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Paperless cardiology
A Toronto cardiology clinic has developed its own technology to automate the collection of data from the myriad devices used during exams. It is now commercializing the solution, which can be adapted to enhance workflow in other areas, too.
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measure the extent to which outcomes are improved by electronic engagement systems.
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PHOTO: BRYN GLADDING PHOTOGRAPHY

Waterloo R&D centre solves healthcare problems

The Centre for Bioengineering and Biotechnology, located at the University of Waterloo, is producing new solutions by combining the expertise of a diverse group of researchers from a variety of departments, along with local entrepreneurs and multi-national companies. The CBB has just celebrated its first year of operations. Pictured above are Dr. Karim Karim and centre director Dr. Catherine Burns. SEE STORY ON PAGE 4.

NYGH to share order sets and promote CPOE

BY JERRY ZEIDENBERG

TORONTO – North York General Hospital (NYGH), one of only four hospitals in Canada to have achieved the HIMSS Analytics Stage 6 rating, has partnered with Canada Health Infoway to freely share the order sets it developed as part of its Computerized Provider Order Entry (CPOE) system.

In August 2011, Infoway awarded NYGH nearly $1 million to finish preparing a library of 500 order sets for medicine, surgery, critical care, and pediatrics; and to create a platform for sharing them – at no cost – with other Canadian not-for-profit healthcare organizations.

The system for sharing is now up-and-running and is called the Canadian CPOE Toolkit. (See the web site at http://www.cpoe-toolkit.ca). Already, 20 hospitals across the country have joined and two have announced plans to contribute additional order sets. In addition to the actual order sets in the toolkit, there is also a 'how to' manual about effective methods to implement CPOE.

"We're doing this because we believe Canadians deserve high-quality, evidence-based patient care," said Dr. Jeremy Theal, chief medical information officer at North

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North York creates system to share order sets and promote CPOE

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York General Hospital, in Toronto, where he is also a gastroenterologist. "Studies have shown that there are a significant number of preventable medical errors in the system. CPOE, along with clinical decision support, can help to prevent these errors."

About half of the 500 order sets from NYGH were licensed and adapted from Zynx Health, a company launched in 1996 by clinicians at Cedars-Sinai Medical Center, in Los Angeles, and now a global leader in clinical decision support systems. These order sets must be further licensed if other Canadian sites wish to use them, but NYGH created about 250 order sets that do not have any licensing restrictions and are free of charge.

NYGH is now working on another 100 order sets for mental health, maternal/newborn and other areas. Not only are Canadian healthcare organizations free to use these sets, but they're also able to contribute their own order sets and lessons learned for sharing with others.

NYGH partnered with Zynx for many of their order sets because they have a staff of clinicians trained in evidence-based medicine, dedicated to monitor medical journals worldwide and determine the latest and best practices for diagnoses, tests and treatments.

According to Dr. Theal, there are some 6,000 medical studies published each day, and it takes a specialized organization to keep up with them – separating the high-quality information from the questionable data, and incorporating it into a useful form. For its part, Zynx updates its evidence and order sets every four months.

The order sets team at NYGH. Left to right: Mahesh Don, Dr. Les Spevack, Rafelina Greco, Dr. Jeremy Theal, Donna Alfoja, Teresa Bishara, Derrick Kwan.

While numerous hospitals across Canada have created their own order sets, much of the work is still on paper, and a good number of the order sets are not based on evidence. Instead, they're often based on the consensus of physicians in the hospital – but the information and practices may be out of date.

What's more, if the order sets are on paper or not fully integrated into clinical systems, they're still liable to generate medical errors, such as through illegible handwriting. As well, they won't automatically generate alerts about potential adverse drug events or inappropriate lab tests.

By contrast, the electronic order sets used by NYGH and available in the CPOE Toolkit are computerized and ready to be integrated into an electronic health record system. "Paper order sets are a good start toward standardization of care," says Dr. Theal. "Only electronic order sets built into CPOE systems can provide integrated clinical decision support that leads to improvements in the quality and safety of patient care."

CPOE is the key requirement for HIMSS Analytics Stage 4 standing, something that only 3 percent of Canadian hospitals have achieved, compared with 38 percent in the United States. This is also the next big challenge for Canadian hospitals – given about one-third of them are at Level 3. Very few Canadian hospitals have improved their rating of late. "Canadian hospitals haven't moved the needle on Stage 4 in the last year," comments Dr. Theal. "In the United States, it's moving by leaps and bounds."

Of course, the U.S. government has created a system of incentives for computerization through the HITECH Act, which has spurred a great deal of activity in recent years. By the same token, if American hospitals don't achieve higher levels of computerization in a few years, they will be penalized – which has also caused them to take action.

The HIMSS Analytics Electronic Medical Record Adoption Model (EMRAM) is used to measure the level of computerization that a hospital has achieved, and it runs from 0 to 7. It's believed that the greater the level of computerization, the greater the benefits in terms of improved workflow and patient outcomes.

After implementing a Computerized Provider Order Entry system in 2010, North York General experienced a significant improvement in patient safety and a lowering of mortality rates. Indeed, the hospital recently achieved the second lowest Hospital Standardized Mortality Ratio (HSMR) in Canada, a measure that tracks the rate of preventable deaths in hospitals.

And in its first year of usage, the CPOE system helped clinicians spot and prevent 2,300 medication errors.

Going back 10 or 15 years, the electronic medical record was often referred to as the 'holy grail' of medicine, something that would revolutionize the quality of patient care. Today, most hospitals have implemented an EMR of one sort or another, but 97% are at Stage 3 or below. As a result, they haven't achieved the promised gains in patient safety or a significant lowering of mortality rates.

What happened?

Research by HIMSS and others indicates that major clinical improvements don't materialize until an organization has implemented higher-level functionality – starting with Computerized Provider Order Entry (Stage 4), and above.

"The critical stage is when CPOE is im-

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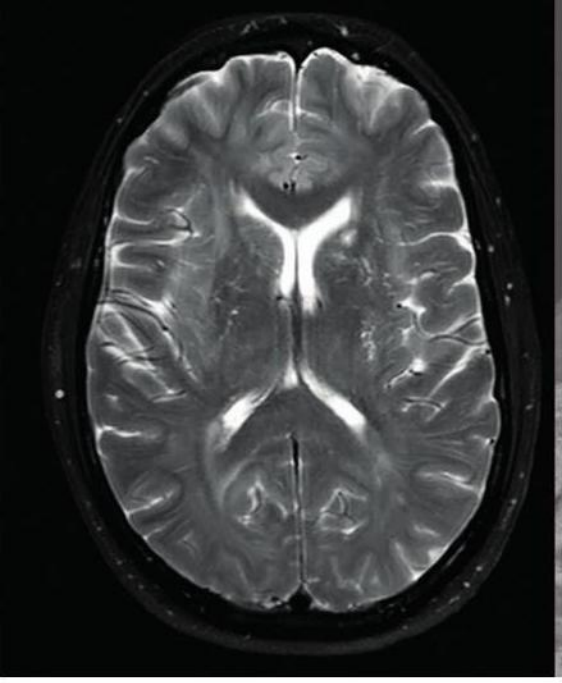

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SickKids tests the impact of family engagement system on outcomes

BY SAVERIO RINALDI AND TINA QUELCH

When a person is ill, close family members often lend a hand. And when a child is sick, the family's involvement is even more intense. Because of this, parents are asking for more online communication with clinicians, according to a national poll by C.S. Mott Children's Hospital at the University of Michigan. By connecting clinicians and family members more closely, it is hoped that better outcomes can be achieved.

Parents wear a number of hats during their child's treatment: advocate, record keeper and caregiver are just a few. Parents can also assist by offering valuable information. To assess how this kind of sharing can make an impact, the Hospital for Sick Children (SickKids), in Toronto, is researching how input and observations from the family can support treatment plans and improve patient outcomes.

The solution includes the Clarity Health Journal, a computerized application from Consulting Cadre that is integrated with Telus health space, a consumer health platform that is certified by Canada Health Infoway. Both systems have been integrated with eCHN, a provincial paediatric electronic health record that provides patients and their families with access to important information, including discharge summaries, medication administration records and lab results.

SickKids conducted a technology assessment of the Clarity Health Journal in 2010 that included children with cardiac care conditions, those waiting for transplants and day surgery patients.

This initial step allowed the hospital to test the application and its ability to collect information securely, while maintaining the patient's privacy. Once this assessment was completed, SickKids initiated a larger demonstration project that included a research component with paediatric oncology patients. A rigorous privacy and security assessment was completed, with support from Deloitte, prior to the implementation of this solution. Funding for the project has been provided mainly by Canada Health Infoway.

Front row (left to right): Saverio Rinaldi, Consulting Cadre/Clarity Health Journal; Helen Edwards, Director of Clinical Informatics and Technology Assisted Programs at SickKids; and Karima Karmali, Director Centre for Innovation and Excellence in Child and Family-Centred Care at SickKids. Back row: Nan Brooks, Consulting Cadre/Clarity Health Journal; Terry Moore, Infoway; Dr. Jim Whitlock, Chief, Division of Haematology and Oncology at SickKids, Nick Zamora, Telus; Daniela Crivianu-Gaita, VP/CIO at SickKids and Mike Horner, Infoway.

The new initiative is now recruiting families in paediatric oncology to participate in family health engagement research. Children undergoing treatment for cancer or blood disease diagnoses, along with their families, will use the Clarity Health Journal to collect health information and receive lab results, medication administration records and discharge summaries. They will also be able to share information with their healthcare teams.

"The intent of the project is to allow families to track care at home after an intensive treatment in the hospital," said Dr. James Whitlock, division head, haematology and oncology at SickKids. "After discharge, families will be able to review their discharge summary and a report of the medications they received while admitted. Families can also review select lab results from ambulatory and inpatient visits. The healthcare team, in turn, will be able to see information about sleep patterns, fatigue, mood and medical dosages. This will allow physicians and families to track progress together and improve monitoring."

Clarity Health Journal was designed as a family-centric health application that allows for information sharing and monitoring between families and healthcare teams. The application collects disparate health information, such as immunizations, medications, procedures, events like doctor and dental visits, insurance records and family histories within a single portal. It makes this process easy-to-use for both the family and the healthcare team, and will help engage families in the care of their loved ones.

As part of the pilot project, Clarity Health Journal achieved certification status from Canada Health Infoway in November 2012 and is one of the first consumer health applications to be approved. The Infoway certification mark indicates it has met a series of pre-defined, domain-specific assessment criteria in the areas of privacy, security and management control.

The new paediatric oncology initiative went live in December 2012 and recruitment is under way. Study results and the benefit evaluation are expected to be completed in April 2014.

By collecting and sharing information among patients, families and healthcare teams, the study will gain insight into the impact of consumer health applications on outcomes.

R&D centre is applying technology to solve health problems

BY SHIRLEY FENTON

WATERLOO, ONT. – Researchers at the Centre for Bioengineering and Biotechnology (CBB), which just celebrated its first anniversary, are working to solve healthcare problems related to an aging population, rising medical costs, and increasing environmental pollution in Canada and around the world. Progress is already being made by over 140 faculty, students, companies and healthcare institutions that are collaborating on projects.

"The common thread ... is a dedication to understanding how technology can work in conjunction with biology and people to make a better world," commented Dr. Catherine Burns, director of the CBB, and a full professor in the Department of Systems Design Engineering at the University of Waterloo.

Take for example, Dr. Karim Karim. With support from Grand Challenges Canada, Dr. Karim is developing a low cost mobile X-ray system for detecting tuberculosis. With advanced sensors, his technology can greatly reduce the amount of X-ray energy needed for detection. This reduces the equipment requirements overall, making the reality of a highly portable X-ray machine possible. Having portable diagnostic technology has great implications for delivering healthcare in developing countries like Pakistan, where Dr. Karim has been developing his technology. Low cost and mobile diagnostic equipment can improve the scope of services available in Canada, too, by bringing devices to remote and cash-strapped regions.

On another front, a visit to your physiotherapist's office may soon change dramatically. Dr. Dana Kulic is investigating how to improve physiotherapy by measuring and analyzing patient movement using sensor technology. This should give the therapist more accurate information on whether the patient is performing the exercises correctly, how many repetitions they performed and how well they are progressing through their sessions. In the future, this technology could easily come home with you, allowing you to complete your therapy under the

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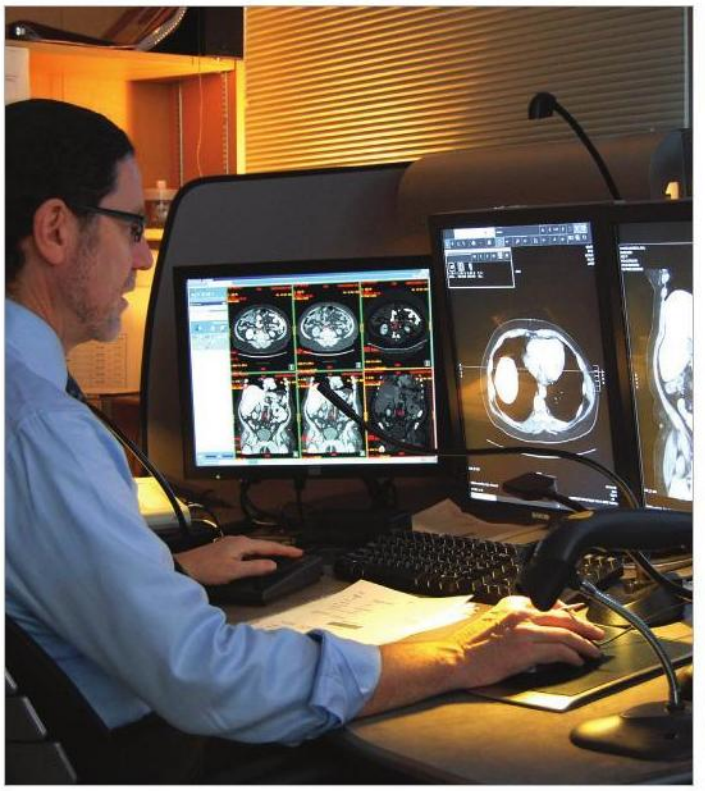
The introduction of breakthrough technologies often means great benefits for patients and physicians alike.

Helping clinicians and radiologists improve patient care with higher image quality and the ability to significantly lower dose levels has been an important goal in CT. A paradigm shift is taking place in the CT world today — GE Healthcare's model based iterative reconstruction algorithm, Veo, is showcasing the potential for higher image quality and lower dose.[1]

"Veo allows us to significantly reduce the amount of radiation exposure our patients are getting while still delivering the diagnostic quality we demand."



By using this model-based approach, Veo can potentially allow physicians to deliver lower noise, increased resolution, improved low contrast detectability and low signal artifact performance.[2] Veo's capabilities give clinicians a powerful tool to improve CT imaging performance for their patients.

"Veo allows us to significantly reduce the amount of radiation exposure our patients are getting while still delivering the diagnostic quality we demand," said Dr. Daniel Lindsay, Director of Diagnostic Imaging at Selkirk & District General Hospital in Manitoba. "Our patients and doctors know that this tool is available and it's well accepted. Referring physicians request the technology when appropriate."

After decades of CT image reconstruction using filtered back projection and more recent advances in raw data-based iterative reconstruction, such as GE's powerful ASiR™ technology, Veo goes even further by modeling the CT scanner itself, and more complex data to help create outstanding clinical image quality.

And pioneering patient-centric technology is nothing new for GE Healthcare. With a goal of bringing better healthcare to more people, GE continues to develop "healthymagination-validated" products in collaboration with leading academic researchers and experts from GE's Global Research Center.

"Given our proven history of CT imaging innovations, GE is proud to bring to market yet another innovative, patient-centric technology in Canada," said Peter Robertson, Vice President and General Manager of GE Healthcare Canada.

1. *In clinical practice, the use of Veo may reduce CT patient dose depending on the clinical task, patient size, anatomical location and clinical practice. A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task.

2. In clinical practice, the actual level of LCD, spatial resolution, and low signal artifact improvement may vary. Consult with a radiologist and a physicist.

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Toronto cardiologist's software eliminates paper, improves workflow

BY ROSIE LOMBARDI

When patients are referred to a cardio clinic for testing, mountains of paper are created. Every cardiac test – echocardiogram, EKG, Holter, stress, nuclear, vascular and more is produced on a separate device, generating paper that needs to be analyzed and summarized.

Dr. Joe Ricci, a lead cardiologist at CorCare, a cardiac and nuclear medicine clinic in the Toronto area, devised a novel solution to digitize and consolidate all the outputs when he discovered that no such solution existed in the market.

"Under the traditional process, each one of those devices created an image or an output that was typically printed to paper or PDF. After a physician reviewed the data, they would generate a report. Every type of study and each vendor's device had a unique workstation, managed as separate workflows, and all the reports looked different," explains Ricci.

Each piece of paper had to be touched 15 to 30 times by technicians, support staff, transcriptionists and doctors before the final consult letter was delivered to the family doctor. "The technician generated the paper, which was then delivered to us. We analyzed all of the reports and dictated our findings via Dictaphone, which staff then typed and returned to us for review and signature. Then it had to be scanned and filed and sent back to the referring physician."

When Dr. Ricci and his partners started up CorCare seven years ago, this kind of paper-intensive workflow was manageable because the clinic was smaller and there were fewer reports to process. But the clinic has grown considerably over the years, and the organization has launched two new clinics in other neighbourhoods to keep up with demand, in addition to adding new cardiac tests and devices.

As such, the volume of reports grew substantially, and the traditional workflow was not sustainable.

"We were a very efficient operation, but we recognized that we could not achieve our vision of rapid access to high quality cardiac care and diagnostics using the traditional approaches.

"We were passionate about workflow." With a high volume, labor intensive process, staff turnover and quality can be a problem. We were looking for a way to manage the volumes better but to maintain high quality. We wanted our service to be built on 'Lean' principles to ensure seamless continuous workflow that could accommodate patients or physicians at each and every site."

No solution appeared to exist in the market. However, 10 years earlier, Dr Ricci had been an early adopter of the Xcelera system for managing echocardiograms from Philips. "We recognized that it accomplished everything we wanted in our 'ideal state', because it allowed us to streamline our echo process, our technicians could do their measurements on the machine, and send them electronically to the Xcelera system where a physician could review, interpret, and report the final study in a single workflow with no paper in between."

But this paperless nirvana existed only for echocardiograms. Dr. Ricci asked the Philips staff if they could extend the Xcelera solution to include other types of cardiac devices, but they said the company wasn't able to provide multi-modal workflow processing, nor were other vendors.

Dr. Ricci decided that there was a clear need for it in most cardiology clinics, not just his own.

"Because it was so important to our vision of high-quality cardiac care, we returned two months later with a strategic proposal to develop a solution to fill this gap in the market. We proposed utilizing the Xcelera platform to develop the multi-modality workflow for cardiac Imaging we needed. Philips management not only shared our enthusiasm but encouraged us to move forward. Within six months we had completed a proof of concept."

Rob Lalonde, CEO of Influx Cardiology, with Dr. Joe Ricci.

Things moved rapidly from here. Dr. Ricci worked with partners who included cardiologists and a software development team to build and field test this workflow system, now called "Influx".

"Influx is a software solution that takes outputs from multiple cardiac modalities, and converts them to a DICOM standard object that can be sent to Xcelera. Once in Xcelera, technicians and physicians can review and report studies, just like we did with echocardiograms. Influx can handle virtually all modalities: stress, stress echo, nuclear cardiology, Holter, ambulatory blood pressure and even pulmonary function and metabolic tests."

Dr. Ricci also developed structured reporting tools within Xcelera that removes the need for transcription of reports. "If we are happy with the report, when we say, "Finalize", Influx can send the report to be automatically filed, billed and distributed."

Influx is an appliance that sits between all the modalities and Xcelera and creates a paperless workflow solution that otherwise wouldn't exist. Dr. Ricci's vision of providing rapid access to high-quality cardiac care was finally fulfilled, as CorCare reduced turnaround time from several weeks to one day for delivering cardiac reports to family doctors.

"Now that there's no human touch or paper in between, we can analyze a test the same day. We've also reduced the staff we needed to manage each modality to two people, the technician acquiring the study and the doctor reporting it. Our reports go to an automatic distribution network, and they get billed, filed, faxed or e-mailed out the same day. We've been able to accomplish more with fewer staff for a higher volume of tests. And we've had dramatic reduction in errors."

Recognizing that Influx is a solution that most cardiac clinics really need, Ricci and his colleagues plan to market the system across America. "Influx is an asset for any cardiac clinic that wants to improve quality, reduce costs and use its resources for better things than paper shuffling, whatever its size. We estimate the return on investment to be less than a year, and as short as months for busy services or hospitals."

Influx, as a commercial organization, is working on further system improvements and high quality custom support. "My personal focus within influx is on the workflow quality, interface and structured reporting. We believe that this is a unique and very good product now, but that it will get even better."

Cardiology clinics are already clamouring for the Influx system. "We've had multiple requests for pilots and installations. By the end of the year, we'll have made several sales. And we've successfully participated in several RFPs that are still pending. So we're pretty optimistic about this."

Beyond cardiology, Ricci says the concept behind Influx can be applied in other specialist areas of medicine that have similar multi-modal issues, including vascular and pulmonary medicine.

"I believe that in all practices, it's actually improvements in workflow that drive quality and efficiency, although many practices make the mistake of getting hung up on the technology," says Dr. Ricci.

For more information, visit: http://www.influxcardiology.com

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VIEWPOINT

Big Data presents us with opportunities, but security risks, as well

The healthcare sector may not have the resources, or the will, to properly protect large amounts of data.

BY RICHARD IRVING, PHD

Big data and analytics are creating tremendous opportunities for public and private organizations to improve their understanding of business processes, suppliers and clients. While Big Data and analytics can provide you with new opportunities, they also present some risks.

In November 2012, ESG, an IT consulting firm, released a report which asserted that up to 88 percent of organizations in the United States are involved in Big Data and are a potential market for advanced systems that provide Big Data security analytics. What are the risks in healthcare?

In healthcare, most Big Data is "anonymized" so that individuals cannot be identified. However, this data may not be as secure as we think. In July 2013, the Guardian newspaper reported that a Harvard professor was able to re-identify people in an anonymized genetics data base with 42 percent accuracy using only a zip code, date of birth and gender. When the first name or nickname was added, the percentage correctly identified rose to 97 percent.

In principle, the anonymization of individual data should not be difficult. Just strip out the name, zip or postal code and address. In large organizations, as the McGuinty Liberals in Ontario found out, removing data is problematic. The reason is that modern organizational databases are dynamic entities which are continuously backed up in real-time and backups of the backups are made, and so on.

The Guardian article quotes Bob Plumridge of Hitachi Data Systems as saying, "… over the years … a given organization will have up to eight copies of any piece of data." Chances are that hidden in backups of your databases are data that can identify individuals. These issues are currently on the table for many companies, and they're on the horizon for all organizations. Fortunately, Big Data analytics, which have caused the problem, may also be able to provide the solution. Big data analytics can provide enhanced security in the following areas.

A Harvard professor was able to re-identify people in an anonymized database, with 42% accuracy, using only a zip code, date of birth and gender.

- Comprehensive Real-Time Asset Tracking – identifying each device connected to the network, the owner of that device and patterns of use.
- Security Intelligence: This includes STIX (Structured Threat Information Expression) and TAXII (Threat Information Exchange). Big Data Threat security analytics can provide real-time threat intelligence that integrates external intelligence, cloud-based intelligence and internal intelligence.
- Real-time Network Analytics: Since most large networks generate huge amounts of data, specific algorithms are used to detect anomalous behavior in real-time.
- Automation of Analytics: Using data from the previous three areas, analytics engines can identify problems and take security actions. In other words the network security analytics engines can act as security enforcers whose actions can then be checked by human security professionals.

Richard Irving, PhD, is an associate professor of management science in the Schulich School of Business, York University, Toronto. If you have comments or ideas on this topic, he can be reached at rirving@schulich.yorku.ca.

Large private corporations typically have access to the resources to act on the challenges discussed here and many are struggling to develop Big Data security systems. I am concerned that our public healthcare system does not have the resources, the will or the expertise to properly protect large amounts of data. The way forward will involve co-operation between federal, provincial and regional institutions. The first step is a realistic assessment of the potential threats and how they can be countered. If you have thoughts or comments on this article, please send them to me.

Implementing Big Data is more like farming than mining

BY DEREK RITZ, P.ENG., CPHIMS-CA

There are some who suggest that Big Data analytics will get gold from mountains of dirt. This is, at best, a mining metaphor. At its most hype-inflated, however, it verges on a claim of alchemy. The truth is not so magical. The power of the analytics lies in discerning patterns that were not immediately evident – but the data has to be there, in a computable form, before we can discover these patterns.

To explore the something-from-nothing myth a bit, let's unpack an often-cited example. Google is able to determine the geographic spread of the flu virus weeks in advance of organizations such as Health Canada or CDC, and with similar accuracy, by simply tracking how many people are searching for "flu" using Google's ubiquitous search engine. By doing rudimentary IP tracing, Google can tell the geographic location of the people doing the search and with some simple statistical techniques they can readily discern signal from noise.

Make no mistake; this is a useful and innovative example of Big Data analytics. And with a weeks-earlier "heads up", emergency rooms can be better prepared and stocked with necessary medications in anticipation of the coming extra traffic – all of which is good news. But in terms of fulfilling the promise of Big Data analytics, this example merely scratches the surface.

The folks at Google know this. They were influential contributors to a President's Council of Advisors on Science and Technology (PCAST) report on Health IT that was submitted to the White House in December, 2010. The PCAST report describes what some believe may be the most impactful benefit to be realized out of America's present $35 billion eHealth investment programme:

If the data gathered by healthcare providers and the decisions made at the point of care by providers and patients were gathered and aggregated, they could reveal patterns of illness in a community or nationally, identify potential epidemics at very early stages, enable comparisons of different treatments or medical devices in large and diverse populations, and evaluate the effectiveness of specific treatments and make information about hospitals, physicians, and other providers more comprehensive and accurate.

Derek Ritz

So why is data mining not the right metaphor for Big Data analytics in healthcare? In some sectors it might be, but in healthcare, we are better served by a metaphor more reflective of the preparation we will need to undertake. The PCAST quote begins with a very big "if". We should think, not about mining, but about farming. In healthcare, we will not be able to reap the benefits of powerful analytic techniques if we do not, today, sow the seeds of our success.

How do we do this? The 2010 PCAST report outlines the two necessary prerequisites. The first is the adoption by providers of interoperability standards that enable data to be shared across institutions. The second is the creation of a network infrastructure that enables distributed data to be indexed and effectively accessed.

Tellingly, without these two prerequisites, there is no "network effect" to leverage. If we can leverage the network effect, however, the opportunities to employ Big Data analytics are genuine and truly impactful.

In the next article we'll look at ways to overcome the impediments to leveraging Big Data analytics in the Canadian healthcare system.

Derek Ritz is an advisor to public and private sector clients, in Canada and internationally, regarding eHealth strategy, architecture, implementation and adoption.

Rebooting eHealth: Are we pinning the tail on the wrong beast?

BY DOMINIC COVVEY

Jumping Jehoshaphat! There are readers out there! Thank you for your emails. I will gradually incorporate them into this column. I do ask that you limit yourselves to 'elevator speeches' – and note that my brain only goes to the 5th floor!

I've received pages of material and the one I'm including here was almost 500 words before chopping. From now on, I'll limit the inclusions to 200 words and that is 100 more than I requested at launch. Please boil down your oceans, lakes or puddles to a glass-full … or suffer from my e-scissors and cognitive limits!

Jody Bevan, President of Jonoke Software Development, Inc., had a lot to share, including (edited for format, brevity and clarity):

There are many things that have been done poorly to get our health system electronic. In my opinion:

Dominic Covvey

- Get government out of physician's offices and let the physicians choose their software.
- Have the government get all of their facilities online, and establish standard, published interfaces to link to them. This will enable direct communication.
- Get the government to stop spending money to automate doctor's offices.

When all labs can accept e-reqs with a sent-in request identifier, allow the labs to send out the result with the sent-in identifier. Furthermore, require that labs use LOINC as their coding system. Why isn't this already the case?

All hospitals should also be able to send their reports, lab results, etc., to the physician community, using HL7 format with PDFs in Base64. In addition, government systems should connect to a central point through which vendors can upload/download. Doing just these will have physicians pressuring their vendors to enable connections to the central point.

Not all physician offices work the same way; the government forcing one piece of software on all physicians won't succeed nor will it be efficient. Having only a few vendors is a recipe for failure. Prices will escalate and innovation will decline. Innovation and great support does not come from telco-type companies in the software business.

We should have nearly 100 percent of physicians on an EMR. Government interference has been the greatest barrier to this. Government can't be counted on. Start the funding, stop the funding, recommend vendors, change the rules, recommend different vendors, etc. All very counterproductive.

How many vendors have a patient portal into their EMR? Very few. How many have a native iPad application for their EMR? Very few. How many vendors are adding new features weekly? Very few. Are organizations funded by government like PITO, POSP, OntarioMD, Canada Health Infoway successful in driving the 100 percent push toward eHealth? No. They have attracted a good set of physicians to get on board, but for the wrong reasons. Therefore, they have hit a ceiling.

Wow, there's a lot there! What are your views? Will Jody's suggestions work or not work to improve actual EMR use – meaningful use? Is the idea of a central point of communication a good idea? Essential? Not?

What about you government EMR-promoting agencies out there, like OntarioMD and your siblings? What do you have to say? What data can you provide (and I know you have a lot) to counter or support Jody's assertions? Write now or forever take the slung mud!

I have to admit that I am bothered by the fact that each province has defined its own criteria for functional capabilities and largely ignored issues like the flexibility and adaptability of systems. In an article in CHT [See Computer Systems as Freezers –

CONTINUED ON PAGE 11

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‘Heavy lifting’ needed to computerize different parts of the healthcare system

Regional healthcare providers are installing large-scale electronic systems to boost their effectiveness.

BY SHELDON GORDON

ConnectGTA, a $72-million project that aims to integrate electronic health records across the six LHINs in the Greater Toronto Area, has completed its selection of technology and some of its implementation at early-adopter sites.

ConnectGTA is one of three regional hubs launched to “do the heavy lifting” for eHealth Ontario, says Alice Keung, Chief Operating Officer, eHealth Ontario. “It was the first horse out of the barn.”

CGTA is a partnership among Ontario’s Ministry of Health and Long-Term Care, eHealth Ontario, Canada Health Infoway, University Health Network, and the six GTA Local Health Integration Networks (LHINs).

“Patient’s electronic health records are scattered widely at different organizations,” says Keung. “Information doesn’t follow the patient as he or she moves from one point of care to another.” The hubs are intended to solve that problem and thereby “help us improve the delivery of care by providing a more complete picture of the patient.”

ConnectGTA (CGTA) has a two-year head start on the other two ehealth hubs (Southwest Ontario and Northern & Eastern Ontario). The plan is that regional integration will eventually enable province-wide record sharing by linking the three regional hubs to a provincial hub.

“We purposely staggered them so we can take advantage of what we learned in CGTA to benefit the other two,” says Keung. “When it procured, we made sure it was a technology that can be leveraged for the rest of the province.”

CGTA’s first year involved a number of targeted activities to increase clinical data volume in regional and provincial repositories and the testing and implementation of technical concepts.

The second year has seen procurement of technology, including some implementation. This stage has included the initial, limited sharing of data across the GTA. St. Michael’s Hospital became the first institution to share its data this past May. Other early adopters to share data over the next few months will include 11 more hospitals and five Community Care Access Centres (CCACs) that will link in one at a time.

The biggest challenge has been procurement, says Malcolm Moffat, Chair of CGTA’s Steering Committee (and Executive Vice President, Sunnybrook Health Sciences Centre). “This is a huge project that hasn’t been done anywhere else,” he says. “When we first started, some thought that by early fall 2013, we would be up and running. Procurement slowed us down. We didn’t recognize just how complex the procurement was going to be.”

The next phase, to begin this fall, will involve expanding to another 85 of the region’s 750 health care facilities, which includes 52 hospitals and 229 long-term care facilities, along with their clinicians. There will also be Incremental increases in the volume and types of data available.

MDs and other clinicians cannot yet access patient records on CGTA because the system’s front-end portal is still not operational. But Moffat expects the first clinicians will be connected by late fall or early winter. He expects 20,000 clinicians to be accessing it by the spring/summer of 2014.

Eventually all healthcare facilities in the region will be linked in. Smaller organizations with five or six employees may take longer to reach. However, says Moffat, “close to 90 percent of patient encounters will be able to be tracked through Connecting GTA with the next wave of participants. We should have that [larger] group finalized by early fall. It will be a much faster process for that group than for the early adopters.”

The first patient data being shared across the LHINs includes clinical reports, diagnostic images, drug information, and lab test results. By the end of the three-year CGTA work plan, the project aims to capture about 60 percent of identified healthcare data from participating healthcare organizations.

The remainder of the data will be captured in subsequent phases. This does not include data that hasn’t been digitized by the participating facilities, such as daily nursing notes in an acute-care hospital.

“Some would say, ‘let’s not do anything until everything is perfect.’ says Moffat. “But our approach has been, ‘let’s leverage whatever information is already in place. If we wait until we have 100 percent of the information in electronic format, we’ll never get started.”

“The information we’re able to share is the information most frequently looked at to make clinical decisions,” says Moffat. “If clinicians don’t have it, they have to order the tests again. The value to the system is that you’re not duplicating tests.”

When his patients receive care in a hospital locally, “we receive reports in a timely fashion,” says Dr. David Daien, co-leader of CGTA’s clinical working group. “But if an ambulance takes them to one of the other area hospitals where I don’t have privileges, it is much more challenging to stay on top of what is happening with the patient and their results.”

The value of CGTA, says Dr. Daien, will be that, regardless of where his patients receive care in the region, “I’ll be able to access the reports generated by the regional hospitals or CCACs or lab systems, and have a more complete view of what’s transpired with the patient.”

The project’s back-end system is being provided by Telus Health Solutions, on an initial contract of $12.6-million. The back-end architecture includes two key components:

- Health Information Access Layer (HIAL): This foundational infrastructure is to securely integrate existing information systems and link them to the front-end system for speedy viewing of clinical data;
- Clinical Data Repository: This will store commonly needed patient details such as hospital discharge summaries, emergency department reports and CCAC reports. The HIAL will draw upon the CDR to maximize system performance.

Telus also won the contract, in a later tendering process, for the front-end system – a Provider Portal. This browser-based tool is to provide a single point at which clinicians can access CGTA data and collaborate with one another.

eHealth Nova Scotia: In Nova Scotia, meanwhile, ehealth is moving forward, with investments to date of $170.5-million. “We’ve done a lot of the foundation work, and we’re starting to bring information systems directly to various provider groups and right to the citizen,” says Sandra Cascadden, chief health information officer at NS Department of Health and Wellness.

“The patient was moving faster in the system than the paperwork moved,” says Cascadden. “The province’s healthcare system was awash in paper, it didn’t move fast enough and it wasn’t shared. The intention was, and is, to eliminate the paper and achieve interconnectivity using electronic systems.”

Nova Scotia has favoured a province-wide implementation of electronic healthcare systems, starting in the year 2000. “When we introduced PACS [Picture Archiving and Communication System],” says Cascadden, “we rolled that out across the entire province, so that any image taken in any facility can be shared with any other facility and other specialists to help provide care across the province. We’ve also done that with our Electronic Health Record, which is called SHARE [Secure Health Access Records].”

Physicians, nurse practitioners and dietitians are also linked in to e-Health’s information systems through the Electronic Medical Record (EMR), which has been installed by 67 percent of the GPs in the province. (The proportion of GPs who adopt EMRs is expected to reach 90 percent in two to three years.)

They now receive lab results and diagnostic imaging into their EMRs. They are also able to access SHARE for other data, such as a patient’s hospital admission and length of stay. “We are moving on transcribed reports flowing into their offices electronically,” says Cascadden.

The next step in the growth of the EMR will be e-

ILLUSTRATION: LINDA WEISS

prescribing, so a GP will be able to send a prescription electronically to a pharmacist. "The way doctors write may not be readable to a pharmacist," she says. "This will reduce the need for phone calls back and forth between the pharmacy and the GP's office."

Now, the province is starting to offer Nova Scotians electronic access to their medical information and to their healthcare provider. Through a formal tender process, the province selected Relay Health to provide the Personal Health Record (PHR).

"They've been supplying PHRs in the U.S. for 13 years, and they had a solid, secure offering for us." Cascadden says Nova Scotia is the only one of the Atlantic Provinces that has moved into the PHR space so far.

eHealth and Relay are in the second year of a two-year demonstration project involving 30 GPs with 3,000 patients recruited from in their practices. Patients are able to see their lab tests online as well as diagnostic imaging reports (though not yet the images).

Participating patients can book appointments with their GPs electronically. There is also a secure messaging link, through the PHR, for communication between patient and practitioner. The PHR will also show the process of referral to a specialist.

Patients can record their medications, vaccination history and visits to hospitals and doctors. This is all web-based, says Cascadden. "We went to the cloud for the Personal Health Record." If the evaluation of the PHR demo is positive, "we'll be looking at a strategy to provide this to every Nova Scotian," she says. "If all goes well, then 2015-16 is when we would start offering it province-wide."

Cascadden foresees another 10 years of heavy investment in the ehealth system in Nova Scotia. At the same time, there is much work to be done creating seamless interoperability among the solutions.

Are we pinning the tail on the wrong beast?

CONTINUED FROM PAGE 9

reference CHT], I wrote the following: "What can we do? I'd suggest the following: reduce the laser-focus on functionality and dramatically raise the emphasis on requirements for systems that are sufficiently adaptive and evolvable to serve as organic enablers of a responsive health system that satisfies human needs." I also am of the opinion that what the provincial EMR organizations are doing is restraint of trade … and that's supposed to be illegal!

What say you? Why are we still struggling with adoption of the EMR? Why do those who have systems not use them except for mundane purposes? Can at least part of the problem be pinned on our favorite donkey, our government? What about the developers and vendors – are they pinnable? Or is it those bloody Hypocratics?

A friend, Erica Drazen, once said that we put the blame for less-than-desirable adoption on the wrong people. Her quote is worthy of memorization. She said: "Wait until resistance changes to insistence!" Maybe what we have so far in terms of systems and applications is causing the wait? Please send your comments to the author, Dominic Covvey, at RebootingeHealth@gmail.com.

This column addresses the fact that over the last decade we, collectively, have made some progress in the domain of eHealth at the local, provincial and national levels. However, we are beset by challenges that may make it time to rethink our course to a significant degree. Perhaps eHealth 1.0 has gone as far as it can and it is timely to do an honest and objective appraisal of progress, a reconceptualization of what we are addressing, a rededication to excellence, a midcourse maneuver (as they call it in rocketry) and maybe even a fresh approach: eHealth version 2.0. Maybe it's time for a reboot! Suggestions for articles and responses to the column are most welcome. Those who submit comments (up to 200 words) may elect anonymity, or may identify themselves. We will edit contributions only for length and good taste. This is your chance to put forward your concerns and to give your perspective on major issues – opportunity knocks!

Dominic Covvey is President and Director, National Institutes of Health Informatics, and an Adjunct Professor at the University of Waterloo.

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Integration engines help organizations to extend reach of their data

BY GARY FOLKER

Integration is a constant topic of conversation in healthcare circles. Yet in recent months, the subject is taking a considerably larger piece of strategic conversations. The reasons for the resurgence are many.

For one, more and more healthcare operations are being asked to do more with less. Service providers, from hospitals to community care, increasingly need to link and share data from different sources in order to operate more efficiently. And innovations such as web-based and mobile service delivery are changing the role that integration will play.

There has been considerable movement afoot in seeking opportunities for consolidation as a means to improve efficiencies and costs. These are focused on various areas of discipline. Perhaps the most noteworthy is potential large-scale investments in the standardization of clinical information systems (CIS). This focus is mainly driven by an understanding of future requirements in patient-centric care delivery. As such, integration stands at the front and centre of discussions, as success will hinge upon the ability to connect to a multitude of users and platforms outside conventional circles.

Cheryl Hansen, executive director of health business and technology for the New Brunswick Department of Health, notes that the province turned to the Orion Health Rhapsody integration engine as a means to reduce the silos of information that existed in its healthcare system. As she notes, "We had people that were moving zone to zone or region to region. When they were provided with service their healthcare information was not available. The key was to find a way to make clinically relevant data available anywhere, anytime to the right provider when needed so they can make the best, most informed decisions possible."

Cheryl Hansen

The integration engine will also be expected to take on an even more important role as provinces prepare to invest millions in their consolidation, in large part because of the need to find ways to handle data before, during and after implementation. Once a silent player in the background, the expectations for integration are increasing exponentially, especially in its role in enabling a seamless transition to the new architecture.

As provinces proceed down the consolidation path, there will be a continuous need to pull data from and communicate to disparate systems that will continue to co-exist or be introduced into the infrastructure at some point or another.

These will become increasingly important as the sector strives to expand the role of data, by giving access to a wider group of caregivers and patients via web-based and mobile apps. These innovations will rely heavily on robust integration engines that will facilitate the uninterrupted collection and analysis of data.

The overarching driver behind all of this is the growing move to a patient/consumer-centric approach within the healthcare system. With that comes a whole range of integration activities that need to happen, since an integral part of that will be getting data to patients and their circle of care, including family members, physicians and caregivers. That is why any technology stack sold today offers some sort of integration engine capabilities to collect and disseminate data from a variety of different sources.

Gary Folker is Senior Vice President, Orion Health and is responsible for the strategic planning, ongoing development and growth of Orion Health in Canada. He draws from more than 30 years of experience and is ideally positioned to guide business development for the leading eHealth provider.

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North York

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plemented," says Dr. Theal. "That's when you see a tangible change in outcomes. Until then, the benefits of the EHR are mostly ones of efficiency – such as making it easier to obtain patient histories or test results."

North York General's Stage 6 award means the organization has also implemented closed-loop medication management (Stage 5) and physician documentation with structured templates and advanced clinical decision support (Stage 6).

Since implementing CPOE and its computerized order sets, NYGH has seen increased uptake by physicians of evidence-based, best practices. For example, rates of prevention against Venous Thromboembolism have increased from 50 percent to 96 percent, and physician medication reconciliation on hospital admission and discharge increased from 8 percent to over 80 percent.

There is virtually 100 percent usage of CPOE and order sets by physicians – an indication of complete acceptance of the system. To achieve this, NYGH worked with its physicians for two years to design the system. As a result, it is really a solution that was created by the clinicians, not something foisted on them.

Dr. Theal notes that CPOE systems are notoriously difficult to implement. Indeed, about 30 percent of early CPOE projects have failed. That being said, the gains to be had from such solutions are enormous, and there are many lessons to apply as organizations pursue the holy grail of safer, evidence-based patient care.

By working together, hospitals across Canada can keep each other's order sets up to date, says Dr. Theal.

To succeed, a hospital has to build the system in partnership with its clinicians and keep them informed every step of the way. A methodology is available from the Canadian CPOE Toolkit. "We've created a 500-page manual, so others can share the lessons we've learned and avoid having to implement CPOE by trial and error," said Dr. Theal.

He says that when it comes to order sets, it's key that every hospital must review and customize them to suit its own practice patterns. "Every organization that has been successful with order sets has reviewed and modified the content to suit its own local needs," said Dr. Theal. "While the evidence-based practices in order sets must be maintained across all hospitals, there are variations in practice at each institution related to differences in available clinical expertise and clinical workflows, differences in hospital formularies and local antibiotic resistance patterns, as well as differences in available laboratory and diagnostic imaging tests." All of this, and more, has to be accounted for.

Another important factor: evidence-based medicine works best when the evidence is right there on the screen. Impressively, you can click on the various parts of the order sets from the Canadian CPOE Toolkit and the actual studies, from which the evidence is based, pop up.

"We know that physicians are more inclined to use evidence in order sets if the source of the evidence is right there, built into clinical workflow," comments Dr. Theal. "It's important to have the literature at your fingertips, to help guide decision-making at the point of care."

He observes that contrary to the criticism that order sets and CPOE lead to 'cookie cutter' medicine, nothing could be further from the truth. Dr. Theal points out that evidence-based medicine will often suggest several different therapies. The physician must still decide which works best for each individual patient. "You may know that a certain antibiotic, for example, wouldn't work well for a patient if they had already received the same one recently. But by having the evidence pertaining to each clinical decision built into the order set, guidance is available to help clinicians decide the best course of action in situations like this."

Ultimately, the time, money and effort expended on creating a CPOE system is for the benefit of patients – and the work has paid off at NYGH, where the risk of preventable deaths for common conditions such as COPD and pneumonia has been reduced by 45 percent. As North York General's CEO, Dr. Tim Rutledge has said, "health information technology has hardwired quality and safety into the hospital."

With Infoway, NYGH now hopes to make it easier for other hospitals to obtain the benefits of order sets and CPOE through the Canadian CPOE Toolkit. And as more organizations join, they can add their expertise and make further improvements to existing order sets. "Everyone can keep each other's order sets up to date," comments Dr. Theal.

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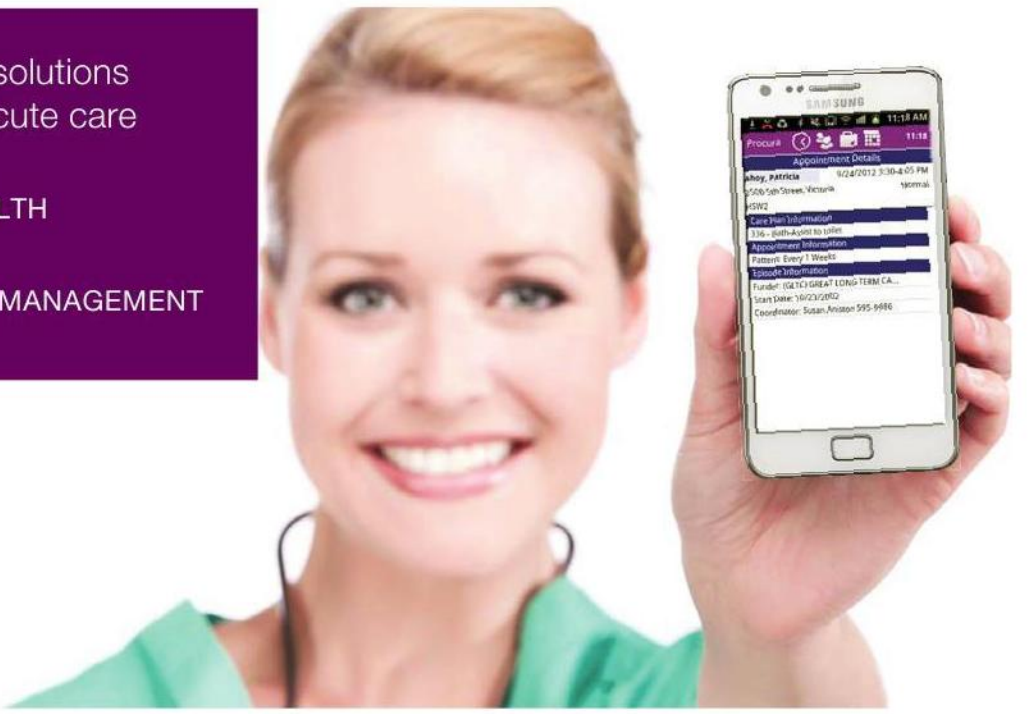

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Your new joints may also come from a technology developed at CBB. Three dimensional printing, known as additive manufacturing, is an emerging technology and one of the most intriguing uses for the technology may be in customized joints and appliances for people. Dr. Ehsan Toyserkani has been working on the construction of highly personalized joints with varying internal architectures using 3D printing. By printing with biodegradable materials, the printer can construct a custom joint scaffold, and then by seeding the scaffold with a patient's own cells, a bone substitute can be built.

A new treatment for autoimmune diseases and organ transplant rejection may be available soon from the centre's researchers. A patented bioprocess for the production of a new biopharmaceutical recently developed by Dr. Perry Chou and Dr. Murray Moo-Young may help treat autoimmune diseases and prevent rejection of organ transplants. Positive preclinical trials at medical institutes in the United States, Canada and Germany have been conducted, which is a prerequisite step to potential FDA approval for new drug development.

A novel way to improve healthcare is under development through the use of electromagnetic waves to image and analyze materials. Dr. Safieddin (Ali) Safavi-Naeini is using this technology to improve the quality control process for pharmaceuticals. His new method not only allows for the analysis of each and every pill that is produced, it also eliminates the need to destroy medications when conducting a full analysis. Using similar technology, Safavi-Naeini's research group is developing an inexpensive device to conduct pre-screening for skin cancers, which is more accurate than a visual exam, without the invasion of a biopsy and, with its low cost, a practical alternative, affordable to even small clinics.

These achievements are a few examples of the Centre's current contributions to healthcare, which could also create jobs and help boost the economy. Many of these research activities are commendably supported by industrial corporations such as Argos Therapeutics, Cangene, Christie Medical Holdings, GE Healthcare, Lockheed Martin, Oculys Health Informatics and Cardon Rehabilitation, to name a few.

The vision of Waterloo's Centre for Bioengineering and Biotechnology is unique. Capitalizing on Waterloo's already world-class reputation for digital technology and entrepreneurship, the Centre works to encourage research and technology in the areas of medical device development, environment remediation, new renewable energy and healthcare.

The research has a decidedly "Waterloo" feel, with most researchers combining advanced digital technology, informatics, and state of the art hardware to tackle tough problems in healthcare technology. All this work is driven by Waterloo's unique entrepreneurial culture, taking advantage of Waterloo's inventor owned intellectual property policy which lets researchers rapidly commercialize their work.

CBB is located in Waterloo, a region with a long tradition of technical excellence and entrepreneurial spirit.

Success in this research requires strong partnerships among researchers, students, industry, healthcare and government. The Centre welcomes members from these communities and encourages them to join and collaborate on research. CBB hosts industry focus days, seminars, workshops and student events. And, it helps build the right research teams to tackle the toughest problems.

According to Dr. Burns, "the prognosis is that CBB will play a vital role in an emerging scenario of a cleaner and healthier world. Collaboration and partnerships are critical in making our research possible."

CBB is jointly hosted by the Faculties of Engineering and Science, which provided seed funding for five years. After this time, the Centre should be self-sustaining through research services and sponsorships. CBB is located in Waterloo in the centre of Canada's technology hub, a region with a long tradition of technical excellence, entrepreneurial spirit and home to many start-up companies.

For more information about our work at the Centre for Bioengineering and Biotechnology, please visit bioeng.uwaterloo.ca or contact us at cbb@uwaterloo.ca.

Shirley Fenton is the Business Development Director of the Centre for Bioengineering and Biotechnology at the University of Waterloo.

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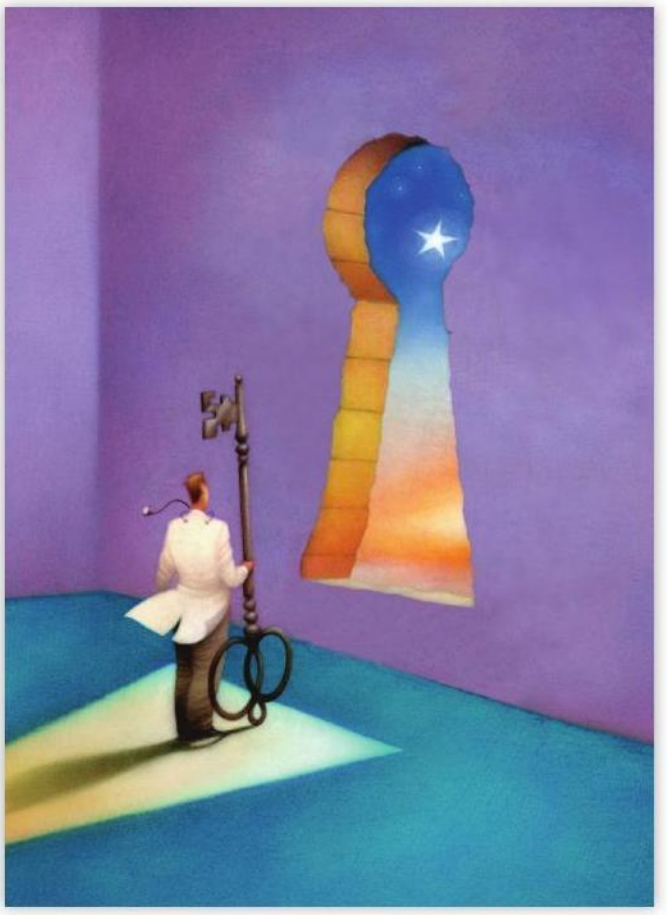

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