healthcare Hamilton explored the possibility of moving away from paper-based infection-prevention audits to improve the auditing process and the timeliness of reports to the clinical units.

After completing a detailed environmental scan and looking at existing products, the organization decided it would be better suited to developing its own custom application to meet SJHH's specific needs.

Representatives from IT and IPAC teamed up with a local app development firm, Weever Apps Inc., to create a customizable tool that could be used to support a wide variety of infection prevention audit types and workflows. The tools would have to meet the auditing needs of a variety of different quality improvement working groups and the infection prevention and control team.

The IPAC team initiated the project, and worked with the Information and Communication Technologies Project Management Office to scope the project, document all the requirements and coordinate the development efforts with Weever Apps, to deliver a high quality product.

It took about six months to develop the app, which has been in use since August 2016.

The tool offers the ability to use Apple iPad devices to conduct IPAC audits throughout the SJHH organization, using an efficient checklist entry model. Each auditable point can be annotated with a photograph and comment if required, which transforms the level of effectiveness in capturing and conveying the particulars of compliance items.

Once the audit data has been collected, the tool can generate summary reports, which allow the ability to email PDFs of each audit summary, including comments and pictures to unit managers and others. As a result, the timeliness and impact of the reports is greatly improved.



Demetree Kallergis, Project Manager in Information and Communications Technologies, and Anne Bialachowski, manager of Infection Prevention and Control and Outpatients.

Audit form content can be maintained by the IPAC team using the flexible form management tooling built into the system by Weever Apps. Changes to the audit tools can be made based on feedback from the users and the clinical teams who receive the reports. A complex change request process is not required.

"Having the ability to add pictures to the audits brings the audit results to life for the clinical managers. They can see the gap identified by the auditor, reducing the needs for extensive written descriptions required by a paper tool," said Demetree Kallergis, Project Manager, and a member of the Information and Communication Technologies Team.

The app is used primarily by the hospital's Infection Control professionals, but since November working group members have also been using the tools and this has made data collection and the summary of findings even easier to complete. About five Infection Control audits are done each week, but depending on the week, it can be as high as 30.

Project ECHO will support primary care providers in underserved areas

BY JERRY ZEIDENBERG

TORONTO – Canada boasts some top-notch pediatric facilities, such as the Hospital for Sick Children (SickKids), where parents from around the province bring their children for specialized services. While specialists provide important care for patients, they can be overwhelmed by increasing demand for these services.

To help manage the demand, SickKids is launching a project called ECHO (Extension for Community Healthcare Outcomes). Pediatric Project ECHO aims to transfer expertise from pediatric specialists at the hospital to community-based healthcare providers across the province.

"People need access to specialty care for complex health conditions," said Adam McKillop, PhD, the Project Manager at SickKids. "ECHO will help healthcare providers to deliver best practices in their communities, through the experience of specialists at SickKids and other community-based providers."

Starting in October, SickKids will use videoconferencing technology to provide education and case-based learning opportunities for clinicians. "We're moving knowledge instead of patients," said McKillop, who was a presenter at the Apps for Health conference, held at Mohawk College in Hamilton, Ont., earlier this year.

SickKids is organizing teams to transfer knowledge in four different areas: acute and chronic pain; bariatric care; complex care; and palliative care – all with pediatric patients in mind.

Project ECHO is approved and funded by the Ministry of Health and Long-Term Care. The program aims to

build capacity in the community so patients can receive the necessary treatment locally.

It will also help reduce the load on tertiary centres, like SickKids, enabling specialists to focus on the most urgent patients that require hospital-based treatments and procedures, while primary care providers are able to supply specialized care in the community.

Pediatric Project ECHO will include regularly scheduled clinics for each specialty. The Pain TeleECHO Clinics will be held twice each month, beginning in October, while the Bariatric Care, Complex Care and Palliative Care TeleECHO Clinics will take place monthly starting in January 2018.

McKillop explained that the Project ECHO team at SickKids is developing a curriculum for each specialty to deliver relevant and up-to-date topics. He and his colleagues have been collecting feedback from potential participants so they can tailor the program to their needs.

The TeleECHO Clinics will include a brief educational presentation, a patient case presentation, Q&A, and ultimately result in recommendations built on best practices.

The teams at SickKids will include a medical lead and a group of multi-disciplinary clinicians to offer different perspectives throughout the clinic. Other attendees may include a guest presenter, students and trainees, and IT support.

While the patient cases will be based on real people, the identities of the patients will be redacted to preserve privacy.

The project will also include a Core Competency Curriculum for each specialty. These workshops are designed to look at certain topics in more detail, delivered via videoconference twice per year starting in February 2018. An in-person "boot-camp" at SickKids will also be offered for the Pain ECHO to develop hands-on pain management skills.

The project also provides an opportunity for clinicians at SickKids to learn about the pediatric needs in different communities. "It enables us to learn what is happening in communities, at the ground level," said McKillop. "We don't know everything, and this will create a two-way exchange of knowledge."

SickKids is currently recruiting groups in communities across Ontario

that are seeking to increase their knowledge in the four clinical areas.

The Project ECHO concept started in Albuquerque, New Mexico, when Dr. Sanjeev Arora, a liver specialist, found

he was overloaded with patients suffering from hepatitis C. Dr. Arora realized that most of the patients could be cared for in their own communities, if only their GPs and nurses received some additional training.

Dr. Arora, in 2003, helped launch a videoconferencing project in which teams of specialists trained primary-care clinicians in outlying communities. Using videoconference technology, they created a virtual classroom that educated their colleagues in best practices,

including lab tests and treatments for hep C patients.

ECHO was so successful that other clinicians and centres adopted Dr. Arora's methods. "ECHO centres have exploded since then," said McKillop.

ECHO projects are now operating worldwide, with Ontario leading the charge for Canada-based ECHO projects. The University Health Network, for example, offers ECHO outreach for hepatitis C, pain management and rheumatology. The Centre for Addiction and Mental Health (CAMH) and Holland-Bloorview Kids Rehabilitation Hospital, in Toronto, and the Children's Hospital of Eastern Ontario (CHEO) have also launched ECHO projects of their own.

At SickKids, Dr. Jennifer Stinson is the project lead. McKillop noted that SickKids will also be doing an evaluation of the ECHO demonstration project, which is slated to last two to three years. The evaluation will cover issues such as feasibility, acceptance, and change in participant knowledge and confidence to deliver specialty care in their practice.

Of great importance, of course, is whether patients are benefitting from ECHO. "We'll want to find out whether patients are staying in their communities, and if they are doing well or even better because they are staying close to home," said McKillop. The team at SickKids will seek additional funding for health system utilization and longitudinal patient-related outcome research.

For more information or to register for Pediatric Project ECHO at SickKids, please visit: www.sickkids.ca/projectecho. For information about other ECHOs please visit www.echoontario.ca or <http://echo.unm.edu/>



Cisco showcases the future of healthcare at its Toronto-based innovation centre

BY DIANNE CRAIG

At Cisco's Toronto-based Innovation Centre – one of nine in total around the world, and the only one in North America – healthcare takes centre stage in a display that includes technology innovations by several of the company's partners. Dimension Data, Apple, JED-MED, Hill-Rom, Industry Weapon, and Jibestream are presenting their technologies, all running on a Cisco network.

The centre is designed to show how the company can innovate with partners and also leverage relationships with universities to “co-create” new vertical solutions. There are three areas of specialization at the Innovation Centre in Toronto, including healthcare, financial services, and the concept of ‘smarter-connected’ buildings, homes, communities, etc. Currently healthcare is featured.

“We want to make sure we are solving real problems in healthcare,” says Marlon Harvey, Vertical Solutions Architect for Cisco Canada. The three primary areas of focus in the Innovation Centre are: the Intelligent Bedside Experience, a Smart Hospital Environment, and Virtual Care.

Consider the patient bed. Now so much more than the largest piece of furniture in the hospital room, smart beds, such as the one made by Hill-Rom in the Cisco Innovation Centre, are assisting healthcare

The idea of constant patient surveillance, for those at risk of a fall, is a priority. There are various solutions that can help.

providers to make informed decisions in several ways.

Alerts can be set to signal for example that someone restricted to bed rest is trying to get out of the bed. “A smart bed could identify whether someone is occupying that bed,” notes Harvey. “If you can start digitizing things like beds, and leverage the notifications, they can help to make informed decisions.”

A whole set of rules tailored to the needs of each patient can be built into the smart bed. For example, it could be set so the bed only reclines to a certain angle because the patient has a tube inserted. A smart bed can also indicate it's time to turn the patient, to avoid bedsores. It can weigh patients – enabling constant weight monitoring during a hospital stay that can be used to assist in determining, for example, whether the patient is retaining water and needs a diuretic.

A monitor on the wall that displays special patient notes can show that a patient is at risk for a fall. If the patient tries to get out of the bed, an alarm goes off that is linked to the nurse call system.

Hill-Rom contributed the smart bed, nurse call system, sensor board (that enables the bed to measure weight, etc.) and the vital signs monitor that are featured in the Innovation Centre.

Cisco is supporting the systems the beds are connected to, such as the nurse call system, over the IoT enabler. “We ask how we can ensure your bed is functioning opti-



Cisco simulates how smart beds, video monitoring and RFID tags can create an Intelligent Bedside Experience.

mally on a Cisco network – that's where our partnerships are so important,” says Shanti Gidwani, National Senior Director, Healthcare, Cisco Canada.

The idea of constant patient surveillance, for those at risk of a fall, for example is a priority. “Now we have the technology to do that. We can watch not just one, but 10 or 12 patients at a time ... and we add in the ability to interact,” says Gidwani.

Next to the smart bed in the Innovation Centre is a mobile Mono Cart, purpose-built by Dimension Data for Virtual Patient Observation that is outfitted with a Cisco security surveillance camera with PTZ, DX70, and a wireless access point battery pack. It gives patients a video connection with the nurses, so that a patient could communicate easily when they need help.

They can look into the video monitor and say, “I'm cold and I need a blanket.” “Seeing someone is reassuring to the patient,” says Gidwani, and to the nurses, she explains, since it gives them a visual link to monitoring the patient and determining how they are, and their level of comfort. It enables quick visual assessments that can improve time management.

One of the key considerations, says Gidwani, is “how do we create clinical workflows that help us better manage patient care?”

Alerts can be set up so that when a clinician wearing an RFID ID tag enters the room, the alert stops, and the clinician interacts with the patient to ensure he receives the right care.

The combination of EMR information with clinical workflow can enhance patient care management and efficiency. When alarms go off they can determine which patient can wait a few more minutes and which needs an immediate response. “There's a cumulative effect of saving time, of becoming more efficient,” says Sandy Saggat, Chief Information Officer, Halton Healthcare.

“It helps us to prioritize better, to become better clinicians,” adds Gidwani.

Notifications can be used in other ways to improve cost efficiencies. For example, they can help with identifying locations and assessing usage of certain types of devices or equipment. “If we employ this type of technology, we can find out for example, where the nearest pump is,” says Saggat.

“It's very difficult to measure how much you're using their devices (pumps for example) every day. We can say you are using this x hours that day, this day, etc. and here are your real costs, what you really used.”

Hygiene stations are everywhere now in every hospital setting, and visitors and staff are encouraged to use them frequently. In the Innovation Centre, an I.D. tag added to a hygiene station can track how often individual clinicians, and groups, also wearing I.D. tags, wash their hands. “When we have the data, we have the power to choose what to do with it,” says Gidwani. “Qualitative data helps us become more productive, efficient, and move closer to clinical excellence.”

The concept of Virtual Care is also presented in the Innovation Centre. A desk is set up for remote video collaboration with an Avizia cart that has Cisco video and codec in it, with a JedMed Horus Scope diagnostic peripheral that includes a general exam camera with otoscope and dermascope attachments.

Above the desk a video is running that profiles Dr. John Pawlovich, an Abbots-

ford, B.C.-based doctor who has a thriving telehealth practice meeting the needs of a remote First Nations community in Takla Landing, 1,000 km north of Vancouver.

Dr. Pawlovich drives a 4X4 to the community for one week each month to see and care for patients in person. He also set up video collaboration in his office and in the Takla Landing community health centre using Cisco TelePresence with a stethoscope, an ENT camera, and a general exam camera.

From Abbotsford he can listen to heart and lung sounds, examine wounds, provide other care, and also enable nurses in the area to consult with him via iPad, smartphone or desktop screen. This allows him to stay connected to patients the three weeks of the month when he is not in the area. “It empowers nurses too to become more competent,” says Gidwani. “The community has access to him four weeks out of four weeks.”

Virtual care for communities has saved thousands of dollars, and the possibilities for virtual care are seemingly endless. For example, says Saggat, “If we need a pediatric neurologist, we have new ones in Ottawa and can do a case consult right away.”

Digitization is transforming the delivery of care. It is even affecting how new hospitals are built. “It's the art of the possible. How do you make it more patient and family-centric, and how do you design and put in these technologies so they are enabling clinicians, staff, and volunteers to do their jobs in the most cost-effective way?”, says Saggat. “For example,” he adds, “enabling the availability of information when and where they need it.”

At Halton Healthcare in Oakville, they have made strides in that direction by integrating the nurse system with mobile devices. “If you're in a patient room and you're in a bed and you need a blanket, cup of water, or help with something, you use the nurse call system. We've integrated it to the mobile phone. If you are away from your room you can talk through the nurses' call system. It's immediate,” says Saggat.

New high-tech innovation hub opens

CONTINUED FROM PAGE 6

in government, industries, and academia by rapidly accelerating the commercialization of Canadian innovation.

Collaborative environments create a strong foundation for high value job creation by providing startups and developers with the expertise, resources, and advanced technologies needed to grow their business and compete on a global scale. Over the past 10 years, IBM Canada has invested more than half a billion dollars of in-kind expertise and related technologies to establish a series of collaborative innovation hubs across the country.

“Markham is home to one of the highest concentrations of Information Communications Technology (ICT) and life sciences companies in North America,” said Markham Mayor Frank Scarpitti. “The IBM Innovation Space - Markham Convergence Centre is a central part of

Markham 2020, the City's economic strategy, and will help foster a collaborative business environment, stimulate new business formation and commercialization, attract high quality employment, and enhance Markham's economic competitiveness and prosperity.”

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To apply to become a part of the IBM Innovation Space - Markham Convergence Centre, please visit i3project.ca/.

Alberta expands the scope of its Netcare EHR, and increases access

Kim Wieringa, Assistant Deputy Minister of Health Information Systems at Alberta Health, the provincial government's health ministry, in conversation with Contributing Editor, Andy Shaw.

CHT: Kim, Alberta has a reputation for being innovative and far-reaching when it comes to health information systems, so we have a lot we can talk about. But let's start with you first. What would you say you personally bring to the job you have now?

Wieringa: Well, it's been a journey to get here. I spent a lot of time in my early career as a business analyst working in corporate systems. I've also had six years of academic training, including certifications in human resources, information technology and project management. My goal in anything I do is to serve the end-user in a way that makes sense to that individual, but also serves the organization well. My background means I can take a concept from legislation and make it operational in a real-life environment.

CHT: I understand you left Alberta Health and were out of healthcare and IT for seven years, but returned in 2013 to head up Alberta Health's electronic record services branch before being promoted to your current position. You've been ADM going on two years now, so you can probably tell us exactly what your Health Information Systems division does these days.

Wieringa: Our division administers the Health Information Act, which sets out the rules for the collection, use, disclosure and protection of health information. We also oversee three e-health systems: the personal health record, Alberta Netcare (the province's electronic health record) and the Provincial Health Information Exchange. We also operate a number of Alberta Health systems such as the provincial health outbreak surveillance system and the Pharmaceutical Information Network, as well as all systems that are used to pay doctors.

CHT: Wow, that's a lot to look after. Do you ever get time to go home?

Wieringa: It's a busy job, for sure. But it also has a tremendous impact, both for healthcare providers and Albertans. And I have a great team working with me.

CHT: How busy are you these days with Alberta's patient portal?

Wieringa: We are continuing to expand its functions and increase the amount of information that's available through the patient health record. Right now, we are in a testing phase with about 1,200 volunteer users. We're moving forward in a prudent way, because we want to make absolutely sure we have a secure way of identifying users and providing the best possible protection of people's health information. To that end, we are working with Service Alberta on a digital identity program that will actually allow Albertans to validate their individual identities and create an online login that will then be used to ac-



Kim Wieringa, ADM, notes that Alberta is expanding Netcare to include dentists, optometrists and others.

cess other government services online. The personal health record is the first service to use the government's My Alberta Digital Identification system.

CHT: How much health information will patients be able to access via the portal?

Wieringa: Patients can currently access information about dispensed drugs, and the personal health record will soon have over 50 different lab test results available to early enrollment users. It's also important to point out the huge potential for the personal health record to be used as a wellness tool where users will be able to track their weight, BMI (body mass index), blood pressure, diabetes, etc. When it's fully launched, it will be optimized for mobile and will have the capability to sync with other well-known fitness devices.

Another feature of the personal health record is that it's linked to myhealth.alberta.ca, which launched in 2008 and is a trusted source of health information for Albertans. So in future, let's say you receive a lab test result you're concerned about, right away you can find helpful information about it on myhealth.alberta.ca.

CHT: How will people actually start accessing their records?

Wieringa: They will first login to the myhealth.alberta.ca website and apply for an ID, which will send them to Service Alberta to get their virtual digital identity. For that, they'll need either a driver's licence or an Alberta identity card. Once they have confirmed who they are, they will be sent a PIN number through the mail, just like the banks do. The PIN will be used to activate the ID and gain access to their personal health record.

We're really excited about that, because once we can get people to that stage, then the sky is the limit for what else we might do for them. We can start to think about offering a full range of what we call digital health services.

CHT: You've described yourself as an "Air Force brat" who moved often. So even as a child, you've experienced healthcare in jurisdictions outside of Alberta. No doubt as an adult administrator now you've looked across the country and beyond to see what can be learned from other healthcare systems.

Wieringa: Yes, certainly in Alberta we are always looking for innovations and best practices that we can implement in our province, and I definitely think jurisdic-

The personal health record will soon have over 50 different lab test results available to early enrollment users.

tions in Canada are learning from each other. Formally, Canada Health Infoway brings the country's healthcare CIOs together at least three times a year. And we're all quite transparent and open about sharing our best practices and lessons learned.

I see a number of interesting things happening across Canada. For example, Nova Scotia is doing some really impressive things with its Health Connect system. Saskatchewan also has something similar going with its CHIP or Citizen's Health Information Program.

In the United States, Kaiser Permanente has done a marvelous job of digitizing health services. They do it with high satis-

faction from providers, as well as from patients. What really stands out is that they are able to leverage their digitized services to improve patient care, to identify where gaps in care exist or where they can streamline or introduce other services. At the clinical level, it helps to curb problems such as overtreatment if you know exactly how many lab tests a patient has already had before ordering more tests. So there's a financial benefit too.

CHT: Which brings us all the way back to Alberta. And I am wondering before we finish if, with a series of quick questions and short answers, you might give us a snapshot of how you see the state of electronic healthcare in your province?

Wieringa: Sure. Let's go for it!

CHT: Great. So what do you see as the e-health priorities in Alberta?

Wieringa: Our e-health priorities are the same as other priorities in the health system, and that is to provide the best possible healthcare for Albertans. That means providing the right services, in the right places, at the right times, with the right health providers and the right information.

CHT: How much does Alberta spend on e-health IT?

Wieringa: In our most recent budget, we have an operational expenditure of \$594 million and a capital expenditure of \$22.3 million. Of that \$400 million has been allocated over the next four years to build a province-wide clinical information system.

CHT: In terms of other IT systems related to healthcare, what have you hooked up or not hooked up yet?

Wieringa: Our goal is to build an integrated system – and that remains a work in progress. Alberta Netcare is the province's electronic health care record system where patient-centred records are stored and referenced by physicians. Netcare today connects with physician offices and pharmacies throughout the province, and we're in the process of expanding the system to connect with chiropractors, dentists, and optometrists. The long-term vision is to continue to expand Netcare to bridge all parts of our healthcare system – and provide that information to Albertans through a user-friendly personal health record.

CHT: Finally, then, is there something you'd like to add that we haven't touched on?

Wieringa: I'd like to say that e-health is really the foundation for a new and transformed healthcare system – one that connects people, care providers and health information in ways that were never possible before. The ultimate aim is to empower patients as full partners with their care-providers in managing their health. This is an incredible opportunity to transform healthcare, and it's within reach with the tools we're building.



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FUJITSU

Acumyn dramatically reduces the time spent on quality assurance

BY JERRY ZEIDENBERG

TORONTO – Acumyn, a spin-off company from Toronto's University Health Network, has produced software that dramatically reduces the time that hospitals spend on quality assurance of their linear accelerators and CT scanners.

Both types of equipment emit ionizing radiation and require quarterly, weekly or even daily checks to ensure that they work properly and meet various regulatory and safety requirements. It's a time-intensive task that has traditionally required the expertise of highly paid physicists.

Acumyn, however, has produced software that automates the various steps required for quality assurance, making it possible for technologists to perform the checks and calibrations, instead of medical physicists.

"A physicist's time is not best-used doing these tests," said Ferhan Bulca, PhD, who is CEO of Acumyn. "It's better spent looking at results, and determining when to replace parts. You don't want to do replacements after the machine goes down," he added, explaining that such a situation would lead to longer down times and waits for patients.

There are about 80 different tests that must be conducted on radiotherapy machines, and about 40 for CT scanners.

Some tests are currently conducted using paper-based check-lists; which are filed and archived, making reporting and analysis difficult to conduct.

Some types of test are computerized, but various pieces of equipment are used and the results are often collated on paper.

Acumyn's AQUA software has consolidated all of the various tests, enabling technologists to run the software and quickly check and make the necessary adjustments. The software displays results on a dashboard for easy viewing.

Moreover, with all of the results consolidated in one database, reporting is much easier than using mixed paper and computerized systems.

Most impressive, perhaps, is the reduction in time needed for staff to conduct testing.

"We've demonstrated our software in radiology departments," said Bulca. "What normally takes 60 minutes can now be done in 60 seconds."

He said that onlookers have been impressed at the speed of the system and the change it means for radiation oncology and radiology departments.

"The product can pay for itself in three to six months," said Bulca. And it means that medical physicists can be doing higher-value work, instead of spending hours on tedious equipment tests.

That's not to downplay the importance



PHOTO: SHAUN DIAS, JDMI

Ferhan Bulca, Daniel Letourneau and David Jaffray are leading the rollout of Acumyn's new technology.

of quality assurance of linear accelerators and CT scanners, however. Bulca emphasizes that if they are incorrectly calibrated or if a malfunction goes undetected, these devices can have serious side effects or even kill patients – which is disastrous.

Incidents of serious burns and deaths have occurred at facilities in the United States, for example. Not only did the events harm patients and the reputations of the hospitals, but the subsequent lawsuits were expensive to settle. In 2011, New York Times published a series of articles to raise awareness on the importance of quality assurance for linear accelerators.

Hospitals must also ensure their CT equipment is tested daily to meet certain accreditation requirements if they intend to participate in certain types of clinical trials, which is another incentive for performing the checks.

"Many hospitals don't know how to meet these requirements," said Bulca. Many feel they can't afford the services of medical physicists and, therefore, do not pursue accreditation, which would elevate their reputation and generate new revenue opportunities.

He noted that with Acumyn's AQUA (for linear accelerators) and AQUA Radiology (for CT scanners), technologists can now perform quality assurance tests with less effort. Moreover, the software is easy to install and use. "It can be implemented in two days," said Bulca.

Acumyn's software has been used to test

linear accelerators at the UHN's Princess Margaret Cancer Centre since 2012. The company has installed about 20 systems to sites worldwide, including Canada, the United States, the United Kingdom, the Netherlands, France and Australia.

AQUA Radiology software is now being rolled out to all five UHN sites for testing CT scanners under Acumyn's early-adopter program. Rush University Medical Center, in Chicago, is also participating in the early-adopter program for AQUA Radiology. Acumyn plans to start commercially marketing in North America in 2018.

Other types of equipment require periodic testing and calibration, such as MRI and ultrasound. Acumyn is working on software solutions for these devices, too.

AQUA software is the brainchild of Dr. David Jaffray, a medical physicist at UHN who is now Executive VP, Technology and Innovation, along with Daniel Letourneau, UHN's Associate Head of Physics. Dr. Bulca, a serial entrepreneur and an instructor of entrepreneurship at the nearby University of Toronto, joined Dr. Jaffray and Dr. Letourneau as a co-founder to commercialize the software and lead the business.

The company also employs a team of developers and business managers.

Referring to Dr. Jaffray and Dr. Letourneau, Bulca said, "They realized there was a problem, and they devised a solution for it. It was first used internally, at the UHN, but it has great potential for all hospitals."



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'Black box' founders use AI, collaboration

CONTINUED FROM PAGE 8

well as gain a better understanding of all the things we could do with this type of data," said Dr. Grantcharov.

By bringing in researchers with different backgrounds, the ways in which Dr. Grantcharov's team will be able to improve surgical safety will expand beyond the procedure and the actions of the surgical team.

"Take OR design as an example. Our team doesn't have that knowledge or background, so we can't offer any insight

into how design could make surgery safer," he said.

"When we have researchers come in with an expertise in design, they are able to see the data we've collected in a whole new light."

Dr. Grantcharov said he hoped that by taking full advantage of the data from the black box, he and his team would find new ways to improve surgical safety.

"As long as there are humans, there will be mistakes. But by learning from these mistakes, and studying how we can do better, we will continue to make surgery safer."

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A lesson for healthcare entrepreneurs: when you've got a great solution, don't quit

Canada's Cloud DX combines brains and tenacity to win \$100,000 XPRIZE.

BY DR. SUNNY MALHOTRA

In July 2016, Cloud DX was disqualified from the Qualcomm Tricorder XPRIZE when they missed a deadline for human testing. Healthcare Canada delayed human testing certification, leading to a disadvantageous position for Cloud DX compared to the American teams. Nevertheless, in April 2017, Team Cloud DX took home the first ever and newly created XPRIZE Bold Epic Innovator Award and US\$100,000, in a fabulous comeback story.

Here's our experience, which illustrates the ups and downs of entrepreneurship:

Starting in 2012, there were over 300 teams from around the world that applied to be in the Qualcomm Tricorder XPRIZE. By August 2014, the competition was whittled down to 10 finalist teams, including Team Cloud DX from Kitchener, Ontario. Throughout 2015, teams dropped out, teams merged and by the summer of 2016, there were only 6 finalists left, including Cloud DX, which made it through to the delivery of finished Tricorder prototypes for human testing by the XPRIZE judges, in July 2016.

And...that's where their XPRIZE journey seemed to come to an end. Due primarily to lengthy delays in receiving approval to test on humans, and despite heroic efforts on the part of the team, Cloud DX was unable to complete the required internal testing in time and were therefore disqualified from the QTXP prize money round.

Later in that year, three more teams were excluded from the consumer testing phase – leaving only two

remaining finalists to vie for a potential \$9 million prize purse.

Then, an amazing reversal occurred.

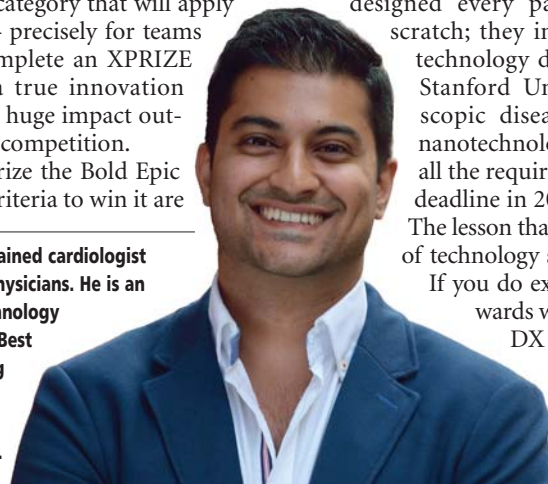
Qualcomm Tricorder XPRIZE recognized that missing a deadline might be a disqualification for the prize purse, but genuinely revolutionary technology

Cloud DX won the XPrize Bold Epic Innovator Award because it designed every part of its Tricorder from scratch, and passed all of the tests.

still deserved to be recognized with an award, so they created a new XPRIZE category that will apply to all future XPRIZES – precisely for teams like Cloud DX that complete an XPRIZE “in spirit”, by taking a true innovation moonshot and having a huge impact outside of the realm of the competition.

They call this new prize the Bold Epic Innovator Award. The criteria to win it are

Dr. Sunny Malhotra is a US trained cardiologist working at AdvantageCare Physicians. He is an entrepreneur and health technology investor. He is the winner of Best in Healthcare - Notable Young Professional 2014 and the national Governor General's Caring Canadian Award 2015. Twitter: @drsunnymalhotra



strict: the winner's Tricorder still had to meet all the minimum requirements for winning the main prizes, as verified by clinical testers at the University of California San Diego; the applicants had to submit a video and one-page pitch explaining why they deserved to be the Bold Epic Innovator; and the judges also asked for testimonials from key medical opinion leaders with some knowledge of the team's work.

Out of the four semi-finalists, all of whom applied for the new award, and all of whom submitted fully functioning Tricorders, Cloud DX was chosen as the first-ever XPRIZE Bold Epic Innovator and received a beautiful XPRIZE trophy plus the obligatory “big foam cheque” for US\$100,000.

Cloud DX earned this new honor because they designed every part of their Tricorder from scratch; they included Nobel-prize-winning technology developed in partnership with Stanford University that detects microscopic disease particles using magnetic nanotechnology; and their Tricorder passed all the required testing, even if it missed the deadline in 2016.

The lesson that Cloud DX brings to the world of technology startups is: NEVER. GIVE. UP.

If you do extraordinary work, then the rewards will find their way to you. Cloud DX and XPRIZE will now work together, with an additional \$5.4 million in grants and other funding, to commercialize the Tricorder for release in 2018 or 2019. Stay tuned!

REBOOTING eHEALTH

Carnac the Magnificent tackles B.C.'s IHealth problems

BY DOMINIC COVVEY

An eHealth system has been implemented in Nanaimo that worked well elsewhere, but has caused quite a kerfuffle on Vancouver Island. Help is needed – luckily, the great seer, soothsayer, and sage, Carnac the Magnificent is here!

Multiple reports, in both the local and national press, indicate that a number of physicians have even gone so far as to refuse to use the system (sound familiar?) The target of their frustration is called the IHealth system from Cerner. On checking, friends indicate that this system has been successful in other jurisdictions. So what the heck is happening here?

Well, there are those wise ones who will remark that it's in British Columbia, the home of everything weird – why expect anything different? Others will point out the deficiencies in this and every other

eHealth system and see that as causal. Still others will rant about physicians and attribute the entire problem to them.

I resisted the temptation to look into this matter in greater depth. I even spoke with someone who was willing to be interviewed about the problems. However, I thought that my channeling of a famous seer would be far more productive and allow me to avoid actual work and real conflict! That seer is Carnac the Magnificent.

Some of you may have watched Johnny Carson from time to time. And some of those might be willing to admit it. Periodically Johnny brought Carnac to life.

Usually, Ed McMahon assisted Carnac. Ed would tell Carnac that he held envelopes that were hermetically sealed and kept secure. No one knew the content of the envelopes.

However, Carnac could use his mystical powers to tell us their contents by asking a question for which

the contents would be an answer. Carnac then provided the question, after which he opened the envelope and revealed the answer ... usually causing great laughter and miserable groans.

The Carnac skits were some the funniest on TV. If you'd like a good laugh, go to YouTube: www.youtube.com/watch?v=ZFQFF_Vb0Hw. Today, the channeled Carnac will consider the facts of the Nanaimo situation to be the contents of the envelope. Based on Carnac's incredible powers, we will divine a set of questions that are answered by the contents. Unfortunately, though, the answers may not be funny!



Dominic Covvey

The questions Carnac foresees are:

Firstly, was everyone properly engaged and motivated during the acquisition, development and implementation of the system? We know from bitter experience, as well as from theory, that the most fundamental and crucial eHealth intervention is the investment of adequate time and energy in soliciting and maintaining participation. This means forming groups of users, and educating, communicating and listening to them. When done well, the results are amazing. However, adequate participation is often not achieved. Was it achieved here?

Next, was the culture and tenor of different groups assessed and recognized? It's clear from both research and practice that what works in one place with one group doesn't always work in all places with all groups. Often a good slogan is: if you've seen

CONTINUED ON PAGE 23

Digital healthcare presents opportunities – don't forget the challenges

BY LYDIA LEE

The digital revolution promises unparalleled access to data, stronger insights and deeper human connections – and in many ways it has delivered. The challenge for most industries, however, has been keeping up with the speed of innovation and the expectations it has created. Healthcare is no exception.

Certainly, there are advantages to a digital-health mindset. Yet to understand the benefits, we must first understand the challenges today's healthcare professionals face.

Information overload: Staying current with best practices and medical innovations can be like surfing an information tsunami. It feels like every 15 minutes there is a new paper, clinical trial, or wonder drug that must be absorbed and internalized – and it's enough to overwhelm even the most studious healthcare professional. There's a reason the Institute of Medicine has now coined the industry a “learning health system”; and while tools such as Pubmed and Google can help manage the flow of information, most of us are scrambling to keep up with new developments and the constantly evolving standards of care.



Lydia Lee

Higher expectations: In the age of Uber, Airbnb, and Amazon, consumers expect service on their terms. This also applies to patients, who are accustomed to 24/7, virtual, self-serve options from their banks and insurance companies, and are now looking to their healthcare providers to deliver the same. More and more, they're wondering why they can't Skype their doctor, use smartphone apps to manage their care, or choose virtual alternatives to sitting in a waiting room.

In short, incorporating social media tools into healthcare communication is a given with Millennials. Patients are aware that alternative service models exist, and these expectations are pressuring healthcare facilities to catch up.

One size doesn't fit all: Automation may work for industries where a standardized approach makes sense, but in the healthcare environment, no two patients are ever alike. So while a modern clinical information system can help standardize various hospital functions, human judgment and other complexities at play make it hard to implement “one-size-fits-all” systems. Beyond enterprise systems, healthcare organizations are also grappling with how best to accommodate new apps that provide solutions to specific niche needs for patients as well as staff.

Change is hard: Implementation costs and common project management pitfalls aside, it can be difficult to integrate new health technologies into complex and ever-changing healthcare environments. Even when the architecture is right, project sponsors still often underestimate the amount of change people need to go through to incorporate new technologies into a redesigned

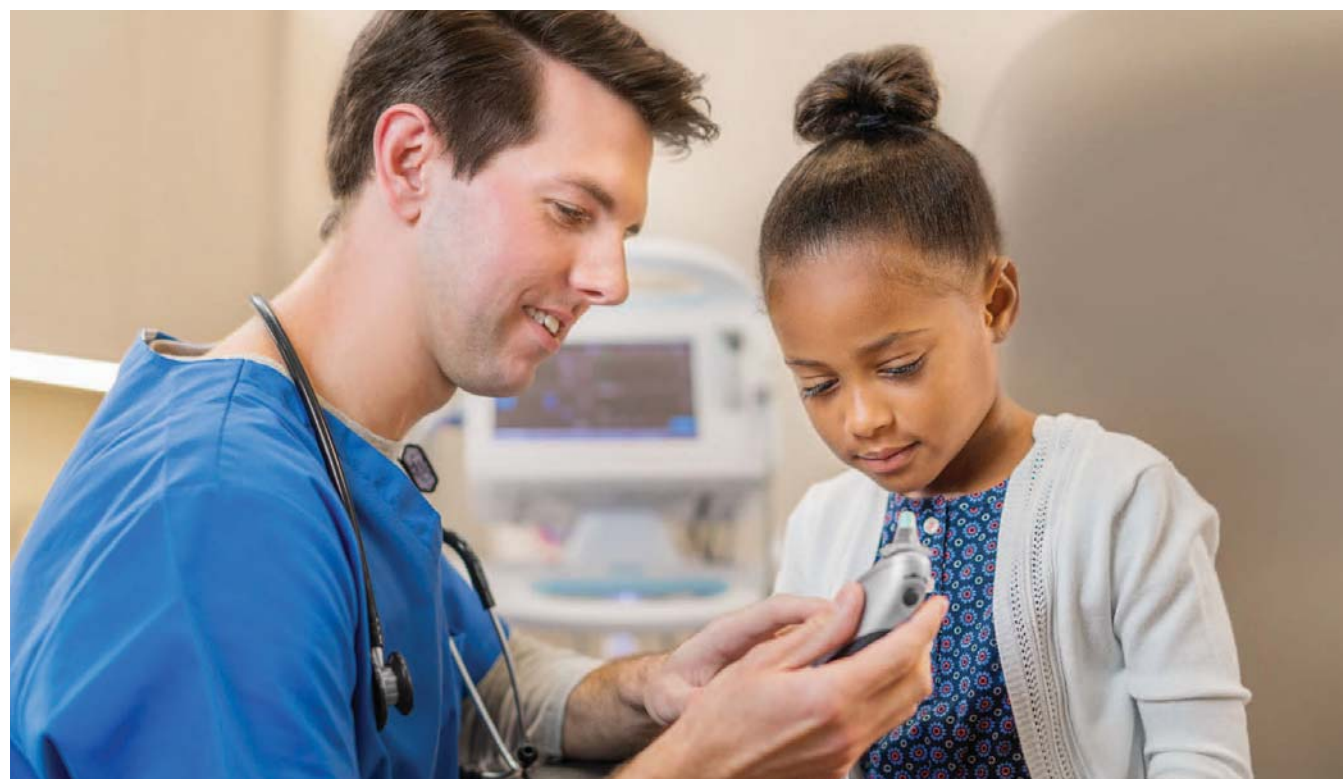
workflow. Technology is supposed to enable change, not the other way around.

Old versus new: Compounding implementation for most healthcare organizations is the challenge of dealing with “legacy debt”, which is the need to update and/or replace older systems in order to make way for

more modern technologies. For example, legacy debt can take the form of old client servers and in-house data centres when a better alternative may be moving to the cloud. Addressing conversion can be a costly and time-consuming proposition which must be carefully accounted for in any digital transformation. However, these major work efforts often get short shrift in IT transformation budgets, which is like building a new house on a weak foundation.

Islands of data: Often related to legacy debt is the problem of data silos. It occurs

CONTINUED ON PAGE 16



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Canadian nurse leaders discuss the importance of data standards

BY SONIA PAGLIAROLI
AND LAURIE A. GEHRT

Nurses represent the highest percentage of human resource professionals delivering healthcare. Moreover, their role in the health system is crucial – they are the professionals most often at the point-of-care, directly interacting with patients. So, as we rapidly transform care to integrate evidence based care and technology, or implement patient-centered care initiatives, we must ensure that the environment for nurses to deliver high-quality care is not compromised.

Last month Cerner participated in the National Nursing Data Standards Symposium in Toronto, Ontario which gathered nurse leaders from across Canada to discuss the importance of nursing data standards to support the measure of nurse sensitive outcome as well as interoperability of data across care venues. There was no doubt among nursing leaders that there was a need to define a national standard, however there was a significant tentativeness in the crowd requiring further understanding of just what a national standard means. Subsequent discourse illuminated a real concern that if not implemented correctly, this new national standard could increase the burden on nursing workload which in turn would impact their ability to deliver high quality care. There have been many regional and provincial initiatives that have endeavored to measure quality through

standard data collection to compare outcome metrics, however the data required has been layer on top of existing clinical documentation rather than integrated creating a burden on healthcare organizations that translates to nursing having to shoulder the lion's share of the data gathering.

Our neighbours south of the border are facing similar challenges, however with the American Recovery and Reinvestment Act of 2009 which introduced incentives to implement electronic health records (EHRs), so they are feeling the weight of data collection more rapidly. Canada is in a position to learn from these challenges and implement EHRs more effectively.

A working group from the Nursing Knowledge Big Data Conference at the University of Minnesota has made significant strides in identifying recommendations for optimization of EHRs to support effective nursing documentation and clinical support. Some of the key recommendations from the working group include;

- Documentation is fast, simple and minimized redundancy,
- EHR supports patient and family centered needs and wishes which drive plans of care,
- A vendor neutral source of clinical best practices, standardized assessments and clinical decision support rules,
- Interprofessional clinical engagement on system design, build and outcome measures,
- Data is standardized and interoperable,
- Biomedical devices are integrated to avoid transcription,

• Well-designed display of real time clinical information that integrates with clinical workflow,

• Tools to support nurse leader decisions, such as dashboards that measure program outcomes.

As many Canadian organizations are embarking on the implementation of advance EHRs these recommendations can serve as guiding principles in system design. As a vendor, these recommendations can help to ensure success as they support standardization, best practice and clinician



Sonia Pagliaroli



Laurie A. Gehrt

engagement. To be successful however, these recommendations need to be adopted and supported by both client and vendor in partnership. The work being done in Canada to define the national standard of using c-HOBIC and LOINC as data standards will support interoperability using common terms across the continuum. A key difference in the approach taken in Canada is related to our culture which is more aligned to collaboration to-

wards common goals rather than mandates. The driving factor to adoption requires the engagement of clinicians through education on best practices and clinical value. Cerner's implementation methodology has improved to include the identification of measureable clinical value outcomes early in the project to ensure technology enabled patient care outcomes are achieved.

In addition to the nursing outcomes data standards, nurse executives require a nursing management minimum data set (NMMDS) to provide an accurate description of the nursing process used when providing nursing care. The NMMDS covers data elements in three different categories of the environment, the nursing care resource utilized, and financial resources focusing on the nursing delivery unit/service/center of excellence level across these settings.

While there will still likely be learnings in the implementation of these standards in Canada, there is no doubt that we have a clear vision to support a successful implementation and more importantly the ability to measure patient outcomes.

Cerner is excited to be a partner with our clients to design solutions that are efficient and effective being cognizant of the potential of unintended consequences.

Sonia Pagliaroli, RN, MSc, CPHIMS-CA, is Chief Nursing Officer, Cerner Canada. Laurie A. Gehrt, MBA, RN-BC, FACHE, is Vice President, Program Executive, Orcah.

Healthcare technologies pose great challenges, along with solutions

CONTINUED FROM PAGE 15

when specific data is housed and controlled within specific departments, and the capability to share and analyze that data between departments, or across the enterprise is limited. As a result, organizations lose the ability to use that data to see the full picture. This situation leads to suboptimal care delivery and patient safety risks when clinicians do not have access to complete information.

Cyber security: In an industry rife with private and sensitive information, it's no wonder that the threat of cyber-crime keeps healthcare IT professionals (and their CEOs) up at night. Personal health information is now more valuable on the black market than financial data because it's a bridge to multiple forms of identity theft. Evolving one's strategies to keep up with the bad guys means implementing new layers of security, training staff on cyber protection, and keeping a constant eye on online trends. It's not cheap, but in today's world, it's table stakes.

Turning challenges into opportunities: Daunting as it may seem, implementing new clinical systems and technologies are moving to the top of the transformation agenda for most healthcare organizations. After all, a transparent healthcare system depends on the free flow of accurate, actionable data,

and health IT professionals need to find better, faster ways to make that possible.

Digital transformation in healthcare requires intestinal fortitude, to be sure, but the benefits of adopting a digital health approach are worth the frustration and investment when done right.

Drawing inspiration: The likes of Uber and Airbnb may be changing consumer expectations, but they're also giving healthcare leaders ideas to improve patient care. Already, the industry is discussing how Uber's approach to scheduling rides can be applied to patient portering in hospitals, how online retail apps can inform the development of new patient apps, and how the "big data" capabilities of systems like Facebook and Twitter can change the way hospitals track and understand their patients. These insights from other industries are already starting to make a critical difference in modernizing the patient experience, and organizations need to consider how, not if, they want to get into the digital game.

Turning change into engagement: Big change initiatives, such as implementing enterprise clinical systems, do not come along very often. They require a whole set of necessary program management, governance, and technical controls to ensure that the organization achieves its intended objectives. That is tough work but can be done with the right set of

eyes at key points in times throughout the planning and implementation. One of the most important opportunities, though, is the chance to use these initiatives to engage and excite the people in the organization to drive the transformation. A key question for program sponsors is whether they have full support from the entire senior leadership team, not just IT, to take advantage of this rare opportunity.

Predictive modelling: Healthcare organizations are rich with data, yet are often lacking in the means to collect and

Developments like Uber and Airbnb are giving healthcare leaders new ideas about improving care delivery.

analyze that data effectively. With more robust data and analytics systems, hospitals can use the information they already have to modify a patient's treatment and predict that patient's outcomes afterward. Already, data from lab results and vital signs are being used in some hospitals to predict an ICU patient's risk of becoming septic, while comparing data sets from a group of similar patients can be used to predict recovery rates and preferred treatment methods. This is

also a critical space for government organizations to facilitate richer planning and policy advances to optimize sustainability of the healthcare system.

Machine learning/Artificial intelligence (AI): We already know that machine learning technology can rival a human's ability to diagnose patients. In a March 2017 study at The University of Texas, for example, a machine-learning approach (Support Vector Machine Learning) was used to classify individuals with major depressive disorder with nearly 75 percent accuracy. Elsewhere, machine learning techniques have also been honed to predict, detect, and manage heart failure with equally promising results.

Yet rather than regard these stories as the end of certain careers, we should view this as an opportunity to leverage machine learning and AI to fill vital resource gaps while freeing up healthcare professionals to spend more time with patients. This also opens up entirely new possibilities to rethink the education and training for the next generation of health professionals. To do so would provide new opportunities to address global health human resource shortages, virtual care across boundaries and access to care.

New ways and competencies: Advanced forms of information technology

CONTINUED ON PAGE 23

The Medical Device Single Audit Program is going to make a big difference

BY ANNE-MARIE PIZZITELLI

The medical device industry is about to experience one of its most significant upheavals in decades. At the forefront is a new quality management system (QMS) audit that allows third party certification to be recognized by multiple regulatory bodies.

In recent months it has been widely publicized, but that does not mean all manufacturers have taken into consideration the effects of, what some call, an industrial tsunami heading their way.

Manufacturers of medical devices are currently required to be audited for quality management systems in each country they sell their device. That ensures all local standards and regulations are being met; for each country there is a separate audit and certification. As a result, the business disruption time can be considerable for exporting manufacturers.



Anne-Marie Pizzitelli

So, after years of talking about finding a more streamlined approach we are now heading towards the Medical Device Single Audit Program (MDSAP), the first major step towards universal certification by third parties.

While this should make life easier for many manufacturers, the longer companies wait to adopt the program the greater the risk of being left behind.

MDSAP began life in 2011 at the International Medical Device Regulatory Forum (IMDRF). It included eight regulatory bodies and a number of interested parties, including the World Health Organization.

As the discussions developed, five of the countries (Australia, Brazil, Canada, Japan and the United States) emerged as being at the forefront of wanting to develop and oversee a single audit program. This would make it possible for any certification company, called an Auditing Organization (AO), to carry out a single audit that would be recognized in all five countries.

The five regulatory bodies are:

- Therapeutics Goods Administration (Australia)
- Agência Nacional de Vigilância Sanitária (Brazil)
- Health Canada
- Ministry of Health, Labour and Welfare and the Japanese Pharmaceuticals and Medical Devices Agency
- U.S. Food and Drug Administration

The QMS requirements will vary for the type of device being produced, but the universal nature of the process that can be done in just one country should make it more efficient. MDSAP does include software, but the auditing requirements may be different, depending if the software is embedded or stand-alone.

In theory, this should make for a quicker, easier and more transparent process. But while all five countries are backing MDSAP, not all are treating it the same way.

Leading the charge is Health Canada. It has announced that MDSAP will be the only recognized certification starting Jan-

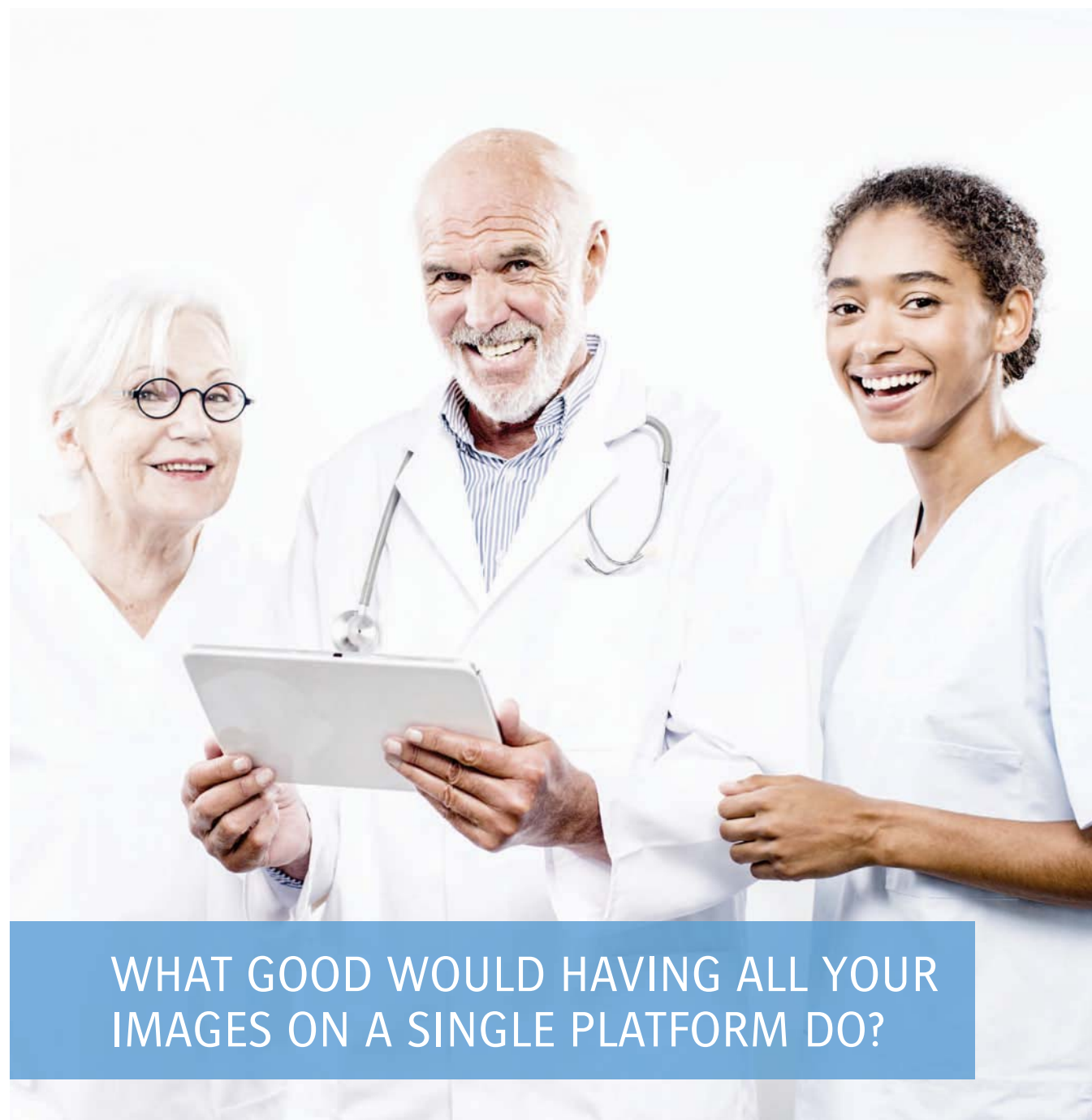
uary 2019. That means any company manufacturing or exporting medical devices to Canada will need to replace the Canadian Medical Devices Conformity Assessment System (CMDACS) with MDSAP to demonstrate quality management system compliance.

For home-based manufacturers and those exporting to this country, the transition clock is ticking. Those who fail to take action soon, risk being stuck in a bottleneck that it expected to develop at the start of 2018. Auditing Organizations fear with a finite number of auditors trained to carry

out MDSAP certification, some companies will not meet the deadline imposed by the Federal Government. Health Canada has made it clear the transition period is fixed and there will be no extensions.

For some Canadian companies that

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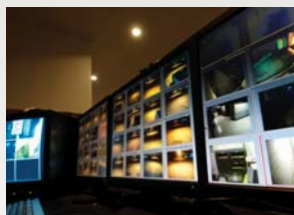
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Be aware of MDSAP, it is going to make a big difference

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only sell in this country, the introduction of MDSAP will be more expensive but Ottawa argues the upside for most manufacturers will be considerable.

While Canada is the only one to abolish its previous certification process, the other four jurisdictions say MDSAP will be recognized in lieu of their own market inspections. For those hoping to export to Brazil, for example, this would allow a manufacturer to skip an existing two-year waiting list.

On a related note, manufacturers are in the transition phase of ISO 13485 – the internationally-accepted model for demonstrating adherence to laws and regulations of the medical device industry.

This transition period ends March 2019. The new version, is the first revision in more than 10 years and puts a greater emphasis on risk management and risk-based decision making. As well, it offers better controls over suppliers and verification processes for connected devices.

And if that was not enough, the European Union has now approved a replacement for the Medical Device Regulation – it is called the Medical Device Directive.

When it comes to MDSAP, there has been a jaundiced view in some quarters. Executives initially saw this as another harmonization project that would be shelved by the bureaucrats once the pilot had been completed. We now know that is not the case and Auditing Organizations fear the demand for audits will outstrip supply if there is a mad scramble at the end of next year.

Given all this upheaval, some manufacturers may be reluctant to make a decision

until they can fully understand the new certification and regulation landscape. That is why it is important to have key personnel involved in proactively seeking solutions. For some it may be nothing more than changing certification cycles. But every business leader must ask: what needs to be done now to minimize the disruption to my business?

New app encourages patient engagement

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will require today's healthcare organizations to learn new skills and competencies. Clinicians are beginning to grasp how the availability of information can personalize care to improve patient outcomes. Organizations are learning how to work together in shared service models to leverage economies of scale that the cloud can provide. Meanwhile, health IT professionals need to apply new ways of working to respond more quickly to demands for the technologies that can advance healthcare. However, can Canada's healthcare organizations learn, evolve and change fast enough to reap the rewards of digital that society expects from us?

The Road Ahead: Though Canada has had its share of healthcare IT challenges, we should still be proud of our advancements. Our country is a leader in healthcare innovations, and in KPMG's 2017 Through the Looking Glass: A practical path to improving healthcare through transparency, it scored 79% when it came

Anne-Marie Pizzitelli is Senior Manager, Communications, with BSI Group Canada. For more information, see: <https://www.bsi-group.com/en-CA/>. BSI Group Canada provides a full suite of services, including training, assessment and certification. As a global leader in helping organizations improve, our clients range from high profile brands to small, local companies in 172 countries worldwide.

to the communication of timely, relevant healthcare data between stakeholders. That said, it also scored 50% when it came to assessing patient's access to personal health data and the policies and legislation in place to protect privacy. There is clearly still more to learn and more work to do.

We can learn from our shortcomings and leapfrog where we have stumbled. We should recognize the need to free data from existing silos, complement it with smarter technology design, and reap new insights that allow healthcare professionals to understand their patients on a deeper level. We also need to think beyond care systems and turn our attention to digital enablers of care prevention and social services that impact health and wellness.

Ultimately, digital health isn't just about making upgrades and replacing old equipment. It's about totally re-imagining health and healthcare in a digital world.

Lydia Lee is a Partner and National Digital Health Leader, with KPMG in Canada.

Dominic Covvey

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one, you've seen one! There are differences that must be assessed and addressed. Was what worked in one location simply transported to another location? Was what worked for one group simply applied to another group? We know this doesn't work, but this seems to be a habitual mistake.

Were there Usability Assessments of the system in different people's hands? Today it is both possible and affordable to test out systems with specific groups of people and to determine their perceived 'friendliness'. However, if Usability Assessment is done at all, it is often in some central location with some selected individuals. What about all the others? What about all the differences among people and their perceptions of both the nature of their practice and the relevance and capabilities of systems? It isn't good enough just to do an in-lab, once-over Usability Assessment.

Perhaps the next question would be: Who created each component of the system content? This includes lists of medications, investigations, diagnoses, devices, or whatever else must be done in terms of content customization. One issue in Nanaimo is that physicians claim that using the system can increase

the likelihood of mis-prescribing. We do know that long pulldown lists allow a simple slip of the wrist to result in erroneous selection. Did physicians participate in the creation of the lists? Are shortcuts available for busy people? Were the lists well-organized? The move from writing down one or a few medications to selecting one or a few from nearly infinitely long lists is a big one.

Carnac is amazingly brilliant, and has come up with lots of other questions. We simple people have little time to ab-

It isn't good enough to do an in-lab, once-over usability assessment. Regional differences must be noted.

sorb the details of all of these. However, consider these:

- To what extent was the user interface customizable to different users' needs?
- What was the overall change process to help transport people from their well-practiced way of doing things to the new approaches demanded by the system?
- To what extent were eventual users given a chance to express issues and concerns and were these listened to?
- Did the users feel, after all the initial interventions, that the system was being

imposed on them? If so, was this perception corrected?

Carnac still does not know the answers in the envelope. Carnac believes, however, that he has come up with many questions that the contents will answer. In fact, these questions will be answered by the contents of the many other envelopes associated with eHealth Implementations – and tell us where we go wrong.

It's up to you at this point. If you are involved in this project, please let us know what actually happened – the facts, Mam, just the facts. If you are not involved, please inquire and try to find out what happened.

We need to do this so we determine yet again why things go wrong. We need to discover what it is about this instrument we call eHealth that often hurts, sometimes doing actual harm, rather than offering cures.

The suggestion is that we all learn enough and then take an oath – like the Hippocratic oath – that includes the statement "to do no harm", rather than the hypocritic oath where we promise to do wonders while ignoring what we know.

Dominic Covvey is President, National Institute of Health Informatics, and an Adjunct Professor at the University of Waterloo. He can be reached at: dcovvey@uwaterloo.ca

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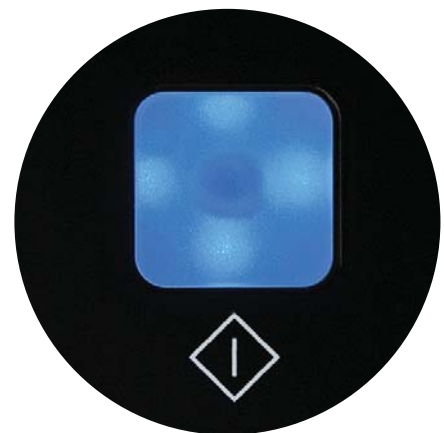
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