



# CANADIAN Healthcare Technology

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allows them to complete the imaging study as soon as it is performed, speeding up workflow.

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PHOTO: COURTESY ONTARIO BRAIN INSTITUTE

The Brain-CODE team at the Ontario Brain Institute has created a province-wide, computerized network that connects neuro-researchers at sites across the province. It's a key element in the organization's plan to transform Ontario into a brain research and technology powerhouse. An additional part of the strategy is to nurture innovative start-up companies through seed capital and know-how. **SEE STORY BELOW.**

## Ontario aims to become a brain-science innovation hub

BY JERRY ZEIDENBERG

**T**ORONTO – Claiming the highest concentration of brain researchers in any jurisdiction worldwide, Ontario is now aiming to turn its neurological knowledge into products that can be commercialized. If successful, the project could produce an amazing array of therapies for patients and an economic bonanza for the province.

"We're trying to create a Silicon Valley of neurotechnology," commented Michelle Wilson, communications lead for the Ontario Brain Institute, a government-funded organization that is spearheading the commercialization drive.

The OBI connects 35 research institutions

across the province, stimulating research and innovation, and directing projects that aim to produce breakthroughs in treating a host of brain-related disorders, including autism, Alzheimer's disease and epilepsy. "There are

**Brain-CODE connects 35 research centres across Ontario, spurring collaboration and innovation.**

800 to 900 neuroscientists in Ontario," commented Jordan Antflick, PhD, senior outreach lead at OBI. "They're sometimes separated by long distances, but with Brain-CODE, geography no longer matters."

Brain-CODE is a neurology informatics platform created by OBI. It is a high-speed

network that connects the researchers and houses their work so that all can access it quickly. What's more, the system employs Big Data analytics to make further sense of the data, resulting in additional insights.

A \$15 million investment by the Ontario government got the OBI off the ground in 2010, and in 2011, an additional five-year funding of \$100 million was kicked in to support research and development work in five clinical areas – neurodevelopmental disorders, cerebral palsy, depression, neurodegenerative disorders, and epilepsy.

For its part, the federal government's FedDev Ontario has contributed \$11 million to the OBI's commercialization effort. In addition, FedDev's investment has been

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**PHILIPS**

# Ontario aims to commercialize its neurological research knowledge

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more than matched by private industry partners.

Already, the OBI is nurturing 15 brain technology entrepreneurs from across the province. (A new round of the entrepreneurial program was just launched, and will result in at least 10 more innovators being groomed.) Some of the innovations are, pardon the expression, mind-boggling, and include:

- a portable PET scanner that can fit into the trunk of a car.
- a new device for treating sleep apnea.
- an app for children with autism.

The entrepreneurs were each given \$50,000 in start-up money by the Ontario Brain Institute, and the 15 companies have now raised an additional \$4 million on their own – they’ve pitched their prototypes to investors who were convinced they have useful and commercially viable products.

The entrepreneurial companies include MDDT Inc., short for Movement Disorders Diagnostic Technologies, which emerged from research conducted by Dr. Mandar Jog and his Movement Disorders Centre at the

London Health Sciences Centre. Dr. Jog has discovered a way of dramatically reducing tremors in patients with Parkinsons and other diseases accompanied by tremors.

“There are about 10 million Parkinson’s patients worldwide, and another 40 million with essential tremors,” said Jack Lee, MDDT’s chief operating officer, and a former researcher at Dr. Jog’s Movement Disorders Centre who now spearheads the commercialization of its work. Indeed, tremors are among the most common movement disorders seen by physicians, and doctors often treat the symptom by injecting a botox-like drug called Xeomin directly into the afflicted muscles.

Xeomin relaxes the muscles, but the therapy has proven effective in only 20 percent to 30 percent of patients. That’s largely because it’s difficult to know which muscles to inject and how much of the medication to use. However, by using a band with embedded motion sensors and computer algorithms produced by Dr. Jog’s team, physicians can dramatically improve the results. “We’re seeing a 70 percent reduction in tremors in 70 percent of patients,” commented Lee.

A pilot project with 50 patients has been running since 2011, and a multi-site trial in Canada and the United States is slated to begin this year. “We have to ensure we can replicate the results,” commented Lee, who has an MSc in physiology and pharmacy.

MDDT’s solution for tremors, called TremorTek, has also won funding from the MaRS technology centre and from the On-

**The OBI is nurturing 15 brain technology entrepreneurs from around the province, and will soon announce several more.**

tario Centres of Excellence. (MDDT exhibited at this year’s OCE Discovery conference, held in Toronto in May.) What’s more, the maker of Xeomin, German-based Merz Inc., has also invested in the technology.

TremorTek is currently under review by Health Canada, and Lee hopes to start marketing in Canada in 2016, followed by the United States and Europe. Currently, it is being used as an experimental treatment.

For those who have tried TremorTek and

benefited, the technology has been a god-send. One of the patients is now able to play golf again, while another, a wood carver, is able to use power tools as she did before her illness struck. Before and after videos of patients can be seen on the MDDT website at [www.mddtinc.com](http://www.mddtinc.com)

Another of OBI’s entrepreneurs, Natasha D’Souza, also showcased her innovation at the recent Discovery conference in Toronto. D’Souza, an electrical engineer by training, has produced Zeely Adventures, a game-like software system that teaches kids with special needs how to recognize emotions in others – something that most children pick up naturally, but which kids with autism, Down’s, ADHD, fetal alcohol syndrome and other disorders must be taught. (See <http://zeelyadventures.com/>)

And because they feel like they don’t fit in, these kids are in danger of getting into trouble – sometimes resorting to anti-social behaviour and substance abuse.

“One out of 88 children is on the spectrum, and the numbers are on the rise,” commented D’Souza. She learned about the difficulties that some children have after becoming a mom and discovering that her own child was having trouble relating to the emotions of others.

D’Souza organized a team of graphics designers, photographers, coders, speech pathologists and voice actors to help create the multimedia game, which challenges kids to recognize and respond appropriately to the facial expressions and emotions of others.

Zeely Adventures launched in January on iTunes (it runs on iPads), and already has users in Canada, the United States, the UK and Australia. The \$20 program has become popular with therapists and special education teachers, who use Zeely Adventures to train children. (One therapist in the United States has been using it to help emotionally delayed adults.)

The program is beautifully designed and engages its users – primarily children, who participate by answering questions and visiting interesting places, like parks and museums. They’re encouraged to activate a green star to light up by getting the right answers – meaning they’ve learned to interpret facial expressions and cues.

Zeely Adventures is a true innovation for kids with emotional disorders like autism, Asperger’s syndrome, and ADHD. “Many of these kids can’t interpret emotions on their own,” said D’Souza. “But if they’re taught, and the message is reinforced at home, the success rate is high.”

For more information about OBI and its work with entrepreneurs, see: <http://www.braininstitute.ca/obi-entrepreneurs-program>.

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Address all correspondence to Canadian Healthcare Technology, 1118 Centre Street, Suite 207, Thornhill ON L4J 7R9 Canada. Telephone: (905) 709-2330. Fax: (905) 709-2258. Internet: [www.canhealth.com](http://www.canhealth.com). E-mail: [info2@canhealth.com](mailto:info2@canhealth.com). Canadian Healthcare Technology will publish eight issues in 2014. Feature schedule and advertising kits available upon request. Canadian Healthcare Technology is sent free of charge to physicians and managers in hospitals, clinics and nursing homes. All others: \$67.80 per year (\$60 + \$7.80 HST). Registration number 899059430 RT. ©2014 by Canadian Healthcare Technology. The content of Canadian Healthcare Technology is subject to copyright. Reproduction in whole or in part without prior written permission is strictly prohibited. Send all requests for permission to Jerry Zeidenberg, Publisher. **Publications Mail Agreement No. 40018238**. Return undeliverable Canadian addresses to Canadian Healthcare Technology, 1118 Centre Street, Suite 207, Thornhill ON L4J 7R9. E-mail: [jerryz@canhealth.com](mailto:jerryz@canhealth.com). **ISSN 1486-7133**.

### Publisher & Editor

Jerry Zeidenberg  
[jerryz@canhealth.com](mailto:jerryz@canhealth.com)

### Office Manager

Neil Zeidenberg  
[neilz@canhealth.com](mailto:neilz@canhealth.com)



### Contributing Editors

Dr. Alan Brookstone  
[alanbrookstone@shaw.ca](mailto:alanbrookstone@shaw.ca)

Dianne Daniel  
[dianne.daniel@cogeco.ca](mailto:dianne.daniel@cogeco.ca)

Richard Irving, PhD  
[rirving@schulich.yorku.ca](mailto:rirving@schulich.yorku.ca)

Rosie Lombardi  
[rosielombardi@hotmail.com](mailto:rosielombardi@hotmail.com)

Andy Shaw  
[andy56@telus.net](mailto:andy56@telus.net)

### Art Director

Walter Caniparoli  
[art@canhealth.com](mailto:art@canhealth.com)

### Art Assistant

Joanne Jubas  
[joanne@canhealth.com](mailto:joanne@canhealth.com)

### Circulation

Marla Singer  
[marla@canhealth.com](mailto:marla@canhealth.com)



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**FUJITSU**

# Toronto startup launches first-of-its kind solution for surgery patients

BY JERRY ZEIDENBERG

Many companies have produced mobile solutions that monitor the health of patients with chronic diseases – innovative solutions for tracking diabetes, COPD and heart failure have scored notable successes in the past few years.

But SeamlessMD, a Toronto startup led by physicians, designers and engineers, has devised what may be the first mobile tracking solution that supports surgical patients throughout their entire journey – from pre-op to post-op. SeamlessMD has gone live with a system that delivers interactive care plans to patients on smartphones, tablets and the web, and connects post-op patients with their care-givers in real-time.

The system also provides patients with quick solutions to problems that occur once they're at home.

"Many post-op patients develop complications and don't know what to do," said Dr. Joshua Liu, CEO of SeamlessMD and named a Forbes 30 Under 30 in Healthcare this year. "They may experience vomiting or nausea, or their wounds may become infected. Typically, they will see their surgeon for a follow-up several weeks later. Many of them think they can just wait it out."

Of course, they shouldn't wait, and often become sick – resulting in readmission.

However, if these patients received attention by a nurse or doctor in a day clinic, and a complication is caught early, before it progresses, they might very well avoid a trip to the emergency department or readmission to an inpatient ward.

That's where SeamlessMD comes in. It

features an easy-to-use menu on a tablet computer or smartphone, and patients can complete key tasks in their care plan, access interactive education modules and report each day on symptoms and concerns like wounds, high-temperature and pain, among others.

Using care plans and algorithms optimized to various surgical procedures, the system analyzes the data and quickly tells the patient whether to seek immediate help at an ER, contact his or her provider at the hospital, or complete the right education module on the application to self-manage at home.

Moreover, the data collected by SeamlessMD can be wirelessly communicated to the patient's care-providers at the hospital, alerting them to urgent issues. This enables physicians and other members of a care team have a better view of the patient's progress throughout the entire journey, from pre-op to post-op.

"Patients tend to forget their instructions soon after they leave the hospital," said Dr. Liu. As well, "They also often lose the papers they have been given."

In essence, SeamlessMD provides patients with access to the information they need at the right time in their care.

So far, the solution is being used by hospitals associated with Baylor College of Medicine in Houston, Texas. Soon, Toronto East General Hospital is going to start using the solution, and other Toronto-area hospitals are on track to follow.

Dr. Liu began thinking of ways to address hospital readmissions with technology while in medical school at the University of Toronto. He was training to become a family doctor, but was also intrigued by

health system problems through his research on readmissions at UHN's Centre for Innovation in Complex Care. Readmissions cost Canadian hospitals \$1.8 billion annually, while the cost in the United States is a whopping \$25 billion.

What's more, readmission means that patients aren't getting better as soon as they should.

In partnership with two friends, Willie Kwok, a computer scientist, and Philip Chen, an engineer, Dr. Liu launched the company. They have created a solution for colorectal surgery patients, which is being used at Baylor in Houston, and have solutions for hip and knee replacement, thoracic, cardiac and bariatric patients in the works.

Dr. Joshua Liu,  
CEO of  
SeamlessMD  
of Toronto.



"These are higher-volume surgeries, with higher rates of complications and readmissions," said Dr. Liu. "But our goal is to provide interactive care plans for every major surgery."

He noted that SeamlessMD can reduce readmissions and improve outcomes for surgical patients. But it can also provide 'business intelligence' to hospital and health system administrators.

"It can be used to show patient satisfaction rates for each surgeon or department, when symptoms and complications occur after surgery, and how hospitals compare with each other," said Dr. Liu. "By having access to patient-reported outcomes in real-time, hospitals will be able to drive quality improvement."

SeamlessMD won first-place awards at both the e-Health Conference in Ottawa in 2013 and TiEQuest, Canada's largest business venture competition, earlier this year. The company now employs the three founders and two software developers.

For his part, Dr. Liu has decided to give SeamlessMD his full-time attention. "I don't know yet when I'll go back to medicine," he said. He feels being CEO of the company is another great way to make an impact on the healthcare system and to improve patient outcomes.

"I couldn't have done this three years ago, and the opportunity may no longer be here three years from now," he said. "It's the right time, and the right solution."

## Northwestern Ontario hospitals first in province to be fully connected

BY DONNA FAYE

With the connection of Lake of the Woods District Hospital (LWDH) in Kenora, Ont., to the region's shared hospital information system in June 2013, the North West Local Health Integration Network (LHIN) became the first of Ontario's 14 LHINs to have all of its hospitals able to access shared electronic medical records. This is of particular importance in Northwestern Ontario, where residents are spread out over a geographic area the size of France and often visit more than one facility to access the care they require.

The connection of all 13 hospitals in the Northwest to the regional hospital information system (HIS) improves access to hospital-based patient information for the 5,800 clinicians and staff located across the North West LHIN. All hospitals are using the same version of a shared Meditech system. All records and information are housed at a central data centre at Thunder Bay Regional Health Sciences Centre (TBRHSC), facilitating interoperability, as it is one implementa-

tion of Meditech, with the same interface feeding all facilities.

TBRHSC/SJCG uses HL7 v2.3 and LOINC standards in the exchange, integration, sharing, and retrieval of electronic information with other internal and external systems.

TBRHSC and St Joseph's Care Group (SJCG) were the original facilities in the region to acquire and implement the shared hospital information system in 1999. Since then, implementation has linked all of the LHIN's hospitals.

"Having a strong governance structure in place is key for these types of initiatives," says Dawn Bubar, senior director of informatics at TBRHSC and SJCG. Project-level direction was provided by a steering committee, accountable to the Northwest Health Alliance (NWAHA), and working groups included representatives from each of the facilities that were participating.

Another key to the success of this project was agreement on the Project Charter with defined deliverables, scope definition, roles and responsibilities of all project stakeholders and timelines for the phases and milestones that everyone works towards.

Different phases of implementation at each facility typically include core systems such as admissions, medical records, imaging and therapeutic services, order entry and Electronic Medical Record (EMR) in Phase 1.

Phase 2 includes Nursing Order Entry, Pharmacy and Laboratory. Phase 3 comprises advanced clinical electronic documentation, patient care system implementation, inpatient areas and identified outpatient units. Phase 3 has been implemented at all hospitals but LWDH. "Geography is a familiar challenge to us in the Northwest region, but a solid project reporting structure, strong working groups, and frequent communication are critical to the success of these projects," says Bubar. "Good use of technology was essential, particularly with the engagement at LWDH." The entire integration was done in-house and the overall cost of the project for bringing



Dawn Bubar

LWDH onto the shared HIS is about \$3.5 million. Information Services project team members, who are primarily located in Thunder Bay, make a priority of regular site visits, particularly at the beginning of engagements, to share the details of the project with staff and physicians and to introduce the project and local implementation teams. Bubar adds that, "Clinician engagement at LWDH has also been instrumental to making the implementation and adoption positive and smooth."

One of the main goals of the project has been to increase HIS capability in the region, resulting in improved patient care and safety. While it is still early to measure the impact on patient outcomes, the region's shared HIS is expected to improve outcomes by making clinical information about the patient's care available to clinicians in a single view. For patients moving between hospitals in the Northwest, the shared HIS enables health information to be available, allowing continuity of care to be maintained from one facility to another.

*Donna Faye is a Communications Officer with the Thunder Bay Regional Health Sciences Centre.*



# Rehab app uses host of sensors in new BlackBerry to assess movement

BY EDWARD LEMAIRE, PhD

One of the challenges for physical rehabilitation is efficiently collecting real-time information about patient movements and body position, within and outside the clinic, to determine the most appropriate diagnosis and treatment. While research into computing and mobility technologies can involve esoteric and specialized hardware, we've recently developed software using a ubiquitous technology: smartphones.

Purpose-built mobility tracking devices have been developed that patients can wear in the clinic or at home. These combine a cluster of technologies including accelerometers, gyroscopes, GPS sensors, light intensity detectors and temperature and humidity readers. However, most of these devices have not made the transition from the laboratory to clinical practice due to cost, implementation and maintenance factors, training requirements and wearability

issues such as bulkiness and cabling.

Many of these sensors are already built into smartphones. This means rather than designing our own hardware, we can take advantage of the sensors, computing power, user interfaces, multimedia displays, and connectivity of a smartphone. This moves the burden of basic data collection to industry partners and frees us to focus on patient-focused applications.



Edward Lemaire

Additionally, a smartphone app can be used at the person's current location, which is important since movement assessment in the clinic does not necessarily reflect how a person moves in the real world.

To better understand how people move in their daily lives, we are developing a Wearable Mobility Monitoring (WMMS) app for BlackBerry 10 smartphones. It collects a wealth of quantitative information about a person's movement, including the context. The person wears the smartphone on a belt clip and goes about their normal activities.

The mobile app records real-time data using the smartphone's built-in sensors, including the magnetometer, accelerometer, gyroscopes and video camera. These data are used to drive our mobility classification software that identifies the type of movement, such as active, inactive, walking, sitting, lying, etc.

With the addition of video clip analysis, where three-second video clips are captured at each change of activity, more detailed classifications can be made (for example, riding elevators, walking on uneven ground, or working in a kitchen). This information can be used to make decisions on treatment related to a physical disability or as an indicator of changes in mobility status for chronic diseases.

To capture critical information, all the sensors and tools need to be in sync. If the camera lags behind the software's signal processing by just a few seconds, an important activity transition may pass with-

out a video record. In this way, the speed and multitasking capabilities of the BlackBerry 10 operating system meet an important threshold. The internal sensors can record data at about 50 times per second, which allows us to make decisions based on real-time information.

For example, if the sensors detect an incline, such as a ramp or hill, the camera could record video that can be reviewed later to get more insight into the person's movement. Was she walking on a grassy, uneven hill? How did she adjust her gait and posture? This context provides inval-

able information about movement in a real environment, and helps us track recovery and adjust treatment.

Data richness is only one of WMMS's advantages. A smartphone approach benefits the end-user by providing a convenient de-

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\* Gartner Magic Quadrant for Enterprise Content Management, 2013

\*\* IHS World Market for Medical Enterprise Data Storage – 2013

# Sunnybrook combines software with portable imaging to improve workflow

BY HENRY SINN

**T**ORONTO – Our 1,212 bed hospital has the nation's largest trauma centre and is one of Canada's leading teaching hospitals. We have an occupancy rate that's consistently over 100 percent and face the challenge of treating a growing number of patients without expanding our facilities or staff. Our situation is not unique since most metropolitan hospitals in Canada are also facing the same issues.

We have enhanced the efficiency of our point-of-care X-ray imaging services as part of our staff's dedication to improving workflow while offering the best patient care available. The hospital had previously converted from CR to DR systems and that upgrade – combined with new software – enables high-quality images to be made available to physicians and radiologists in real-time. We also have been able to reduce dose by 20-30 percent when compared to our previous CR systems.

Sunnybrook has been a leader in implementing portable imaging systems throughout its facilities – and was one of the first hospitals in Canada to convert portable X-ray imaging systems from CR cassettes to DR detectors. The hospital also has room-based DR systems installed in its ED and general radiology division.

Portable imaging is used to care for patients in adult ICUs and the 24-room operating suite. Delivering high-quality images to physicians in seconds can greatly improve patient care, which is why DR-based portable imaging systems are so essential.

We upgraded three GE AMX systems with wireless DRX detectors using Care-

stream DRX-Mobile Retrofit Kits. These imaging systems serve the ICUs and surgical suite and capture more than 80 portable exams a day. Physicians can now diagnose and treat acute conditions quickly.

New software allows technologists to complete imaging exams in the RIS.

The DRX detectors deliver excellent image quality, immediate image access and convenient wireless communication with our PACS. However we had a common problem: technologists could not mark the imaging study as complete in our RIS after they reviewed the images.

This caused delays because radiologists cannot begin reading and reporting until an imaging study has been designated as complete. Previously our technologists needed to return to their workstations so they could complete the exam in our RIS or if it was an urgent situation, they called the main department so someone else could complete the exams.

We asked Carestream for help and they developed a RIS interface in their DRX software that allows our technologists to access the RIS via our wireless network



Henry Sinn and colleagues with the new technology.

and complete the imaging study immediately after it is performed. This created a dramatic improvement in our imaging workflow by giving physicians the information they need to move ICU patients to an inpatient bed, for example, or verifying that a patient is ready to be discharged. Physicians now have access to images in minutes instead of hours.

We are under tremendous pressure to reduce length of stay and this capability equips us to free up beds in our acute care

and inpatient areas and allows us to more efficiently manage care for a growing number of patients. Given our current patient volumes and limited beds, this efficiency is essential.

While efficiency is a vital asset, image quality is equally important. Sunnybrook uses anti-scatter radiation grids for all our adult portable chest exams to enhance image presentation. The hospital also uses Carestream's high-resolution DRX-1C cesium iodide detectors that offer exceptional image quality and DQE (detective quantum efficiency).

While cost was not the primary concern, it would be very difficult to justify the replacement of mobile imaging systems that have years of usable life. Retrofitting these systems with the latest image capture technology is a good business decision that simultaneously contains costs and enhances care.

Henry Sinn is Director of Medical Imaging, Sunnybrook Health Sciences Centre.

## Rehab app uses host of sensors in new BlackBerry

CONTINUED FROM PAGE 5

vice that is less intrusive than a more unwieldy, specialized device and minimizes instruction and teaching time since the person may already be using a smartphone. In these ways, a smartphone app overcomes issues such as access to training and technology. In addition, WMMS allows us to download a

full activity report before a clinic visit, making the appointment more efficient.

Our WMMS project has resulted in two other related apps: a data logger that captures sensor data and saves it to a file and an app that timestamps a video when the user touches the screen.

Software development is done primarily by co-op and graduate students. One stu-

dent can typically complete an application in a four-month work term, including learning time and product testing. The program is co-funded by the Natural Sciences and Engineering Research Council (NSERC) and BlackBerry, which also provides the devices and development support.

While WMMS evaluates mobility, we are also developing apps that can be used for real-time biomechanical measurement. The Biomechanics Augmented Reality (BAR) app uses the smartphone's accelerometer and camera to superimpose a gravity reference grid and line (i.e., a plumb line) over the camera's live video.

Since the grid is always oriented to gravity, the clinician has a repeatable reference frame when visually assessing posture and body orientation, such as during a wheelchair seating assessment or standing posture evaluation. By adding additional lines over the video that represent the phone's orientation, the app can display live angles between the phone and the gravity line. This provides a quick tool for body angle measurement at the point of patient contact.

The BlackBerry 10 platform has allowed us to share the app globally without investing in distribution ourselves. BAR is available for free in BlackBerry World and has been downloaded 660 times from 74 countries.

The project's success can be measured a few ways. Qualitatively, the smartphone app could unobtrusively provide information to inform clinical decision-making and evaluate new rehabilitation interventions. Quantitatively, we can measure success by its ability to answer questions about human movement.

Edward Lemaire, PhD is a Research Associate, Centre for Rehabilitation Research and Development, The Ottawa Hospital Rehabilitation Centre. He is also an Associate Professor, University of Ottawa, Faculty of Medicine.

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# Baycrest delivers first international webinar on psychogeriatric issues

BY AMANDA PATERSON

Participants from seventeen countries logged into the International Psychogeriatric Association's (IPA) first international webinar in April to hear experts from Baycrest Health Sciences discuss best practices for managing aggression and agitation in older adults with dementia.

Resident aggression in long-term care facilities, most often related to dementia and other psychiatric illnesses, is one of the most complex and highly contentious issues in healthcare today. There are growing public concerns about the safety risks associated with prescribing off-label antipsychotic drugs to the elderly and calls for enhanced staff training in non-pharmacological behavioural management strategies.

Two of Baycrest's leading psychiatrists in the management of behavioural and psychological symptoms of dementia (BPSD), Drs. Robert Madan and David Conn, delivered the one-hour webinar presentation to healthcare professionals in Australia, Canada, Belgium, Brazil, China, the U.S., Israel, Germany, India, Iran, Ireland, Netherlands, Norway, Portugal, Switzerland, Taiwan, and the U.K. An IPA needs assessment determined that BPSD is one of the highest priority topics.

Baycrest is a global leader in innovations in aging and brain health, and a partner with the Ontario Government in the Behavioural Supports Ontario initiative to build capacity (specialized skills) for those on the frontlines of caring for older adults



Drs. Madan (left) and Conn (right), confer before hosting the international webinar.

exhibiting challenging behaviours related to dementia. The IPA's international webinar was a stellar example of leveraging telehealth technology to improve late-life health on an international scale.

The estimated number of people with dementia is rising significantly, according to a 2009 World Alzheimer Report. Seniors are increasingly entering long-term care facilities older, sicker and frailer than previous generations of residents. As a result, these individuals are increasingly exhibiting behaviours such as aggression, agitation and anxiety.

"The tremendous response to the webinar clearly demonstrates the demand for specialized skills training to enhance patient care and overall safety in long-term care environments," said Dr. Conn, vice-president of Education at Baycrest, professor in the Department of Psychiatry at the University of Toronto, and co-chair of the Canadian Coalition for Seniors' Mental Health.

Those linking in to the virtual presentation included psychiatrists, pharmacists, nurses, social workers, psychologists and

geriatricians. The post-webinar feedback was overwhelmingly positive and the learnings are already being put to good use.

"BPSD is a common and complex problem where there is no one simple solution or treatment. Our intent with this webinar was to provide knowledge and

practical tools that could be applied immediately," said Dr. Madan, chief of psychiatry at Baycrest.

The webinar was conducted using Adobe Connect, easily accessed from Dr. Conn's desktop. This platform allows for live engagement tools, such as surveys and

polling. "Engagement is the key," said Dr. Conn, "You must work harder to engage an audience you can't see than if you were in the same room."

Webinar participants were presented with case studies and polled on the approach they might take.



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# Toshiba of Canada Limited 2014 INTERNATIONAL CT SYMPOSIUM

Vancouver, Canada May 23-24, 2014

The Toshiba International CT Symposium was held this year in Vancouver. The meeting ran from May 23-24th with a series of lectures focused on functional CT imaging incorporating both helical and volumetric CT techniques, and integrating the very important

consideration of dose. The conference was well attended with 196 registrants and 13 highly regarded speakers from leading hospitals from around the world. On the first day, five speakers re-emphasized the significance of dose reduction and shared

concrete tips on reducing dose while maximizing outcomes using technologies such as 80kV feature of the Aquilion ONE ViSION and CT Fluoroscopy. The lectures given on the second day focused more on the theme “functional CT imaging”, introducing how Toshiba’s newest applications such as Perfusion, Dual Energy and Iterative Reconstruction, can be used for better diagnostics. CT system features providing high quality patient care were also presented from the radiographer’s perspective. Below are a few highlights from the symposium presentations.



The conference presenters included an exceptional list of highly regarded and internationally renowned speakers.

## Technique Optimization and Utility: Ultralow Dose Thoracic CT

Dr. Narinder Paul, the Division Chief of Cardiothoracic Imaging, Joint Department of Medical Imaging, Toronto General Hospital, presented a summary of a prospective Minimum Dose CT Trial that demonstrated the utility of ultra low dose CT with filtered back projection compared to chest x-ray in the detection of new disease and for patient management.

The trial demonstrated that for patients with completely resected lung cancer, surveillance with MnDCT, when compared to CXR, leads to earlier detection and higher rate of treatment of new or recurrent lung cancer. Dr. Paul further added that “the early indication of Toshiba’s model based iterative reconstruction is that it offers some important features: sharper images and better contrast to noise. Today we can do ultralow dose imaging with filtered back projection in the right patient population. With the new tools that are coming out, this will become part of regular practice.”

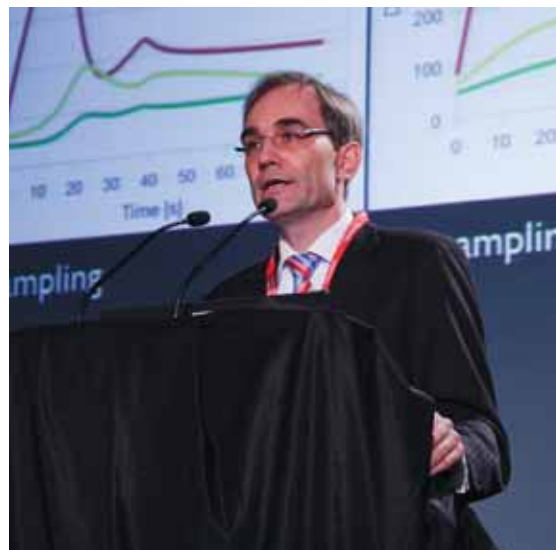


Dr. Narinder Paul - UHN, Toronto

## Abdominal Imaging with Organ Perfusion & Dual Energy

Professor of Radiology and Head of Abdominal Imaging at the University of Toronto, Dr. Patrick Rogalla discussed abdominal perfusion imaging using computed tomography (CT) for oncology as a tool for tissue characterization, staging and monitoring treatment response to anti-angiogenesis drugs. Dr. Rogalla indicated that “CT has moved away from morphology to physiology assessment. Dynamic volume CT has paved the road into the future.”

Dr. Rogalla stated that “Perfusion imaging can be integrated into clinical protocols. A great benefit for patients today is that you don’t need separate appointments as you can integrate everything into one acquisition. Dual energy will add value no doubt, and there will be growing clinical acceptance and an exciting future for abdominal imaging.”



Professor Patrik Rogalla – University of Toronto

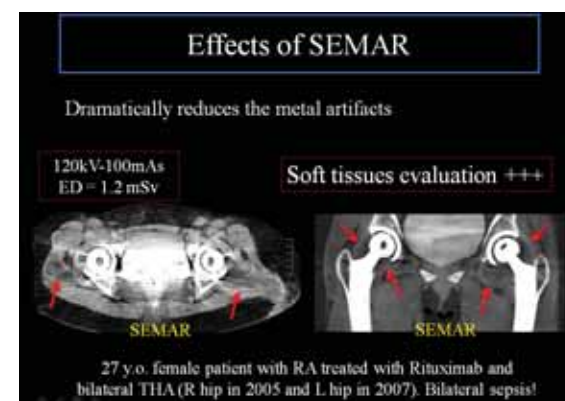
## Impact of single energy metal artifact reduction (SEMAR) on Orthopedic imaging

Professor Alan Blum, Chief of the MSK, CHU Central Hospital, Nancy, presented a number of cases demonstrating the benefits of single energy metal artifact reduction (SEMAR) on orthopedic imaging. Dr. Blum indicated that “CT is clearly the only technique which provides information on the implant components, on the bone stock, on the interface and on the soft tissues.”



Professor Alain Blum – CHU Nancy, France

Dr. Blum concluded “There is a synergistic role of Iterative reconstruction and SEMAR. It improves image quality with much lower dose. Since we have started using this technique in our department, we have observed a dramatic increase in the number of CT examinations for the evaluation of hip prosthesis and metal hardware, and I believe that in the very near future this will replace standard radiography.”



Professor Alan Blum, CHU Nancy, presented a number of cases demonstrating the benefits of single energy metal artifact reduction (SEMAR) on orthopedic imaging.



## Dose Reduction Technologies

Consultant radiologist at Royal Bournemouth Hospital, Dr. Russell Bull presented a number of cases demonstrating how state of the art CT technology opens up the possibility of scanning CT patients using very low doses of both radiation and IV contrast using low kVp techniques, very efficient detectors and the latest generation of iterative reconstruction. In his talk, Dr. Bull discussed the role of radiology today, posing the question, “Is it to produce great images or is it to detect disease?”



Dr. Russell Bull – Royal Bournemouth Hospital, UK

Dr. Bull stated that “the great technology, great workflows and fantastic advances from Toshiba are only useful if we can do something with it and detect disease or

make processes safer for the patients. The Aquilion™ ONE Next Generation we recently installed (at Royal Bournemouth Hospital) offers the combination of a more advanced detector system and AIDR 3D, pushing our radiation doses down to very low levels and that has a big impact on the way we use the technology and the kinds of investigations we do.”

Dr. Bull presented data from a national radiation dose audit for cardiac CT conducted in the UK. Dr. Bull highlighted that the Royal Bournemouth Hospital submitted a total of 59 cases using the Toshiba Next Generation Aquilion™ ONE, with a Median DLP of only 77 (1.1mSV) concluding “with the best technology and the right protocols, radiation dose is now not really an issue in cardiothoracic CT. Or to put it another way, the risk of driving to the hospital is now much greater than the risk of a scan. Using the very best equipment and the right protocols all cardiothoracic patients can now be scanned using very low doses of radiation and contrast.”

## Cardiac Imaging

Dr. Marcus Chen, Director of Cardiovascular CT at the National Institutes of Health, presented a review of cases demonstrating how low dose achieved during CT angiography could be used to minimize overall radiation dose to the patient and enable new cardiovascular applications.



Dr. Marcus Chen – NIH, USA

Dr. Chen stated “Overall the Toshiba Aquilion™ ONE helps enable the translation from anatomic imaging to functional cardiac imaging. On the anatomic side, it is capable of very low

radiation doses, less than 1 mSv, and contrast doses of about 55 mL. We have scanned heart rates of almost 100 bpm. With the pristine image quality of the Aquilion™ ONE, you are able to perform novel visualization techniques such as Coronary Subtraction, or utilize new techniques such as Contrast Gradients or Myocardial Perfusion. Using Aquilion™ ONE technology, we are able to image a whole organ at one time. When we image a heart, we can image it within one heart beat.”

Dr. Chen explained ‘If you don’t have a wide volume scanner, you can get misalignment, step or banding artifacts, and patients have to hold their breath for a longer time; whereas with a wide volume scanner you get temporal uniformity which enables the translation of Anatomy to Physiology.’

## The Role of 320 Multidetector CT in Neurological Diseases

Dr. Donatella Tampieri, Professor of Radiology, Neurology and Neurosurgery at McGill University and Head of Diagnostic and Interventional Neuroradiology at the Montreal Neurological Institute, presented examples of clinical applications illustrating the role of CTA and CTP in the management of acute Stroke and TIAs, and the use of 4D CT in the Cervical spine. Dr. Tampieri stated that “Multidetector CT, CT Angiography and CT Perfusion play a tremendous role in the evaluation of multiple vascular and non vascular neurological conditions.



Dr. Donatella Tampieri – Montreal Neurological Institute

This type of scanner is extremely useful in the evaluation of several types of vascular disease, mainly stroke and aneurysm”. “We also have the privilege of having a Toshiba biplane angiosuite and have observed that CTA has reduced the time of angiography, the number of projections,

the amount of contrast injected and certainly the length of the procedure which of course has a tremendous benefit on the patient outcome.”

Dr. Tampieri also presented a summary of a study assessing the diagnostic performance of low-dose 320-row CT in the evaluation of cervical spine instability with dynamic images serving as the standard of reference. CT examinations were performed using the 320-row Aquilion ONE scanner (Toshiba), using four to five volumetric acquisitions while the patient, in lateral decubitus, moved from the extension to the flexion position. The study demonstrated that Dynamic CT of the Cervical spine is a novel application of Multidetector CT technology with this technique delivering a lower effective dose in comparison with conventional CT of the Cervical spine, while enabling complete evaluation of the anatomical structures (discs, vertebral bodies, facets and adjacent soft tissues) as well as evaluation of the spine motility in its integrity. Dr. Tampieri commented that “Due to the time resolved CT scanning (4D) while the patient moves from the extended to the flexed position we can assess the presence of instability or facets luxation. Prospectively this novel application will shed light on the physiology and understanding of the cervical spine dynamics.”

## Toshiba Aquilion PRIME: Initial experience using 160 slice CT Technology



Dr. Mark Kon – Bradford NHS, UK

Dr. Mark Kon, Consultant Radiologist at Bradford Teaching Hospitals used clinical examples to demonstrate the use of Toshiba’s Integrated Dose Reduction technology (AIDR 3D and <sup>SURE</sup>Exposure) to reduce noise in images along with cases to illustrate Toshiba’s suite of Adaptive Diagnostics Clinical Solutions available with the new Toshiba Aquilion™ PRIME. This included <sup>SURE</sup>Start, <sup>SURE</sup>Cardioprospective Helical, <sup>SURE</sup>Subtraction™ and Variable Helical Pitch which was specially designed for assessment of TAVI patients.

Dr Kon demonstrated the use of AIDR 3D with the new Toshiba Aquilion™ PRIME scanner in a range of clinical indications to achieve a dose reduction of 50 – 80% “straight out of the box with excellent diagnostic image quality”.

Dr. Kon also commented that “AIDR 3D is built into all protocols so we don’t have to choose whether to have it on or not, and we don’t have to worry about it slowing down our workflow as the reconstructions are very quick”.

Dr. Kon concluded “there are everyday benefits of using the Toshiba Aquilion™ PRIME CT, from the ergonomic design features of the scanner to patient and staff comfort, to health and safety and integrated dose reduction providing every day low dose imaging. Also of importance, the Toshiba Aquilion™ Prime Scanner offers superior clinical solutions though its suite of Adaptive Diagnostic Innovations”.

In conclusion, it was agreed that the conference provided accomplished thought leaders in all of the key areas. The speakers did an exemplary job exploring the clinical impact and clinical outcome of modern CT imaging techniques. The details of the scientific sessions will be available soon on the conference web site ([www.toshiba-medical.ca](http://www.toshiba-medical.ca)).

Toshiba wishes to thank all of the conference speakers for making the 2014 International CT Symposium a wonderful success:

- Professor Alain Blum – CHU Nancy, France
- Dr. Russell Bull – Royal Bournemouth Hospital, UK
- Dr. Marcus Chen – NIH, USA
- Mrs. Kate Clough – Bradford NHS, UK
- Dr. Cupido Daniels – Dalhousie University
- Dr. Bruce B. Forster – University of British Columbia
- Dr. Mark Kon – Bradford NHS, UK
- Mr. David McDougall – Toshiba of Canada Limited
- Dr. John Mayo – Vancouver General Hospital
- Dr. Narinder Paul – UHN, Toronto
- Dr. Daniel Podberesky – Cincinnati Children’s Hosp. Med. Ctr.
- Professor Patrik Rogalla – University of Toronto
- Dr. Donatella Tampieri – Montreal Neurological Institute

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# To improve organizational performance, first identify your most important processes

Many organizations are overwhelmed by more than 200 administrative and clinical processes.

BY RICHARD IRVING, PHD

In the previous column, I discussed the first of five steps to organizational improvements, getting decision-making right. Here I discuss process improvement. Healthcare processes include administrative processes, such as admissions and human resources, as well as clinical processes. Many organizations are overwhelmed by more than 200 processes and have difficulty identifying where to focus their efforts. One approach that I have found useful is to identify processes on three key dimensions; Importance, Brokenness, and Feasibility.

An important process is one that is key to your organization. If it works right, it has a major positive effect. A low importance process makes little difference to the organization whether it works or not. For example, scheduling operating rooms could be considered an important process, while scheduling volunteers for the gift shop might not be considered as important. The level of importance depends on the specific organization and its values.

The degree of brokenness of a process measures the extent to which it does not work well. To continue our previous example, scheduling surgeries in operating rooms may work quite well (low level of brokenness) while scheduling volunteers in the gift shop may have a myriad of difficulties (a highly broken process). In determining brokenness, look at the level of errors, rework, changes and unnecessary delays associated with the process.

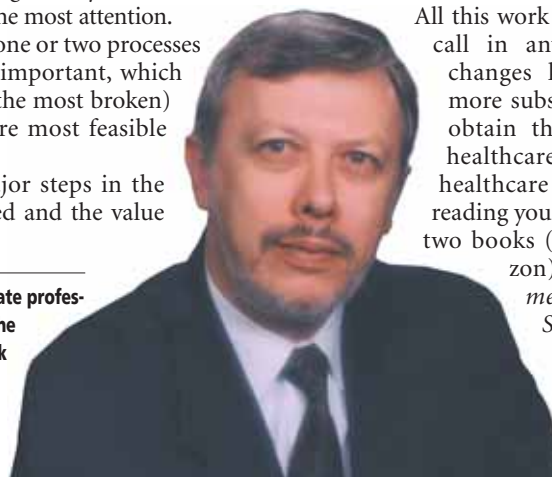
The feasibility of a process measures the degree to which it is possible to effect changes to the process. The three major roadblocks that reduce the feasibility of changing a process are cost, complexity and political will. Cost is perhaps the most obvious roadblock to change, but it may not be the most important one. My money goes on political will (or clout if you prefer). Over the years I have seen several changes that were killed because a powerful clinician or administrator didn't like them. Period.

Monday morning, make a list of your 10-20 key processes using the three dimensions discussed above. One approach is to categorize each process on each dimension on a scale of Low, Medium and High. Once all the processes have been categorized you can determine which ones you feel need the most attention.

As a start focus on the one or two processes which you feel are most important, which need the most work (are the most broken) and which you believe are most feasible to change.

Make a list of the major steps in the process, the resources used and the value added at each step.

**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](mailto:rirving@schulich.yorku.ca).**



With your staff, review the process and see if you can determine which activities can be eliminated because they add little or no value, which activities should be enhanced because they contribute value and which activities can be combined with other activities to reduce work and increase value. Once you have a clear understanding of how well your processes work try to answer the following three questions:

- Are there processes which add little or no value? Can we eliminate them?
- Are there processes which are needlessly complex? Can we simplify them or combine them with other processes?
- Are there processes which do not exist, but which we need? Can we create them?

All this work should be done before you call in any consultants. For small changes keep them in-house. For more substantial changes you should obtain the services of one of the healthcare groups that specialize in healthcare process change. For more reading you could acquire the following two books (both available from Amazon): *Business Process Management: Practical Guidelines to Successful Implementations*, by John Jeston and Johan Nelis; and *Process Mapping, Process Improvement and Process Management* by Dan Madison.

## REBOOTING eHEALTH

### What the heck is wrong with eHealth project management?

BY DOMINIC COVVEY

A few years ago, I participated in a major portal development. That portal addressed patient care, but was beset by significant problems.

One of these was the failure to include an expert who understood the nature of the patients who would be affected by the portal. When an expert was engaged rather late in the project, she pointed out that many of the targeted patients were depressed and unlikely to use the portal.

Another issue was that the software development team did not use adaptive or agile development techniques – even though this was a highly innovative project. They did proclaim that the agile approach was important, but their contract did not allow them to proceed using that development methodology.

Further, the people who conceived the project failed to consider that this was quite an innovative exercise and there was little or no opportunity to readjust activities in re-

sponse to what was discovered as the project proceeded. Finally, there was an expectation that the project would also evaluate the effectiveness of the system, but it was not realized that this would require several years of use, which was not funded.

In other instances, I have been subjected to what I will call 'amateur project management', by less-than-mature project leaders, who seemed to be guided by a textbook.

I will admit that I do not know the answers, but here are some of the questions you might want to answer:

Are we using the wrong project management paradigm, one suited more for well-understood, cut-and-dried and many-times-repeated projects, versus a paradigm that can address the management of innovation? Most eHealth projects have a significant innovation dimension.

Given the clear message that agile development is the wave of the future and that the 'waterfall method' is dead for anything but the simplest development, why do we not yet have 'agile project management'?

Do we have the community of mature, experienced and capable eHealth project managers that we need? Are our education and training programs producing this kind of project manager?

Is the object of project management just to get projects done on time and within budget, or is it also

to deliver an effective project? In other words, is it only these quantity outcomes that are important, or are quality outcomes also crucial?

What are the crucial competencies that project managers must master before they are given serious projects? In particular, should there be a 'ladder' that a project manager must climb in terms of experience: starting as an observer, then as a participant, then as an apprentice, then

as a co-leader in a small project and then in increasingly larger and more complex projects? Should a PMP or similar certification be an absolute minimum requirement?

Is there a set of attitudes project managers must have, including truly understanding the goals and objectives and the quality of crucial deliverables? What attitudes should the project manager have related to the handling of people?

What are the agreed responsibilities and authorities of a project manager? What if a major issue is discovered, like lack of clinical expertise on the project team, but the powers-that-be want the project to continue? Think, in this case, of the way management browbeat engineers into continuing with the launch of the Challenger space shuttle. That made NASA have the meaning 'Need Another Seven Astronauts'!

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



**Dominic Covvey**



# Here's how increased data will help achieve healthcare's Triple Aim

BY SCOTT R. HERRMANN

From my research and understanding, Population Health Management can be defined as broadly as a method of lowering the cost of care through early intervention, utilizing programs focused on the individual's responsibility to make the right choices in managing their own health, and health monitoring and analyzing of health data analytics. Population Health Management applies a patient-centric method to improving overall health outcomes at a lower cost, without impacting the quality of healthcare by addressing health issues before they become higher-cost critical care situations.

Population Health Management aligns with Triple Aim of the Affordable Care Act (used by ACOs) in the United States. The Triple Aim states these three items:

- Improve the health of patient populations
- Improve patients' experience of healthcare
- Reduce per capita costs of healthcare

To make these three points a reality, this formula needs to be applied: in the first year the cost of care needs to be reduced, in succeeding years per capita costs need to be reduced, all the while improving the experience of the patient and improving the health of the population being managed.

So, can this be achieved? Absolutely; we begin with data collection on both the healthy and the unwell, and chronicle the data from the claims-based systems of hospitals and doctors that are already in place today. From the analysis and measurement of this information, personalized programs or services for patients can be determined. While some provider groups across the US have been managing risk for years as part of capitation programs, most providers do not have the technology or infrastructure, or the processes within their organizations to maximize the financial benefit of managing risk through proactive population management. A key component of providers' financial upside in taking on risk will be their ability to implement effective population health management programs in order to manage their highest cost patients.

Population Health Management can be broken down to three areas where we can begin to collect health information for the population we need to manage. Those areas include: technology, new processes and organizational changes.

• Technology. Software companies and system integrators are staking their claim in this new and rapidly growing market, Procura being one of them. Many providers are looking for varying capabilities to deliver care at less cost, but there is no interoperability between systems. The

lack of interoperability means information cannot be shared for overall population health management. Companies are building analytic tools and dashboards to collect clinical data from EMRs in order to create information that providers could use to manage their patient population. But they are costly and still look at claims based data in many cases.

• New Processes. Providers must develop new practices around who should be actively managed,



Scott R. Herrmann

what they will do with these patients, and how they will do it. Health plans have traditionally attempted to enroll segments of their members into specific programs tailored to help manage certain health conditions.

Providers have an opportunity to be more successful due to their relationships with their patients and the potential to manage the patient as a whole person instead of trying to address only a single health condition.

• Organizational Changes. While some processes are easy to conceptualize, the biggest unknown related to provider based population health management is 'who is

going to do it'. I have seen, firsthand, nurses and case managers in organizations interacting regularly with clients by phone. For example, this is happening today for home care in Ontario. This concept can be used by nurses in the physicians' office that are asked to schedule health coaching appointments with patients or analyze results from remote monitoring devices, or smart phones or tablets with applications, to determine when interventions may be needed. What is needed is the ability to sort capabilities or ways to analyze their inputs of data that do not exist today, which is often where a solution like Procura steps in.

We are in the earliest stages of data inputs for better care. Providers looking for opportunities in their population health efforts will likely go through several evolutions before any best practices, processes and technologies are established. I see opportunities for better health technology platforms arising from this data input requirement, to collect and analyze a client's health data and prevent them from becoming acute or critical. These initial roots may begin with our own personal applications on our personal devices, but eventually, we will be able to design, implement and deliver entire programs of Population Health Management.

Scott R. Herrmann is Director of Mobile Solution for Procura. [www.goprocure.com](http://www.goprocure.com)

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Our healthcare solution can help automate the following: Budgeting; Forecasting; Long Term Planning; Variance Analysis & Reporting. The solution contains customizable driver based logic, staffing, financials and other modules. Aligned with patient based funding model. References: William Osler Health System (Toronto), Quinte Health Care.

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