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INSIDE:

CARDIOLOGY REPORT
PAGE 8

Automation for cardiology
A Toronto-based cardiology clinic has developed a system that can consolidate all of the information from various imaging modalities, enabling cardiologists to collect information in a single workstation. That's far more efficient than previous ways of working.
Page 8

Organizational efficiency
Not only is the new Oakville Hospital one of the leaders in the use of cutting-edge technologies, it is

also pioneering the way nursing units are organized. The hospital has created 12-patient pods, with dedicated nursing staff.
Page 4

Machine learning at home
AlayaCare and We Care have teamed up to demonstrate that machine learning, and the Internet of Things, that can be used to better monitor patients at home and reduce readmissions to hospital.
Page 14

How to spur innovation
Southlake Regional Health Centre, in Newmarket, Ont., is targeting start-up technology companies as

a way of solving problems faced by the organization. The innovation approach is also designed to foster the growth of the economy.
Page 20

PHOTO: COURTESY TORONTO EAST GENERAL HOSPITAL

The Clinical Steering Committee at the Toronto East General Hospital has helped the organization achieve Level 6 in the HIMSS Analytics EMRAM scale. Thanks to its Level 6 systems, medication incidents are down 30 percent, the number of documents sent to family physicians has increased 600 percent, and medication turnaround time has decreased by 60 percent. **SEE STORY BELOW.**

Barcoding key to reaching HIMSS Level 6

BY DIANNE DANIEL

When Toronto East General Hospital started its automation journey in 1997, the HIMSS Analytics Electronic Medical Record Adoption Model (EMRAM) didn't even exist. Now, 18 years since implementing its first "view-only" systems to provide clinicians with better access to information, the 515-bed community teaching hospital is being recognized as the fifth Canadian hospital to achieve Level 6 on the adoption scale.

Ironically, most of the systems required for Level 6 have been live at TEGH for several years, including computerized physician order entry (CPOE), physician documentation and electronic medication administration records (eMAR). What was missing was automated pharmacy workflow based on barcoded medications, a Level 5 requirement.

"We already had the eMAR. We had positive patient identification. We just didn't have the medication barcoding," said TEGH CIO Pegi Rappaport.

Though improvements are being made, Canadian pharmaceutical manufacturers do not use consistent barcodes, she explained. That means the only way to attain a closed loop medication process is to repackage medications once they arrive in the pharmacy.

Drawing on the experience of North York General Hospital, which rolled out its barcoding strategy in 2010, TEGH implemented a barcoding station and is currently

> The addition of medication barcodes closes the loop on medication administration.

in the process of formalizing the new workflow for pharmacy assistants and technicians. The process differs slightly between oral solids, oral liquids, IV injectable and bulk medications, and uses automated machines as well as manual processes.

Essentially, if a GS1 standard Global Trade Item Number (GTIN) for healthcare is available, no action is required. In the ab-

sence of a GTIN, a Cerner Item ID is printed and affixed. Unit doses are also dispensed, packaged and labelled as required.

The addition of medication barcodes closes the loop on medication administration at TEGH, creating a process that's so efficient it's not unusual for medications to arrive on the floor before nurses even begin to look for them. "The only way you can write orders on a paper chart is to physically find the chart," said Rappaport. "Now physicians can go to the nearest computer, enter the order and it instantly goes where it needs to."

The decision to aim for HIMSS Level 6 was a conscious one, and was made to provide the best patient care possible. "The components that take you to HIMSS Level 6 are absolutely critical for patient care … whether it's about timely availability of information, being able to pass on information to family doctors, reducing errors or improving workflow," she said.

Reflecting on TEGH's achievements to date, Rappaport points to "many pieces of the puzzle" coming together. First, as a commu-

Medication barcoding a key part of reaching HIMSS Level 6 at TEGH

nity teaching hospital, TEGH is grounded in a sense of teamwork.

Second, an Electronic Patient Record Committee made up of IT representatives, Risk and Privacy employees, clinical management, physicians and allied health administrators is in place to provide routine

> **A turning point for process improvement occurred with the implementation of CPOE and eMAR systems.**

input and facilitate a grass roots approach to technology implementation that ensures user design requirements are met.

Third, the hospital has adopted a core vendor strategy, standardizing on hospital information systems from Cerner where it makes sense and integrating to other clinical systems as required. And finally, the hospital is leveraging the expertise of an in-house IT team, many of whom were there in the beginning to launch the process 18 years ago.

"We have a combination of clinical people on our IT team, as well as technical and business analysts," said Rappaport. "We have different skill sets that we're leveraging and feeding into that are all of the skills sets of the clinicians who are very engaged in our design process."

A notable turning point as the hospital works towards its fully integrated healthcare delivery model was the implementation of CPOE and eMAR in 2009. Up until that point, the facility was "nibbling around the edges in terms of impact on core work processes," said Rappaport.

Using funds available through an Ontario Ministry of Finance Strengthening Our Partnerships program intended to kickstart automation projects, TEGH took a "big bang" approach, going live with CPOE and eMAR across all areas and departments at once. Overnight, the relationship between IT and the clinical side of the house flipped.

"It was like drawing a line in the sand and it changed," said Rappaport, noting that clinicians have almost no tolerance now for paper. "To some extent, it brought the organization together around what it takes to make a record electronic."

Which is why TEGH skipped over HIMSS Level 5 requirements to focus on physician documentation. "Physicians who were still writing were getting feedback from other clinicians saying, 'I can't read your notes. You've got to get on board,'" she said.

Roughly half of physicians use Cerner PowerChart to enter notes while those who choose to dictate are supported, leading to an initial rise in costs related to transcription. Order sets increased from 150 to 500 and were developed in conjunction with Think Research Corp.

As a condition of its funding, the hospital is required to measure and report benefits derived from its technology implementations. Thanks to its Level 6 systems, medication incidents are down 30 percent, the number of documents sent to family physicians has increased 600 percent, and medication turnaround time has decreased by 60 percent. TEGH is also seeing a steady increase in patient satisfaction.

"HIMSS Level 6 is a huge achievement," said Michael Billanti, director, Central Canada, at Cerner Corp. "Organizing adoption, and organizing the change in process control across the hospital to get there, is a Herculean effort. Technology is a big part of that, but ultimately it's a function of the leadership and vision of the hospital."

Evident announces its Canadian arrival

MOBILE, ALA. – Evident, a wholly owned subsidiary of CPSI and a leading provider of electronic health record systems and services in the United States, has announced its intent to provide its health information system and electronic medical record (EMR) solution to Canadian hospitals and physicians.

Alan Haaksma has been appointed Director of Business Development for Evident in Canada, and will be leading the charge to bring the solution to Canadian hospitals. Previously, Haaksma was Director of National Accounts, North America, for Orion Health.

Haaksma noted that Evident will appeal to many hospitals in Canada, as it provides a cost-effective solution that can quickly improve the EMRAM performance of a facility or an entire region.

"64 percent of Evident's hospitals in the United States have Level 7 functionality in the HIMSS EMRAM adoption model," said Haaksma, adding that most of Canada's hospitals are at Level 2 or 3.

Moreover, he pointed out that Evident intends to set up shop in Canada to service its customers, with additional support from over 1,000 service staff at its headquarters in Alabama. "Evident is committed to contributing to the economic development of Canada," he said.

Evident says that its hospital information system, called Thrive, is ideally suited to Canada's hospitals, most of which are small and mid-sized facilities, often in rural or suburban settings.

"Approximately 80 percent of the hospitals in Canada are community hospitals," said Boyd Douglas, President and Chief Executive Officer of Evident. "Evident has been successfully serving those same hospitals in the United States for more than 35 years.

Evident is a recognized leader in providing fully integrated solutions to the community hospital market in the U.S.

Haaksma said that Evident has been working to localize their Thrive EHR for the hospitals in Canada.

Halton Healthcare's new hospital employs state-of-the-art technologies

The new Oakville Hospital, which opens December 13th after four years of construction, is using a combination of organizational innovation and technological wizardry to provide the best patient care possible.

While the hospital may be huge – it's 1.6 million-square feet – management is taking special measures to ensure the needs of each and every patient are met.

For that reason, instead of traditional nursing units, where one main nursing station serves as a hub for an entire unit, the inpatient units at the new Oakville Hospital are using a more innovative design, called 'nursing pods'.

Each 36-bed in-patient unit is divided into three, 12-bed pods, with one team per pod. Each pod is set up with its own computerized workstations, communications systems and dedicated supplies and equipment. Nurses will be responsible for the patients within their assigned pod.

This is expected to be a more effective method of caring for patients, since 80 percent of the rooms at the new hospital are single occupancy. While better for infection control and patient privacy, the units need to be significantly larger than at the older hospital.

The decentralized pod system re-organizes the large units into more manageable spaces.

"Nurses have more time to spend at the bedside," said Inderjit Sahota, Halton Healthcare Services (HHS) Professional Practice Clinician, Operational Readiness, Medicine. "They can more easily see and monitor their patients, attend to their needs and help ensure their safety. They will also be more available to work with families, address their concerns and answer their questions."

To improve nursing productivity and patient care, each 36-bed in-patient unit is divided into three, 12-bed pods, with one care-team per pod.

For the nurses, it's a practical way of managing the space.

"Having everything close by or within each pod will also reduce walking distances for nurses and other caregivers," notes Andrew McGarrity, Halton Healthcare Patient Care Manager, Patient Care Unit. "Ultimately this will translate into to a better hospital experience for our patients and their families and improved patient satisfaction."

The pod system was tested at the Oakville-Trafalgar Memorial Hospital legacy site to ensure its effectiveness and to train staff in the new way of working. The pilot project was one of many operational readiness activities that took place to ensure a seamless transition to the new hospital.

Another important pilot centred on technology – in particular, the use of electronic nursing unit dashboards, mobile apps and a capacity management solution, all provided by McKesson and referred to as the McKesson Performance Visibility solution. The solution enables staff and management to see at a glance whether beds are occupied, unoccupied or in need of prep for patients.

The system also shows when patients are expected to be discharged, and if they're still in beds after the expected discharge date.

The hospital has been testing the solution since July 2014, so that staff and clinicians would be well acquainted with it. At the end of the pilot project, "Our staff didn't want to stop using it," said Susan Bisaillon, Chief Operating Officer, Oakville Trafalgar Memorial Hospital.

"One of the goals of the system, once it is fully implemented," she said, "will be to provide increased visualization of our patient movement and activity that will support access and flow across units and departments in the hospital."

McKesson Performance Visibility will help track patients as they move from the old hospital to the new one. "We'll even be able to track when they're in the ambulance, on the way, and we'll be able to tell how long they're out there," commented Carole Moore, Chief Operating Officer, New Hospital Transitions.

She noted that patient transfers have been a "pain point" for other hospitals that have opened new facilities – especially when patients took longer than expected to arrive. "It's an uncomfortable feeling when you don't know where your patients are – and there are issues for some of them when they're out too long."

The new Oakville Hospital is the first in Canada to deploy the solution on iPads, iPods and iPhones, noted Steve Lawrence, National Business Development Executive for McKesson Canada. "The solution is usually deployed on large, 65-inch screens and wall-mounted touch screens, as well as on desktops.

The addition of mobile devices is designed to increase productivity. Porters and cleaning staff will be able to receive and respond to orders on the go, instead of looking for the nearest workstation or touch screens.

Clinical and administrative staff will also be able to check the status of patients and the availability of beds, wherever they are in the hospital, by using their smartphones or tablets.

Digital supply chain upgrade gives ESC LHIN new purchasing power

BY ROSIE LOMBARDI

TransForm Shared Services Organizations, which handles IT and supply chain management for five hospital systems in the Erie St. Clair LHIN of southwestern Ontario, has succeeded in squeezing numerous inefficiencies from its supply chain process. In doing so, it has also achieved substantial cost-savings.

"We've executed strategies to improve our technology, to improve our data, and to ensure that we have a good, sound item master file under which the best product, with the best overall value for money, is chosen for utilization within our hospitals," said Derek Robertson, chief business development and supply chain officer at TransForm.

TransForm has been working since 2011 with its ERP vendor, MediSolution, which provides some advanced capabilities in its Virtuo MIS Supply Chain Management module to improve workflow, data integrity and drive savings.

One prong of the strategy is the standardization of product identifiers across hospital systems, said Michael Conn, national sales director at MediSolution. The Virtuo MIS Materials Management Module uses the Global Trading Identification Number (GTIN), which is a global standard used to uniquely identify products or services and easily communicates information about those items to trading partners.

This feature addresses an issue that is growing increasingly urgent as healthcare budgets are slashed, said Conn. "Historically, healthcare has been slow to adopt a particular supply chain standard – hospitals identify their inventory using several different numbering systems. So item 1234 is a box of gloves in one hospital's system, but it's gowns in another. Hospitals can't afford to make these mistakes."

In another piece of the strategy, MediSolution worked with TransForm and its suppliers to implement advanced eCommerce capabilities that provide a completely digital source to settlement process, he said.

"Our software eliminates the need for paper documents such as packing slips and invoices that hospitals deal with on a daily basis. Rather than processing invoices received by fax and emails, which are disconnected from the ERP system, TransForm has been able to save a lot of money by receiving electronic invoices from its supplier community, using electronic data interchange (EDI)."

TransForm introduced electronic in-

> **New systems have eliminated the need for paper documents, such as packing slips and invoices.**

voice and purchase order matching during the reconciliation process and invoices are now automatically routed between the materials management and accounts payable departments.

This step required some footwork to put in place. Surprisingly, many major suppliers don't have systems that are capable of providing electronic invoicing,

said Conn. "TransForm and MediSolution worked jointly to advocate to the supplier community, urging them to make electronic invoicing available, so healthcare can use 21st century tools to make processing more efficient."

The last prong of TransForm's strategy was to automate contract pricing updates. Ensuring that contract pricing with suppliers are up-to-date with the most current price for each product is typically a cumbersome manual exercise for hospitals.

"Historically, it's been a manual process of going into their ERP system, eyeballing every single item and changing the price on an effective date. We've been able to automate that whole process," said Conn.

Hospitals and shared services organizations (SSOs) that implement Virtuo MIS will see savings in just a few months after they go live, said Dean Tessman, vice president of Canadian Health Solutions at MediSolution. Over 30 hospitals, SSOs and other companies Canada-wide have implemented its Virtuo MIS advanced supply chain modules.

Connecting to community: BC's profound healthcare shift

By **Kathryn Seeley**, Director, Health Enterprise Business Development and **Shannon Malovec**, Principal, Transformation Services, TELUS Health

The idea of connected healthcare is gaining traction in Canada. Extending care beyond hospital walls and out into the community is having a profound impact on healthcare delivery. In British Columbia, a province with strong advocacy for bridging primary and community care, having patients at the decision-making table is increasingly the norm, not the exception.

Embracing patient-centred care

While the term "patient-centred care" may sound like rhetoric, in BC there is no question that it is a philosophy and a movement that is ramping up and here to stay.

For example, the Ministry of Health operates the Patients as Partners program that matches healthcare partners and patient partners to work collaboratively on healthcare redesign.

"There are so many things you can focus on in healthcare. Putting forward a framework for patient-centred care as a North Star for all of us to focus on is really bold," says Tracee Schmidt, BC Ministry of Health's Executive Director of Strategic Projects, referring to the province's policy discussion paper. "What we are being challenged to do is understand the patient perspective in the initiatives we are working on. We need to be able to articulate that value proposition in everything we are doing."

Technology, meet healthcare, meet community

BC has made progress using technology to bring care into the community and help patients manage their health closer to home.

"When I reflect back a little over ten years ago, people used to ask me 'what is telehealth anyway?' and 'informatics' wasn't even a word. Today, we have groups of physicians and clinicians who are telling stories about how telehomecare has changed how they can deliver care," says Dr. Mary-Lyn Fyfe, Chief Medical Information Officer at Vancouver Island Health Authority.

> " Today, we have groups of physicians and clinicians who are telling stories about how telehomecare has changed how they can deliver care. "
>
> Dr. Mary-Lyn Fyfe

Indeed telehomecare, home health monitoring and other consumer technologies like wearables and health apps are ushering in a new era in healthcare delivery that is better for patients, better for healthcare budgets and is scalable.

"Speaking as an Emergency doctor, we are a key interface between acute care and community care. This is where technology can play a strong role," says Dr. Kendall Ho of UBC's Department of Medicine. "First, how can we leverage technology to follow up with patients soon after they are discharged from the ER, without having to wait a full week until their follow-up with a primary care doctor? And second, how do we empower patients to monitor themselves so they can head-off a follow-up visit to ER? It's important that technology strengthens the trusted patient-provider relationship. We can achieve high touch and high tech for our patients."

> " We can achieve high touch and high tech for our patients. "
>
> Dr. Kendall Ho

From the perspective of delivering care throughout BC's numerous remote communities, the need for telehealth and home monitoring is tangible. As Island Health's Catherine Claiter-Larsen observes, "citizens in remote areas have complete clarity on their need of telehealth. People do not want to travel, incur costs, and even lose income by missing work. They reach out to us to express their frustration, sharing personal stories of travelling eight hours one way for a 15- or 30-minute appointment that doesn't even involve a physical examination. Our community members are scrutinizing these encounters and asking us to provide technology-enabled alternatives like teleconsultation."

> " [...] citizens in remote areas have complete clarity on their need of telehealth. "
>
> Catherine Claiter-Larsen

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Patient voices inspiring change

As BC increases momentum in delivering patient-centred care, patients are being actively sought out and engaged in the process. Today, more than 30,000 patients are directly engaged in activities with Patients as Partners organizations. And Island Health's Board hears regularly from patient groups.

"It's really getting back to a focus on the patient first," says Lois Dalrymple an Okanagan citizen who, based on personal experience, wanted to take steps to see how the patient experience in hospital settings could be improved. "They really listen to every patient. But, it's important to remember that change takes time."

Engaging patient advisors is the new normal. "Patients are changing the conversation at the decision-making table," says Catherine Claiter-Larsen. "It's inspiring to see the consistency of commitment across healthcare leaders. We see people coming together and meeting in a purpose-driven way – where historical hierarchies and roles are not as relevant; where vision and commitment to change is what matters," says Catherine Claiter-Larsen.

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Empowering patients and citizens:
Renewable energy for health and healthcare

Health systems around the world are waking up to the necessity of 'people power' to high quality, efficient and affordable care. Drawing on his experience from 200 visits to 60 countries over the last five years, Mark Britnell will explain why hospitals, physicians, politicians, consumer goods companies and others are focusing on better engaging people to manage and improve their health. From India to Israel, Singapore to South Africa, he will outline the most innovative solutions working now to achieve this, and what kind of health system these trends will likely produce in the future.

Guest Speaker:	When:	Topic:	Location:
Dr. Mark Britnell, Chairman and Partner of the Global Health Practice at KPMG	Thursday, November 19, 2015 7:30 am - 9:00 am	Patient Engagement	TELUS House, 25 York Street, Room 003-031 Spirited Teamwork Toronto, ON

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Automating work of cardiologists and staff improves patient care

BY ROSIE LOMBARDI

Diagnostic imaging devices are remarkable technologies, but they've been developed separately over the years by different vendors, without regard to how they're used together. That incompatibility problem not only plagues radiologists, but cardiologists, too.

Busy hospitals and cardiology clinics must work with multiple imaging tools, and unfortunately, cardiologists have to view studies at different workstations.

Moreover, many devices don't include even basic report generation tools; cardiologists are forced to rely on time-consuming dictation and transcription to produce reports that are then manually processed by fax or mail.

"It's a complex, slow and error-prone process because of all these inefficient processes, multiple steps and various people who are involved in the workflow," said Dr. Joe Ricci, a lead cardiologist at Toronto-based CorCare, a cardiac and nuclear medicine practice which operates three clinics.

Now, however, Dr. Ricci and his team have produced a game-changing solution called Influx Workflow, a software system that automates much of the troublesome data collection and reporting that must be done in cardiology departments and clinics

Based on Lean management principles, Influx's Workflow software brings a wide range of diagnostic imaging devices–echocardiogram, EKG, Holter, stress, nuclear, vascular and more – into a single paperless and efficient workflow.

"It used to take us about a week and six staff to get a full diagnostic report back to the referring physician. With Influx, working with one technician, we can complete the test and have a report ready for the referring doctor in less than one hour," he added.

Two major factors inspired Dr. Ricci to develop the solution. In his hospital and office-based practice, he worked with Lean management methods and gained great respect for workflows that focused on efficiency by reducing wasteful steps and unnecessary waits. It was a fortunate coincidence that his office also became an early adopter of Philip's Xcelera system for echocardiograms.

"We recognized very early on that Xcelera created a remarkably lean workflow – but it was designed to work only for echocardiograms. Our research showed us that no vendor offered what we really wanted: a unified workflow solution that could be used with all cardiac modalities. So we developed a solution ourselves, based on Lean management principles, that extended the capabilities of Xcelera."

Influx is middleware that extends the Xcelera workflow to all cardiology imaging devices, explained Dr. Ricci. "Using DICOM technology, we transfer images and measurement data from various cardiology imaging devices into the Influx workflow. The solution includes a report viewer and a very efficient, structured reporting tool to generate reports. Cardiologists can view all the different studies at a single workstation, analyze them on-screen, and create consistent reports without transferring any paper."

Once the cardiologist completes the report, reports are stored electronically and they can be printed, sent to an EMR and transmitted by digital fax with the office admin system.

Influx has been implemented, tested and refined in recent years at CorCare's three clinics across the Greater Toronto Area and at four hospitals and clinics, including Calgary's Total Cardiology clinic and Toronto's St. Michael's Hospital.

Learning to use Influx wasn't difficult, says Dr. Paul Galiwango, a Toronto-based cardiologist who has been using Influx for over a year. "It didn't take long to adapt to it. Instead of dictating a study, we input our findings ourselves. We developed some templates for recurring elements so the actual amount of typing we do is minimal. And there's little eyestrain, since you're mostly looking at images on-screen, not text, so the medium lends itself well to that."

The biggest beneficiaries of Influx's improved workflow are patients, added Dr. Galiwango.

"Tests go back very quickly to the referring doc, which is much better for patient care. If there are any abnormal results, we'll know within 24 hours and can start treatment right away."

Influx can dramatically boost the number of patients a cardiology practice can handle, said Dr. Ricci. "After a full year of implementation at CorCare, we were able to improve our workflow to the point where we could handle 30 percent more patients. Cardiologists who used the system were more focused and efficient, with much greater throughput. In higher volume practices with waiting lists, you can produce more high-quality reports with fewer errors and complaints."

Integrating and digitizing the workflow results in real savings in many other areas. The reports can be sent instantly, via computers, to the referring doctors, which reduces administrative costs and overhead. Dictation and transcription are not needed, as they can be replaced with structured reporting tools and advanced templates, so those costs are eliminated as well.

"We reduced our non-technical support staff by 20 percent," said Dr. Ricci. "More importantly, our imaging technicians can use their time more efficiently on patient imaging, with less time wasted on processing paper.
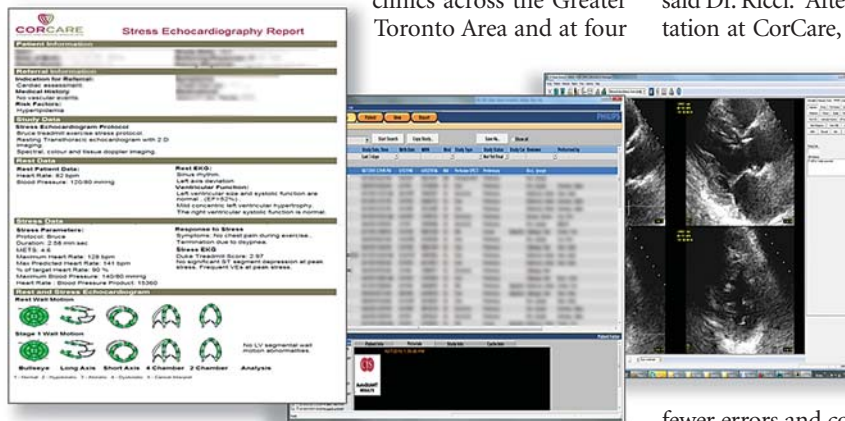
"Cost savings in our first full year showed an immediate saving of over $100,000, which we were able to reinvest in newer technologies, staff training and increasing our technical staff."

Cardiology clinics can recoup the costs of acquiring the system in about 18 months, he said. "In a large institution with seven or eight imaging modalities and multiple machines, the return on investment will be substantially more because the impact on efficiency is larger."

Dr. Ricci believes there's a big unmet demand for a solution that integrates existing equipment in cardiology. To this end, Influx is vendor-agnostic and will work with virtually any diagnostic imaging equipment. "However, at present clinics do need to have Xcelera to implement the full solution. But in the future, we plan to add an interface that will allow Influx to work with other PACS systems as well."

The Influx Workflow solution can be extending beyond cardiac imaging, said Dr. Ricci. Influx's developers are working with the respirology department at St. Michael's Hospital to modify the system.

"St. Michael's approached us about using Influx to manage their multiple pulmonary function testing requirements, because there's no product with Influx's capabilities, and the workflow for pulmonary function testing is very similar. Because of the work we've done with them, we've fine-tuned the new respirology product, and it will be available for distribution at the end of 2015."

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Canada's CloudDX a winner at Interface Health Summit in Vancouver

BY DR. SUNNY MALHOTRA

VANCOUVER – The Interface Health Summit is the intersection of digital media, digital health and business. It is where doctorpreneurs and health technology entrepreneurs congregate to learn about healthcare innovation (http://interfacesummit.com/).

The Interface Health Summit Innovation Excellence (IHX) challenge, hosted in Vancouver, at the end of September, brought together companies trying to solve real healthcare problems.

It is a global competition to find the world's most innovative health technology entrepreneurs within 10 award categories, including: Big data and visual analytics; Biopharma and digital drugs; Consumer engagement; Digital therapies and medical devices; Mental health; Personalized medicine; Population health management; Telemedicine and Virtual therapy; Wearables and biosensors; Surprise us (wild card).

The winning companies who are disrupting the healthcare community are:

First place: Sproxil is a Cambridge, Massachusetts company that provides "smart" technology via a Mobile Product Authentication system to help patients avoid purchasing counterfeit prescription medications in Africa and India. They offer track and trace supply-chain protection solutions through their mobile product.

Second Place: CloudDX is a Kitchener and Brooklyn based startup (a Qualcomm Tricorder Xprize competition finalist) has two products: Vitaliti and Pulsewave. Pulsewave is at the heart of the remote patient monitoring solution, and provides medical professionals with access to their patients' critical vital sign data for a fraction of the costs of competitive systems.

It compiles blood pressure, heart rate, heart rate variability, blood oxygen level and weight while screening for seven different cardiac anomalies. Data is compiled and analyzed by algorithms in the cloud for assessment by patients, family members and medical professionals.

Third Place: The Admetsys Smart Pancreas attaches to a patient's intravenous line, and automatically measures real-time blood glucose concentration before administering insulin to control glucose levels.

The IHX Challenge connects companies together which pursued innovation in developed and developing ecosystems. "It is great to see companies finding solutions for developing economies being rewarded for their efforts," said Zayna Khayat, lead of MaRS Health and director of MaRS EXCITE, in Toronto, and an IHX Challenge judge.

The winners received a portion of a $100,000 in-cash and in-kind professional services prize.

The problems that healthcare providers face today may very well be solved by new technologies, and the Interface Health Summit provides a national stage for innovators.

The 2015 Interface Health Summit was the Interface Health Society's fourth annual summit. The two-day event involved both innovators and stakeholders from Canada and around the world.

Sponsors included Telus, Lumira Capital, the National Research Council of Canada, Genome British Columbia and Providence Health Care Research Institute.

The summit is produced by the Vancouver-based Interface Health Society, which runs an international health accelerator. The organization's website is a platform and community that connects researchers, innovators, providers and large corporations. For additional information, see: http://interfacehealth.com

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 Dr Sunny Vikrum Malhotra is a physician advisor for CloudDx.

Hospitals adopt integration engine to meet needs of today and tomorrow

BY GARY FOLKER

For healthcare organizations like hospitals, key data resides in a wide range of internal and external source systems. Multiple EMRs and other clinical systems format, store and share data in many different ways.

That complexity is multiplied as they start to bring in data from an even greater variety of EMRs and other systems in use by community practices, as well as the long-term care, rehab and home health systems that fill out the continuum of care.

The essential IT infrastructure requirements to support effective data acquisition starts with an integration engine for accurate and reliable interoperability across a wide array of systems, to ensure secure exchange and information transport.

As technology quickly evolves, integration engines need to be scalable and robust enough to integrate with legacy as well as next generation healthcare solutions. When selecting an integration engine, the requirements of the system must be considered for both today and tomorrow.

Gary Folker

If not, hospitals and other healthcare organizations will find themselves incapable of scaling to manage patient data and their population effectively over time.

As legacy engines come to an end of life, hospitals need a migration strategy to plan, procure, prepare, implement and operationalize an integration engine. And they need an engine that is designed for rapid interoperability between healthcare IT systems, regardless of technology or standards.

Integration engines are used by thousands of hospitals and healthcare organizations in North America and around the world, to provide comprehensive support for an extensive range of communication protocols and message formats. They help interface-analysts and hospital IT administrators reduce their workloads while meeting the complex technical challenges associated with making healthcare data accessible to all stakeholders.

In Canada, OntarioMD, Quinte Healthcare and Sunnybrook Health Sciences Centre – three organizations that service different population sizes – use the same integration engine, the Orion Health Rhapsody Integration Engine.

OntarioMD has more than 11,000 physicians enrolled in its programs and a proven track record of developing and implementing award-winning connectivity to EMRs in its Hospital Report Manager (HRM). Quinte Health Care provides a range of services to 160,000 people living in a diverse region of Prince Edward and Hastings Counties, in southeastern Ontario.

As Canada's largest single-site academic hospital, Sunnybrook Health Sciences Centre, in Toronto, faced challenges that are affecting many of Canada's hospitals as they work to provide clinicians with secure, up-to-date patient information in a timely

manner. Sunnybrook needed to integrate its external and internal systems, but didn't want to 'rip and replace' the current system.

Instead, Sunnybrook selected an integration engine as it was confident in its ability to securely handle the millions of messages crossing the hospital's network

daily. As a result, the organization is able to meet its current clinical demands and has a solid foundation in place to address any new standards or emerging protocols.

It is crucial to have an integration engine that is scalable, powerful and easy-to-use; one that can adapt as new technolo-

gies and standards like HL7 FHIR are introduced, and evolves with the needs of patients and care providers.

Gary Folker is the SVP and Country Manager for Orion Health Canada. For more information, visit www.orionhealth.com
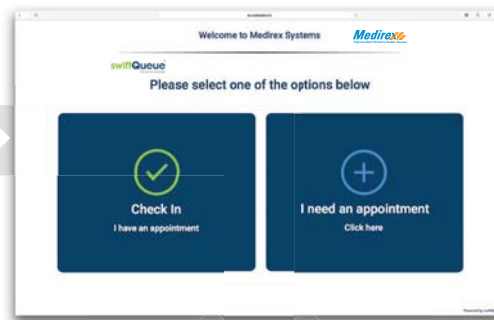
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Machine learning applied to home care reduces hospital re-admissions

BY DIANNE CRAIG

Machine learning – it's part of your Facebook experience, tagging faces and determining what appears by your newsfeed. It's in on-demand Internet streaming services that track viewing patterns, as well as in usage-based car insurance sensors, and fitness-tracking wristbands that determine the length of a step for each wearer. Machine-learning software is embedded in our daily lives – recognizing patterns, assisting with predictions and decision support.

For its part, CBI Health Group, Canada's largest provider of rehabilitation and home health services under several brands, including We Care, saw the potential for applying machine-learning predictive modeling in home health care monitoring.

We Care approached Toronto-based AlayaCare, a home sector start-up about applying their machine-learning algorithms to its remote patient monitoring to see if it could increase accuracy and reduce over-diagnoses.

"We could identify when a patient was out of the zone, but they've added machine learning that helps us with predictive modeling," says Anthony Milonas, chief operating officer at We Care and CBI Health Group.

AlayaCare helps care providers combine different modes of care, such as in-person, virtual visits, and remote patient monitoring, on the same software platform.

The company had spent a year-and-a-half developing machine-learning software for the home-care sector with a team of 12 people. "I've been a software entrepreneur for a decade, around point-of-care and de-vices called chip care, and saw that all these things happening in the hospital could happen in the home," says Adrian Schauer, CEO, AlayaCare. AlayaCare and We Care had a close relationship even before launching their remote patient monitoring pilot project. "The CEO of We Care was one of the people I talked to when formulating the idea of building AlayaCare," recalls Schauer.

AlayaCare's year-long project with We Care was designed to review three years of data that had been collected for 256 clients participating in We Care's ReACT program. The Remote Access to Care (Re-ACT) health monitoring program for seniors living with chronic diseases had been in operation for 10 years. It was designed to reduce unnecessary hospitalizations and Emergency Room visits, while encouraging patients' individual participation and skill development for managing their chronic conditions at home.
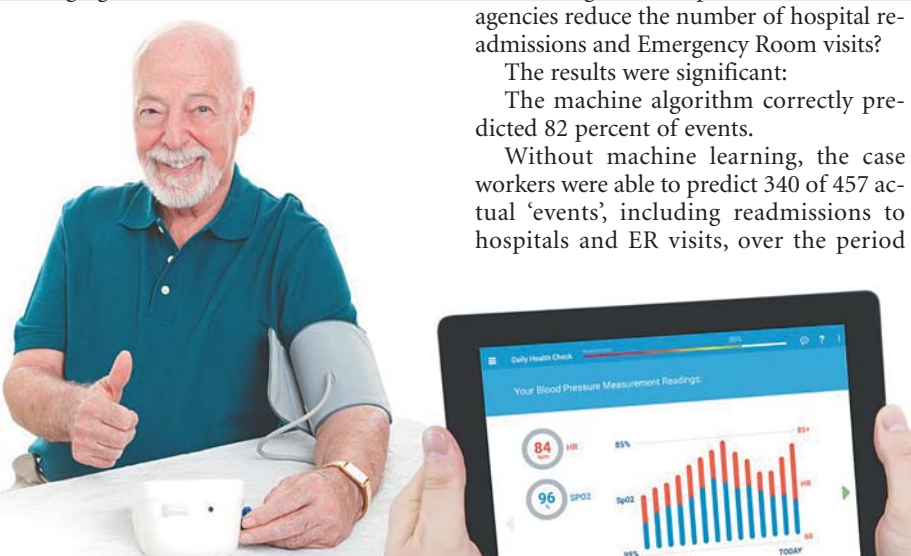
To collect those vast amounts of data, the We Care ReACT program used wireless technology and monitoring devices to remotely connect seniors to a Registered Nurse (RN), who monitored, assessed, and managed their chronic condition(s) and corresponding care plans. Patients were trained to use the monitoring devices daily to check vital signs, and the data was stored on a secure server where results were populated and categorized for review by an RN and physician.

ReACT's remote patient monitoring program is popular with its participants. "Just the fact that when the technology was to come out of clients' homes they pushed back and wanted to keep it," says Milonas.

The pilot project was designed to answer the key question: "Can machine learning algorithms, applied to remote patient monitoring data, help home health care agencies reduce the number of hospital readmissions and Emergency Room visits?

The results were significant:

The machine algorithm correctly predicted 82 percent of events.

Without machine learning, the case workers were able to predict 340 of 457 actual 'events', including readmissions to hospitals and ER visits, over the period covered by the study. With assistance from machine algorithms, they could predict 376 of the 457 events. Care workers were also able to cut their false event predictions in half with the help of the machine learning algorithm, from 54,384 to 25,006.

The financial benefits of machine-augmented remote patient monitoring were also significant: Based on the sample population on the Re-ACT program from September 2008 to December 2010, without accounting for the reduction of false positives, the additional prevented events based on machine learning increased the total savings after the Re-ACT program by $67,728.

Results showed machine learning could have the following effects on home healthcare:

• Care workers could prevent more than 10 percent of hospital readmissions and ER visits

• Patients could spend more time at home

• False positives could be reduced, in turn reducing patient stress levels

• Care workers could prioritize time based on urgency of patients' needs

• Overall care costs could be significantly reduced through fewer unnecessary hospitalizations and readmissions.

We Care and AlayaCare are continuing to work together, using machine learning augmented home healthcare to reduce adverse events. The next step is to apply the algorithms in a live remote patient monitoring setting. "We're gearing up to launch with 75 more patients with We Care. Now we're putting these algorithms into live situations," says Schauer, adding that they will assist with monitoring chronic issues like hypertension, chronic heart failure, COPD, and diabetes.

Hospital readmissions and ER visits could be reduced by more than 10 percent using machine learning.

A solution for DI peer review: Cloud-based, cost-effective and anonymous

BY IAN MAYNARD

We all want to do the right thing, and improving radiology quality through automated and anonymized peer review solutions is clearly the right thing to do.

The discussion of radiology peer review is not new. For decades there has been a dialogue of how to best tackle the methodology and implementation of peer review systems. In 2003, RADPEER was initially offered to physician groups and an electronic version was made available in 2005.

Ten years later and the use of peer review systems are far from becoming ubiquitous for Canadians. Yes, there are some individual examples of hospitals that have implanted systems, but it has been a slow process and only for a select number of facilities.

So then the question remains, why isn't peer review as a means of continuous quality improvement ubiquitous for Canadians? It turns out that there are a number of practical problems that hospitals and clinic groups run into when trying to implement a peer review system.

• Cost: systems can be capital intensive to purchase;

• Implementation: Implementations are intrusive, sometimes requiring in-depth integration with internal systems – which is entirely dependent upon the willingness of the vendors of these systems to perform the necessary work;

• Impetus: historically, healthcare providers have been reactive in nature, with a culture of addressing issues after the fact (e.g. audits) instead of being proactive;

• Methodology: peer review techniques have also traditionally followed an 'after the fact' format, relying purely on retrospective feedback after a diagnosis has already been made. Far better to use a prospective methodology, to afford the opportunity for correction to an erroneous diagnosis.

The net result is that widespread implementation of peer review has progressed far too slowly. There are of course, individual examples of hospitals, regions and one or two provinces are implementing systems, but individual deployments take several months and the legacy, larger scale deployments are still ongoing after several years, both of which demonstrate a very slow approach to a large-scale problem.

We need peer review solutions that allow for rapid, widespread adoption.

The natural conclusion is a secured, cloud-based system. To that end, and in support of the province of Ontario's directive that all organizations and radiology groups implement peer review solutions, Real Time Medical has announced

> **Real Time Medical has launched the first private, cloud-based peer review subscription service.**

the first private cloud-based, anonymized peer review subscription service.

Hosted on Canadian soil, this new offering gives clients at no capital costs, access to the first proven software platform capable of both prospective and retrospective peer review.

Clients can access the software platform on a monthly subscription basis to perform peer review within their own radiology group or groups of radiologists they credential. In addition, those groups with too few radiologists (or too few radiologists with a given subspecialty) for objective peer review, can request anonymized peer review assistance from appropriately credentialed Real Time Medical radiologists.

If we are serious about the widespread adoption of peer review as a means of skills development, training and quality improvement, then it's time to move beyond conversation. Furthermore, almost half of all radiology exams are performed in clinics and small community hospital settings, which may be served by only a handful of radiologists. This means that the solutions and strategies we put forward must address the unique challenges of these types of practices. Doing so will help us achieve the peer feedback and skills improvement we seek for all radiologists.

Ian Maynard is the CEO of Real Time Medical, based in Mississauga, Ont.

To reduce medical errors, proper patient armbands must be deployed

BY ANDY SHAW

Even with their barcoded links to the hospital information system and their colour-coded warnings to caregivers, studies show that patient armbands are not yet the panacea for medical errors.

In the rush to do their job, in one instance, caregivers missed an allergy alert resulting in a patient falling into anaphylactic shock. In another case, the alert for a crippled limb got misread as do not resuscitate.

It's also reported that nearly a quarter of all errors related to armbands are caused by information on the armband itself being worn off or made illegible by the often rough-and-tumble, damp nature armbands suffer in a hospital environment.

Traditionally, vendors have manufactured armbands out of plastics made quite hard to withstand those hospital rigours. But such stiff armbands or wristbands tend to chafe and even cut patients' skin, putting them at risk for hospital superbugs and other infections.

To the rescue two years ago, along came Medirex's Supersoft ID bands.

"We've been in the business of positive patient identification for over 15 years, but to develop this new one, we really did search the world for better solutions," said Ken Caskenette founder and president of Medirex Systems Inc., of Toronto. "In particular, we looked at the whole banding process and the quality of materials they used. We looked at plastics and fabrics, and in the end found and developed a patent-pending material. It is both soft and rugged, so our armbands protect even babies and adult patients with the most sensitive skin.

"At the same time," he added, "it is water and chemical proof, and it's durable enough to keep all the data printed on the armband readable for up to four weeks when worn in hospital conditions."

Just as importantly, from the production and cost-saving point of view, users can produce them from any laser printer.

One of the sites that has benefited from Medirex's armband technology is the three-site Trillium Health Partners hospital, with facilities in Mississauga and Etobicoke.

"The integration of processes across the merged hospital sites had created some unique challenges for armband production," said Trillium Corporate Registration Manager, Debbie Devlin, a former physiotherapist. "There are a wide variety of printers used across the organization, and Medirex products and software allowed all sites to standardize their practices for armband production, despite using different printers.

"Additionally, the service and support offered by Medirex employees facilitated the the successful transition to a standardized product and workflow."

The armbands and their associated labels, being entirely laser-printed and barcode-enabled, allow for accurate reading with hospital glucometers. As well, they have improved efficiency in Trillium Health Partners' back offices.

"Labels applied to patient records can be picked up in their entirety by the scanning and archiving equipment in our Health Information Department," she said. "The staff there no longer have to key in any information, and that certainly improves accuracy and expedites their processes."

Medirex armbands and their behind-the-scenes software are now at the forefront of the safety movement's drive to positive patient identification.

"We are being approached to put our products into the United States," said Caskenette. "There are only three manufacturers of armbands at all like ours in the world, so one potential American client did a comparison test and they picked us as number one.

"Now," Caskenette added, "I am getting calls from around the world almost every day asking about our armbands and our other products."

The new era of wearables in fitness training and sports medicine

As diagnostic tools become smaller and cheaper, they may also become ubiquitous.

BY DR. SUNNY MALHOTRA

Human bodies are storehouses of information. We are generating megabytes of data per minute, but most of the information goes untapped. We often respond in a reactive as opposed to a proactive way with limited data to support our decisions. With the advent of wearables, we have sophisticated biometric data that has added a layer of objectivity to our fitness regimens and training. Here are some of the fitness wearables that I have encountered and seem noteworthy:

Apple Watch: Apple Watch attempts to measure your heart rate every ten minutes. The heart rate sensor in the Apple Watch uses "photoplethysmography" – which is a simple, non-invasive optical technique that can be used to detect blood volume changes in the microvascular bed of tissue. In addition, it can measure how many calories you have burned during a workout.

CloudDX (www.clouddx.com): A Kitchener and Brooklyn, N.Y.-based startup, and an Xprize competition participant, has two products: Vitaliti and Pulsewave. Vitaliti measures blood oxygen, blood pressure, and heart rate while combining weight with ECG variability. Data is compiled and analyzed by an algorithm in the cloud for assessment by patients, family members and medical professionals. Higher resolution, single lead ECG can be utilized in fitness and rehabilitation regimens to improve training while reducing risk of injury for detecting coronary ischemia and arrhythmias. The actionable data is used to train faster, harder and smarter.

Athos (www.liveathos.com): This California-based company is a venture-backed startup developing Smart apparel that tracks your muscle activity, heart rate, and breathing rate. The "smart" clothing is designed to locate which muscles are firing during dif-

> With the advent of wearables, we now have sophisticated biometric data that has added a layer of objectivity to our fitness regimens and training.

ferent exercise routines to enable an improved user experience.

Moov (http://welcome.moov.cc/): An artificially intelligent coaching fitness device that provides training programs for physical activities by analyzing biomechanics during exercise and providing feedback to improve training.

Push (http://www.trainwithpush.com/): Utilizes force, power, and velocity as key

Dr. Sunny Malhotra is a US trained Cardiologist working at AdvantageCare Physicians. He was named one of the top "Doctors on Twitter" to follow. He is an entrepreneur and health technology investor. He is the founder of Bookaclinic.com, a Canadian telemedicine practice in Ontario, Canada. He is the winner of Best in Healthcare – Notable Young Professional 2014 and the national Governor General's Caring Canadian Award 2015.
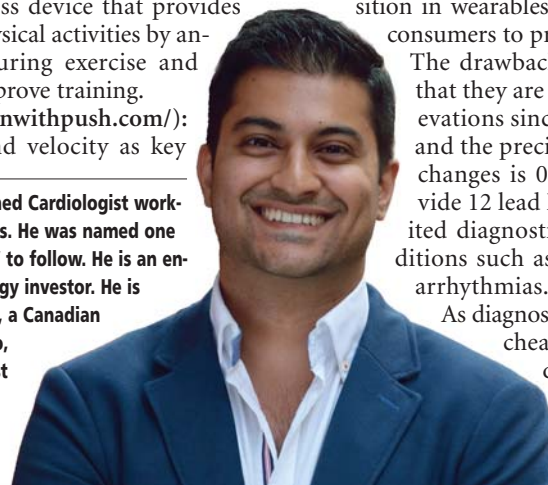
metrics to enhance strength training and optimize training programs. PUSH detects reps, sets and can gauge performance based on the velocity of each rep or your peak power output.

Under Armour (https://www.underarmour.com/en-us/accessories-gear): Another wearable wristband that supports different workout modes, such as a gym mode, cycling, indoor and outdoor running. The advantages of the EKG wrist bands is continuous cardiac monitoring and detection of arrhythmias.

Technologies assessing contraction strength, duration, and accelerometry assist athletes with measuring and monitoring. They also enable athletes to adjust their training schedules faster and more objectively. The fitness world has seen the value proposition in wearables for training everyone from consumers to professional athletes.

The drawback of most of the devices is that they are not good at detecting ST elevations since they use 0.5 Hz frequency and the precise frequency to measure ST changes is 0.05 Hz. They will not provide 12 lead EKG support, and have limited diagnostic utility, especially in conditions such as sudden cardiac death and arrhythmias.

As diagnostic tools become smaller, and cheaper with more supportive data for screening, we may see these devices becoming ubiquitous among the fitness and sports medicine communities.

Health system renewal relies on empowered patients

BY DR. AHMAD ZBIB

Information is power. Over the course of history, information has helped underdogs break free from their dependencies on those who controlled the masses. At times, it has even contributed to the toppling of regimes and the elimination of famine.

This reminds me of a story my dad told me about a famous regional political leader, a mid-century feudal lord. One day, the farmers protested the lack of access to postsecondary education for their kids. His response? "Why would you want to send your kids to university when I am sending my son so he can learn and bring back his knowledge to help you all?"

Does that sound familiar? While there is no doubt that healthcare providers do truly have the patient's best interests at heart, paternalism is still prevalent in our healthcare system.

In trying to understand some of the factors that are likely to shape the future, a couple of questions come to mind:

To what degree are new medical devices and information technologies empowering patients?

How might this evolve over time?

There is no doubt; we are in the middle of a health information revolution. What was once reserved for a relatively small group of professionals is suddenly accessible by all. While the informed/empowered patient movement started before medical information became available online, the internet has facilitated the dissemination on a far broader scale.

This has been so impactful that we had to coin a term (cyberchondria) for people who have "unfounded escalated concerns" about serious illnesses based on their reviews of online medical and health literature.

While this "diagnosis" is reserved for a few, modern day healthcare practitioners are learning to deal with the phenomenon of empow-

ered patients and in some cases, they are encouraging it. Why wouldn't they, if it can ultimately help them be more efficient? After all, patient education and self-management, when done right, can lead to positive outcomes.

The Internet is not the only factor at play. Most current smartphones feature immensely powerful chips with great processing power. Add cloud hosting and computing to that, and consumers today have access to ever increasing computational power. As well, we now have access to medical grade smartphone enabled devices and sensors, such as smartphone-compatible ECG leads, respirometers, pulse oximeters, brainwave measuring headbands and the

Ahmad Zbib, MD

list is growing. Furthermore, novel home genetic testing kits and modern approaches to laboratory medicine, as Theranos is doing in the United States, for example, is putting information in the hands of patients, sometimes even before their health providers receive it!

Soon, the patient will not only get the actual lab reading, but they will be receiving accurate interpretations and recommendations made possible by sophisticated algorithms that can interpret massive amount of data virtually instantaneously.

Austere global economic conditions and skyrocketing healthcare spending will also drive the transformation.

In Ontario, for example, government spending on healthcare will exceed 50 percent of the provincial budget in the not so distant future. The current archaic model of a provider- or hospital-centred system is not sustainable.

There is an economic need to

Analytics should be delivered in real-time, and made available to all

BY JO SURICH

There is no debate about the need for advances in analytics in healthcare. It's generally agreed that the innovative answers needed to improve patient care, while simultaneously reducing costs and increasing efficiencies, come from the insights, trends, and clues hiding in the very data that is being collected.

However, the data warehouses managed by IT departments to produce information, often of a financial or administrative kind, can be an expensive proposition. Often, this approach of preparing and massaging the data into a common element is denounced as consuming 80 percent of all expenses, with only 20 percent being devoted to delivering clinically valuable information in real-time.

Unfortunately, data warehouses exhibit a tendency to create silos, often based on the source of the data or the special interests of particular departments. This data silo effect often works against effective production of analytics for the whole enterprise and tends to lead to the separation of entities and interests. Overcoming this separation becomes a significant management challenge.

Jo Surich

None of this suggests that data warehouses should not be built as resources allow, but it does set out some cautions on the road to doing so.

Value is generated by producing data, not by spending the majority of resources on the cube-building process. Value is generated by democratizing the flow of data to managers in departments under constant resource and service demand pressures.

Moreover, if data are provided months after events, it's like asking someone to drive while using the rear-view mirror.

Speed and client responsiveness, along with accuracy and relevance, have to be among the key measures of success. If habits and structures built around data warehouses work against speed and client responsiveness, they undermine the potential for improving the quality of what we do in healthcare.

The historical response to democratizing the data analysis process is to argue that end users will not have the skill-sets required for statistical analysis and for complex model building. While that may be true in some cases, such statements are positioned in the context of a culture of secrecy and a failure to share information with those in immediate need of it.

To knowledgeable observers, this argument will be recognized as nonsense, and it will certainly be resented by the end users who must build a culture of analytics to effectively manage their services and departments.

Democratizing the data analysis process involves giving managers at the point-of-care the capacity to apply knowledge derived from data to their particular clinical environment and its demands. If you can deliver data in a visualized form to managers, they will recognize anomalies, outliers, unusual time consumption patterns and respond to those with decisions and leadership.

Where those data are readily manipulated and filtered, and when they are provided in real-time, they will enable a culture of improvement in processes and services at the local level – where services are delivered.

Gartner has recognized the trend that reflects this democratization movement: "[Companies] are increasingly shifting from using the installed base, traditional, IT-centric platforms that are the enterprise standard, to more decentralized data discovery deployments that are now spreading across the enterprise." In healthcare, where resources have been historically

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Canada's newest hospitals are electronic 'ecosystems'

The latest solutions are integrating patient information and the Internet of Things.

BY DIANNE DANIEL

Hospital or ecosystem? With all of the modern networking and integration going into new hospital builds across Canada, the comparison has never been more appropriate. At the Niagara Health System (NHS) St. Catharines site, a state-of-the-art acute care facility that opened in March 2013, systems are so interconnected and wireless coverage is so pervasive, it's hard to imagine delivering healthcare without it.

"It's a living building," says Jeff Wilson, NHS regional manager, ICT technical support. "We have the capacity to run a small city in here."

From day one, the network was built with the future in mind. The goal was to achieve 100 percent coverage throughout the building, which spans nearly one million square feet. From the high-grade cabling and underlying network infrastructure provided by Hewlett-Packard (HP), to the wireless access points supplied by Cisco, to the distributed antenna system supplied by InnerWireless – a first for Canadian hospitals – every nook and cranny is covered, even the elevators and basement.

"Our networking and connectivity is like a utility; we can't live without it now," says Wilson. "It's not a nice-to-have; it's a must-have … As we move forward, it really is becoming the Internet of Things, so connectivity has to be seamless."

Just as living and non-living things are interconnected in an ecosystem, the robust wireless infrastructure at NHS is enabling people and hospital equipment to interact in new ways. Nurse badges are equipped with wayfinding capability, making it easier to locate nurses and communicate with them using nurse-call consoles and cellphones as opposed to loud PA system announcements.

The porter and housekeeping systems operate in a similar fashion, sending automated alerts to the nearest porter when a patient needs to be moved, for example, and then automatically update the system to show the request was answered and someone is on their way. Even the Philips telemetry system, another implementation first for Canada, is sending vital patient information through the network to Cisco wireless phones so clinicians can access it wherever they happen to be.

Some of the functionality was in place on opening day, some is evolving as the hospital gets comfortable in its new 'city-like' environment, which includes building automation to control lights, heating and cooling.

Women's College Hospital in Toronto is another Canadian facility capitalizing on a new build to deliver futuristic services. With phase two of its "Hospital of the Future" slated to open this fall, the hospital is embracing a ground-breaking ambulatory care approach, meaning surgeries, diagnostic procedures and treatments do not require overnight hospitalization. Instead, patients can be released within 18 hours to recover in the comfort of their own homes.

Designed to be an easily accessible hub of programs and services, Women's College Hospital now runs like a "beautiful ecosystem," says director of IT Brendan Kwolek.

"We have a number of renowned clinicians at Women's College Hospital who've been encouraging us and pushing us to get to this point and now we're finally here," says Kwolek. "We're evolving their vision which is a completely electronic record, with integration into all clinical systems and access to live data."

Phase one of the new building was completed in 2013. Similar to the NHS experience in Niagara, automation hinges on robust, pervasive wireless coverage and a modern high-speed network. Women's College Hospital chose a brand new HP wired and wireless network that includes intrusion detection and monitoring capabilities. Using the HP Intelligent Management Centre, IT staff can pinpoint gaps in coverage on live radio maps, making it easier to troubleshoot problems and provide proactive assistance.

"It's great technology to have in your back pocket so you can actively monitor coverage," says Kwolek.

Part of what makes Women's College Hospital unique is its focus on ambulatory care. Because documentation and prescribing takes place in an exam room setting, every room must be "computerized and ready to go, and have documentation at the physician's or care provider's fingertips," explains Kwolek.

Prior to moving into the new building, the hospital had a "mish-mash" of systems from a number of providers, and paper documentation was still in place. To support its forward-thinking ambulatory care approach, the hospital chose the Epic electronic patient record, joining only a handful of other Canadian implementations.

"Behind the scenes, there's an emphasis on how tightly our computer systems need to be tailored to our workflows to support ambulatory care," says Kwolek. "We had a good opportunity to work closely with Epic to implement what we feel is a very solid, very efficient system that will allow us to do a lot of unique things in the future."

Right now the hospital is live with Epic's Registration, Scheduling and Ambulatory modules. New features include the ability to auto-determine the 'next best available time' when scheduling appointments, and to automatically prioritize people according to wait times and urgency. Epic also integrates with other hospital systems, such as the radiology information system, so that reports are automatically fed to the patient record, including a link to view and manipulate images where appropriate.

Wireless device integration is another advanced strategy in place at Women's College Hospital. Glucose monitors and mobile ECG carts are wirelessly connected to the core hospital information system so that results are automatically transmitted and read. Later this year, the Philips telemetry system will also be implemented.

To facilitate its highly connected and integrated approach, each new exam room is equipped with a 24-inch monitor, allowing clinicians to easily work without the need to scroll or page back and forth. Beyond that, each area of the hospital is free to use whichever device makes sense. Some areas are standardizing on Microsoft Surface 3 tablets, while others are incorporating Rubbermaid wallmounts or workstations on wheels.
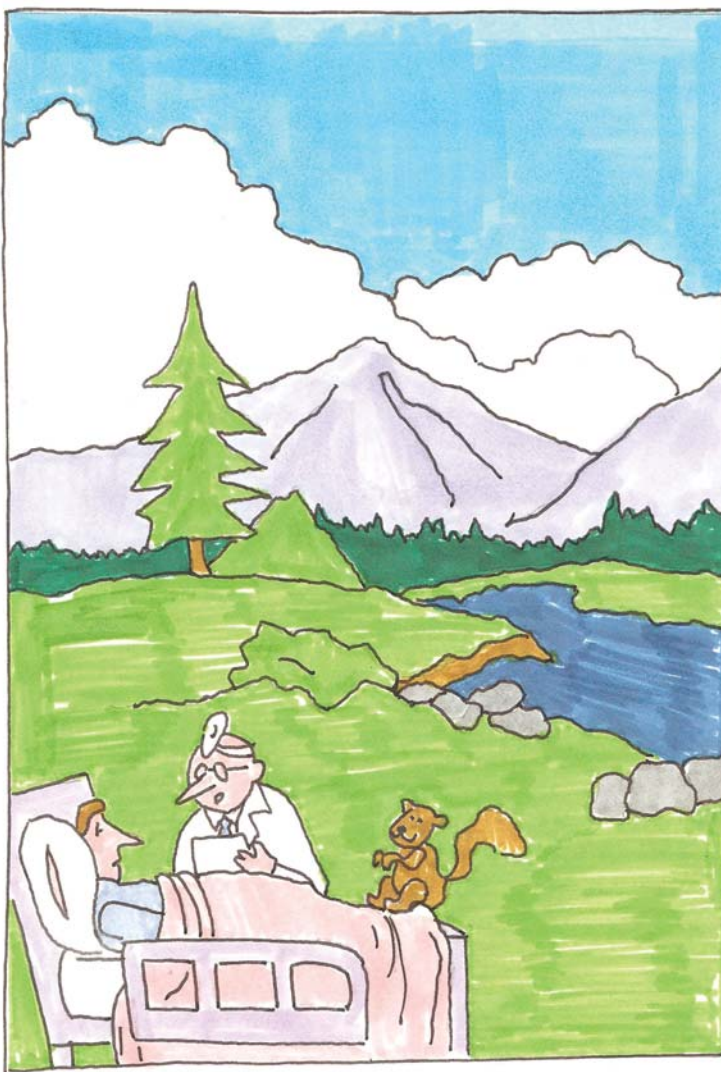
"The advantage of having a new, modern infrastructure is we're not limited by the technology we've got in-house," says Kwolek. "We can pick a cart, a wireless tablet, a handheld, just about anything, and not have to worry about additional infrastructure investment … This is the way we do business now. It's not the paper world anymore," he says.

Earlier this year, McGill University Health Centre (MUHC) opened the doors to its 43-acre super hospital, spanning five city blocks in Montreal. Not surprisingly, a robust fibre optic network and WiFi mobility strategy are key enablers as the facility aims to be one of the most innovative academic health centres in North America.

After four years of construction and a $2.355-billion investment, the site is among the most advanced in Canada, though some solutions are still in the process of being rolled out. The high-level goal is to identify the most important functions carried out each day and ensure clinicians are equipped with applications and devices to support their workflow, says Dr. Jeffrey Barkun, professor of surgery and chief clinical officer for technology transition at MUHC.

ILLUSTRATION: LINDA WEISS

"For a workflow related to completing rounds in a group, we'll have a huge LCD screen. If it's something that has to do with putting a note at bedside, which we do not have yet, we're aiming for tablets. And if it's to do with looking at results on the move, that's where we have our WiFi mobility platform and the form factor we've targeted is cellphone," explains Dr. Barkun.

Every patient room at the new Glen site is a single room and that means a lot more walking and more dependence on two-way communication. Wall-to-wall WiFi coverage is necessary, says Dr. Barkun, to support the hospital's Bring Your Own Device (BYOD) strategy. To facilitate communication between care teams, in-house developers created two applications designed for smartphones. One provides quick and easy access to essential parts of the in-patient records housed in the organization's Oacis information system through a visual display, and the other pre-populates up to 80 percent of daily notes by capturing information from tagged text messages.

One development having the most impact on how clinicians work in the new environment is a new electronic card system. Each member of the hospital staff has a card which serves as their unique identifier. The card opens doors and provides access to on-demand printing services, a functionality Dr. Barkun didn't expect to be as popular as it is.

"The few times you want to print something, you just bring your card, swipe it in front of a printer and no matter where you are in the hospital, what you've sent to the print queue will come out," he explains.

Moving forward, the cards are expected to provide garage access and will also be used to log into new thin client terminals spread strategically throughout the hospital, with the ability to maintain context between sessions. Right now, only generic logins are provided for the thin clients, which can be confusing at times.

"Not everything was optimal from the word go but we expected some of this," says Dr. Barkun, noting that electronic medication reconciliation and point-of-care recognition are among the software applications slated for implementation later this year and early next year.

Core to every hospital of the future is the patient experience. Inpatient rooms at the new MUHC site are unlike anything Dr. Barkun has experienced previously. And the same is true at NHS and Women's College Hospital where both Wilson and Kwolek remain focused on making the patient experience even more seamless.

In St. Catharines, Wilson is considering adding a meal ordering feature to the patient bedside terminals, which already provide television and Internet access. He'd also like to provide patients with access to their clinical records, either from a mobile device or at bedside, as well as provide visitors with patient tracking capabilities similar to the information currently displayed on large monitors in day surgery wait rooms.

In downtown Toronto, Women's College Hospital is openly promoting its patient-accessible wireless network and plans to add more patient-specific capabilities in the future. One area under consideration is the whole aspect of proactive care management, says Kwolek, where patients could be prompted to book routine exams or tests according to their specific health condition.

"We've learned through consumerization that patients want more access to their information and they want to be more active in their healthcare," he says.

Another technology under consideration at both NHS and Women's College Hospital is wider use of beacons – also known as micro-location sensors or Bluetooth Low Energy devices – both for asset tracking and a means to deliver personalized, predictive services to patients. Kwolek's vision is to use the technology to deliver relevant patient information to mobile devices, whether that's access to medical records or information related to a current visit. "Maybe I'm guiding patients to information based on where they are in the hospital," he explains. "If you're in Endocrinology, do you want to see information about diabetes? It really presents an exciting opportunity."

"We need to look at innovating beyond the four walls," adds NHS's Wilson. "How do we enable cloud technology? How do we involve patients in their own records? How do we connect the community? We've done the groundwork but we still have a lot more to do."

Southlake teams with innovators to solve problems, boost economy

Playing with teddy bears isn't exactly what springs to mind when you think of healthcare innovation, but as Andrew Eckford rolls a teddy bear around on a desk, you start to see how a small matchbox-sized pod strapped to the plush toy could make a big difference for patients and healthcare costs.

Eckford's company, Engage Biomechanics, developed the pod to track a bedridden patient's movements with the goal of reducing pressure ulcers and falls, both of which can keep patients in hospital longer and needlessly cost the healthcare system millions of dollars every year.

"It's a great idea," says Gary Ryan, Chief Innovation Officer at Southlake Regional Health Centre. "But there were many barriers to getting the pod off the bear and onto patients, notably getting access to a hospital environment in which to test the device with real patients, doctors, and nurses. That's where we come in."

Three years ago, Southlake Regional Health Centre launched a healthcare incubator in collaboration with municipal and academic partners to foster innovation in the healthcare sector. Called CreateIT Now at Southlake, the incubator offers innovators access to a large community hospital and the clinicians that work there. It's an offer that is gaining the attention of more than a few startups, as well as some established companies that are looking for a foothold in the North American healthcare market.

Engage Biomechanics is not alone in facing barriers to accessing hospitals and clinicians. In fact, 90 percent of healthcare startups in Ontario fail in large part because they don't have access to the healthcare system while developing their product. "With no early adopters, no first sales, and no foothold in Ontario's complex procurement system, too often these companies don't get their products to market," says Pat Clifford, director of research and innovation at Southlake.

This sobering reality spurred Southlake to focus their innovation efforts on helping entrepreneurs get into the market. "We were concerned that devices and technologies that could have a real benefit for our patients might be lost if these business don't succeed," says Dr. Dave Williams, Southlake's president and CEO. "To counter this, we focused on developing a business incubator and launched CreateIT Now at Southlake."

Barriers to start ups not only frustrate entrepreneurs, but also contribute to a national innovation gap. While Canada ranks third among Organization for Economic Co-operation and Development (OECD) countries in per capita spending on research, the country ranks 13th when it comes to commercializing that research.

In launching CreateIT Now, Southlake partnered with venture-LAB, one of Ontario's 14 Regional Innovation Centres that help entrepreneurs develop their businesses, the Town of Newmarket and the Region of York, who saw the hospital as an economic engine that could be revved up to develop the regional economies. Seneca College and York University are also key partners.

To begin laying a pipeline, Southlake

Gary Ryan and Pat Clifford help drive Southlake's innovation strategy.

and ventureLAB collaborated to develop the Healthcare Ecospheres – a Dragon's Den-style innovation pipeline that has startups pitch their products to hospital and ventureLAB staff as a way to quickly connect with entrepreneurs. In the first two years Southlake chose to work with 14 companies through the ecosphere process,

including Engage Biomechanics. "The ecosphere showed us there are many promising companies using technology in ways that could make a difference for our patients, but they're challenged to break into the healthcare sector, so it also proved there is a demand for a community-hospital-based incubator," says Ryan. The incubator has found more demand than initially expected, having now worked with more than 40 client companies whose devices and technologies are at every stage of development – most coming through word-of-mouth referrals.

With the momentum building, CreateIT Now is opening offices on the Southlake Campus in Newmarket, Ontario, offering clients low-cost working and meeting space, just steps from the main hospital. Space that encourages entrepreneurs to share ideas is a hallmark of successful incubators, so CreateIT Now is co-located with Southlake's Research and Innovation team and ventureLAB's new satellite office. The office offers desks, offices, and common meeting space, as well as access to the ultra-high speed Ontario Research and Innovation Optical Network (ORION). With a permanent home, the future is looking bright for the incubator.

"CreateIT Now is a model for hospitals of the future," says Dr. Williams. "Fostering healthcare technology is a catalyst to a more sustainable healthcare system."

Hospital of the future is rapidly becoming digital, virtual and personal

BY MARK CASSELMAN

Today, innovation in health services is taking hold at a faster rate outside of our traditional health system boundaries. Healthcare leaders in many countries are struggling to keep up with the pace and degree of change in health delivery coming from retail, consumer technology, and adjacent industries. A rapid shift in consumer (and professional) expectations and attitudes related to health service access, use, and experience is under way.

A survey of 12,000 global consumers highlighted that the majority of respondents believe "traditional" hospitals will be obsolete in the future. "Traditional" is the key word here. While historically designed largely for acute care and medical crises, Canadians' changing healthcare needs means hospitals now have a growing role to play in care delivery outside their walls.

Various factors, including the aging population, longer life expectancies, chronic disease, fiscal challenges, health system funding reform, huge advances in health IT and more broadly available, consumer-friendly technology, including mobile devices, make it essential to rethink the concept of hospitals and the health system in this country.

What will Canadian hospitals of the future look like? They will look and be different, but remain a vitally important element of the evolving Canadian healthcare continuum where community and home-based care and virtual care are increasingly important to an effective, sustainable health system.

Academic medical centres and community hospitals alike will face a multitude of decision points and strategic pivots that may lead to a smaller, more focused physical operation. This will be combined with a growing digital enterprise model that includes virtual care delivery and partnerships integrating community- and home-based care within the context of a larger system.

This foundational shift has major ramifications for all professionals involved in health service delivery – including clinical, business, and information technology stakeholders. Health informatics (HI) professionals involved in all three of these domain areas will increasingly be called in their leadership roles – inside and outside of the hospital – to help transform the healthcare service delivery system of the future.

Empowering the Digital Health Enterprise: While the speed of innovation and change in health care may be slower than other industries, health technology is definitely improving access to care and eliminating distance barriers between patients and providers, particularly in remote and rural Canadian communities.

The latest COACH CTF Canadian Telehealth Report, released in September, shows a 42% – 46% jump in tele-

Mark Casselman

health clinical sessions and endpoint delivery locations between 2012 and 2014, and more technological diversity in devices used.

In addition, remote patient monitoring, grew by 54%, with COPD and congestive heart failure being the most predominate conditions monitored. So, the technology is out there and, through collaboration between clinical and technology professionals and patients and family, improving care.

But, it keeps changing. As an example, in the space of the last 15 years, telehealth technology has moved from a point-to-point hospital model – where the technology was located only at a specialized facility that could link to other specialized facilities – to a facility-to-desktop connection (allowing a more distributed model, albeit still from the specialized facility point of origin).

Now, everything is moving to mobile. Today, a clinician can use a digital otoscope, exam camera, tablet, etc. directly with the patient, without any requirement to be in a certain physical space.

Increasingly, hospitals (and other care delivery organizations) are implementing the Internet of Things, where objects such as medical devices and sensors of all kinds are capturing and transferring data to analytics engines that provide real-time feedback to positively impact care delivery. Let's work together to build a uniquely Canadian roadmap for the hospital and health system of the future – digital, virtual, and personal – keeping our eye, at all times, on the most important prize of all – achieving better health for Canadians.

Mark Casselman is CEO, COACH: Canada's Health Informatics Association.

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Use of remote computer technology improves seniors' quality of life

BY DR. DAVID SABAPATHY

Caring for seniors using remote computer technology may be one of the most important, yet underutilized, healthcare interventions available today. A pilot project in Charlottetown, Prince Edward Island has connected three seniors living in residential care with their remote caregivers online.

The results hold promise for improving care and quality of life for seniors across Canada.

When my father transitioned to residential care in PEI at the age of 86, I wanted to help care for him but was working in Alberta. We decided that remote computer technology was the solution. Before returning home, I installed an inexpensive PC and Internet connection in my father's room. It was the first such installation in the >100 bed facility.

The intent was to remotely monitor my father's physical and mental health using Skype video calls, and it was remarkably effective. We were able to discuss issues such as his medications, blood pressure control, mood, sleep patterns, coughs and colds and various needs of daily living. It was a great way to be involved in his care and to partner with the facility's front-line staff and administration.

Internet connectivity also introduced a new world of online social support for my father. Family and friends from as far as Norway soon discovered him online and began connecting via webcam, leading to an enhanced sense of community. When visits from local family and friends were hindered by travel or winter weather, remote video calls helped bridge the distance.

Evidence linking seniors' social support networks and physical health is well-established. The Public Health Agency of Canada recognizes social support networks as essential to healthy aging. The Canadian Medical Association, a strong supporter of healthy aging, is leading an alliance of partner organizations in calling for a comprehensive National Seniors Strategy by 2019 that intelligently invests in redesigning long-term and community care. (http://www.demandaplan.ca/)

Beyond the benefits of health monitoring and social inclusion for my father, the greatest surprise was yet to come. Having never used technology before and after only two days of on-site instruction, he began to surf the Internet independently.

Within weeks, he was exploring a vast online world from the comfort of his room. His favorite activities: reading news from around the world and watching YouTube videos of classical music, reminiscent of his time as a choir conductor.

For younger Canadians, the Internet is essential to knowledge-sharing and social interaction. Yet for many seniors this digital world is inaccessible. Inexperience with technology, skepticism concerning potential benefits, physical barriers to access, and apprehension regarding security concerns are a few of the challenges leaving seniors disconnected. According to a 2010 Statistics Canada study, only 60 percent of individuals age 65 to 74 and 29 percent of those 75 and over had used the Internet in the previous month, compared to near universal use among those age 15 to 24.

Many barriers to accessing the web can be overcome through attention to issues such as hardware, software, training and administration. My father's PC and LCD screen were installed on a wheelchair accessible workstation and secured to prevent theft. A large keyboard and single button

mouse simplified input. Software accessibility settings were turned on to assist with reading. Operating system controls were locked-out to avoid inadvertent changes.

Critical to success was the use of free remote access software, one of several products on the market, which allowed for remote log in and control of my father's ma-

Dr. Sabapathy's father has benefited from his PC.

chine from Alberta. This software enabled periodic troubleshooting and computer maintenance, as well as online teaching of new skills.

Encouraged by my father's success, personal computers have now been installed for two other seniors in residential care. Both seniors have primary caregivers liv-

ing out of province and had never used technology before.

Again, the benefits of this simple intervention have been striking. These seniors and their remote caregivers report peace of mind from being able to discuss health concerns such as arthritis, vaccinations, depression, headaches, shoulder pain, stomach illness and diabetes. Issues that are raised prompt follow-up with a care provider.

By 2030, almost a quarter of Canadians (23 percent) will be over age 65, compared with 15 percent in 2013. To care for our rapidly growing population of seniors it will be critical to promote healthy aging and consider upstream, collaborative care models which will in turn reduce pressure on the healthcare system. Leveraging low-cost computer technology to improve care and quality of life for seniors in residential care represents a pivotal opportunity.

It has been five years since my father first went online, and the impact on his life has been significant. He is now 91 years old and continues to use his computer daily. His response when asked recently if he wanted to upgrade to Windows 10: "Sure, why not?"

Dr. David Sabapathy MD, MBA, MSc, PEng, FRCPC now works in Prince Edward Island as Deputy Chief Public Health Officer with the PEI Department of Health and Wellness.

Analytics should be delivered in real-time and available to all

more limited, an opportunity is presented to use the newly available data discovery tools and "Big Data" to deliver real-time analytics capacity to end users without the immediate political pain of managing away from the data warehouse silos.

Longer term, there may be a desire to construct warehouses among the larger and more well-heeled institutions. This need can be served by ensuring that the distributed and democratized solutions are immediately ready for transferring data to the emerging warehouse and its more rigorous techniques.

Nevertheless, many traditional warehouse implementations are dependent on the construction of interfaces to other applications and carry with them the significant cost of maintaining these interfaces. Another impediment lies in the fact that frequently, production systems have to be touched to extract the data.

Generally speaking, a "do not touch production systems" approach makes for a good start. For heavily used systems like PACS or EHR servers, there tends to be only one safe time, in the middle of the night for extracting data from the production servers.

Any other time might have unacceptable impacts on the production environment, and should be avoided. This constraint means by definition that it is impossible to deliver near real-time data, reports and alerts to the user. From the start, data become retrospective and less useful.

Having made the decision to avoid the construction of interfaces and to not touch production systems, we are led directly to seeking a use for the health protocols that have been built at great expense to allow systems to communicate and interconnect.

In particular, we can make use of the DICOM, HL7 and XML headers and messaging that allow the health enterprise to function. All take advantage of modern networks, and all make it possible to bring the health enterprise closer to an integrated whole. Clearly, we have not reached the end of this path, but great progress has been made and continues to be made across the health system.

Sharing a system with all staff ensures that all have a serious stake in the out-

come. And all can ensure the delivery of quality care to patients.

The next step, beyond the descriptive systems and capacity delivered to front-line managers, calls for the development of models and deeper, statistically based analysis that will often require greater expertise than line managers are able to bring to the table. This next predictive step requires the ability to download and extract data from a system and to move those data into analytical tools designed for these purposes.

A sensible way to address this need for predictive capacity is to ease the data extraction process. Built-in, easy to use tools can allow for the extraction of data in a number of formats such as .csv, JSON and Avro, along with a built-in extractor for R, the most popular open-source analytics package, used by 2 million people worldwide. It is at this stage that models will be constructed to allow for further analysis.

The combination of democratized data discovery and real-time engagement for front-line managers with effectively unlimited data extraction capacity from health protocols, provides a sound foundation for the development of an analytics-driven culture in the healthcare environment.

Joachim Surich is President and COO of Bialogics Analytics Inc.

> **Sharing an analytics system with all staff members ensures that all have a serious stake in the outcome.**

Empowered patients

leverage the most important stakeholder, the patient. In the United States, through the Affordable Care Act, where healthcare organizations and providers are rewarded for positive outcomes or penalized otherwise, there has been a realization that the new model of care needs to include, if not rely heavily on the patient.

Luckily, technology has the potential to facilitate this by helping to connect patients with their healthcare organizations and providers and by raising their awareness, boosting their motivation and enabling their self-efficacy.

While I certainly do not see the role of healthcare providers vanishing in the

future, I can see healthcare delivery becoming more efficient and focused on addressing urgent matters while passing some of the treatment adjustment accountability along to the patient. For physicians, the time-savings can be reinvested back into treatment.

Finally, I would like to restructure the questions I started with and instead of asking whether new medical devices and information technologies are empowering patients, I would like to leave you with this question to ponder:

To what extent will empowered patients impact the creation of a new generation of medical devices and information technologies?

Ahmad Zbib, MD, is Director, Digital Health and Innovation at the Heart and Stroke Foundation of Canada.

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