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Ontario's clinical labs are expected to modernize as hospitals expand

BY JERRY ZEIDENBERG

TORONTO – Hospital laboratories in Ontario are set to embark on a new wave of automation in the next decade, thanks to the building boom that's going in the province's hospital sector.

While many hospitals have installed modern analyzers – devices that actually test samples – most labs haven't taken advantage of the new 'front-end' automation that gets specimens ready for testing.

It's the front-end or pre-analytical preparation that's the labour-intensive part of lab work, and the one that can lead to perhaps the most dramatic improvements.

It consists of repetitive uncapping of samples, centrifuging to divide samples into their component parts, and aliquoting them (breaking them into smaller quantities so that a variety of tests can be conducted.)

Automating these steps appears to be just over the horizon, as dozens of Ontario hospitals get ready to build new wings or whole new sites.

"This is the next big piece in lab automation," says Kathryn Snell, clinical lab director for Halton Healthcare Services, in Oakville, Ont. She has responsibility for three hospital labs – in Oakville, Milton and Georgetown – and is president of the Trillium Chapter of the Clinical Laboratory Management Association.

Ms. Snell points out that the slowness to automate the front-end procedures hasn't always stemmed from a lack of funding – although lab budgets are as constrained as the other departments in hospitals (and some observers say that labs have been the poor, under-funded cousins to the more glamorous diagnostic imaging departments.)

From time to time, she notes, cash has appeared, but it hasn't been allocated to front-end lab automation. As an example, Ontario pumped millions of dollars into
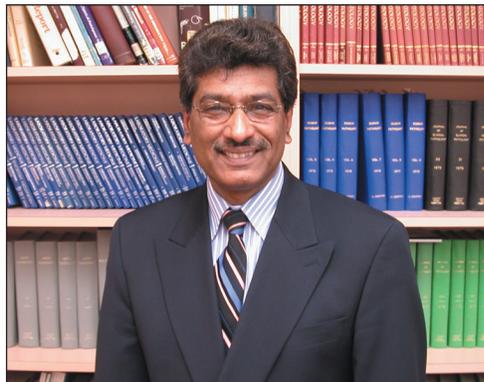
Vince D'Mello, director of Mount Sinai Hospital's innovative lab.

labs and radiology departments in 2004 through its special funding of diagnostic labs and imaging departments. But it wasn't used for front-end lab automation.

What held things up, observes Ms. Snell, was a lack of space.

"These are large machines were talking about, and you need a big, open space to fit them," she says. "Most hospital labs are small.

She adds that in some cases, the pre-analytical systems- which resemble miniature assembly lines that move racks of specimen tubes down a line – require compressors and other equipment that must be installed in yet another room, or even on another floor. Older hospitals, starved for space to begin with, couldn't accommodate such systems.

But new buildings can be constructed with front-end lab automation in mind.

Ms. Snell's own hospital is a case in point. She notes that Halton Healthcare is about to begin construction of a new hospital, located northwest of Oakville. It's scheduled to open its doors in 2013. "Front-end automation is definitely going into the lab at the new hospital," she says.

Ms. Snell noted that other hospitals have also planned for such heavy-duty automation in their new or expanded sites. William Osler Health Centre, in nearby Brampton, Ont., will open its 600-bed Civic Hospital this fall, and pre-analytical automation equipment will be a key part of the lab.

There are terrific benefits to this type of automation. As you reduce human intervention throughout the testing process,

you also cut the rate or errors – a boon to patient care and safety. It also leads to faster test results.

And as Ms. Snell points out, staff safety is improved. "You reduce the need for staff to physically open and handle samples," she says, noting the contents of the tubes can be extremely hazardous. "You hear a lot about patient safety, but worker safety is also an important issue."

Last but certainly not least, automation helps relieve staff shortages. "Our resources in labs are stretched as tightly as those for doctors and nurses," says Ms. Snell. With greater automation, "your people can spend their time analyzing results, and making judgment calls, instead of capping and uncapping samples and centrifuging them."

A sparkling example is the lab at Toronto's Mount Sinai Hospital – one of Canada's early adopters of laboratory automation and the first site to implement the Roche automated system. A large and busy lab, it's capable of conducting 1,800 different types of tests and processes 2.7 million reportable tests annually.

As lab director Vince D'Mello points out, about 70 percent of those tests consist of biochemistry work, the heart and soul of most labs. But getting the samples ready for testing was a slow and laborious task.

"All of this used to be done by manual labour," says D'Mello. Human intervention meant there were often "delays, errors and bottlenecks, when people were not able to keep up with the repetitive tasks and peak volumes."

In September 2005, Mount Sinai's lab took an innovative leap – it implemented a new piece of equipment from Roche Diagnostics Canada that automates not just the front-end processing of biochemistry samples, but also the second and third steps – called analytical and post-analytical processing.

The second, or analytical step, is made up of the actual biochemistry tests, and the Roche machine can conduct a battery of them – including cardiac functions, tumour markers, thyroid function, glucose, cholesterol, therapeutic drug monitoring, and many others. It also performs the final step, the post-analytical work that consists of reporting and auto-validating the results.

Auto-validation is an important feature, because if staff were required to check all the results manually, they'd quickly become fatigued and prone to making errors. This way, technologists can concentrate on abnormal results and verify whether they make sense or not.

All in all, the results have been impressive. Speed and reliability of testing has improved remarkably. "We're now processing 90 percent of our biochemistry samples in 60 minutes or less, 24 x 7 x 365," says D'Mello. "Before we installed the Roche system, we were only processing 60 percent of the samples in 60 minutes or less."

D'Mello will be presenting these and other results of Mount Sinai's lab automation experience later this month, at the American Association of Clinical Chemistry conference in San Diego. It's the world's largest annual medical lab conference, and D'Mello is a featured speaker.

He emphasizes that accuracy and speed are high priorities in lab work, especially when supporting a busy Emergency Department. "Doctors want their results yesterday," asserts D'Mello. "The sooner they get results, the sooner they can start therapy." And he notes that an extra hour or two, waiting for test outcomes, can seem like an eternity to both physicians and patients.

The new, automated system also means that high-priced lab professionals are no longer required to manually prepare or find samples for tests. Instead, they've been re-deployed to higher value-level tasks, such as quality control, validating results and evaluating new advances in technology.

An important feature in the Roche system is that it integrates all three phases of the biochem testing cycle – pre-analytical, analytical and post-analytical. While most Ontario labs have automated the last two, unless their systems are all tied together, staff members are still forced to distribute samples from one area of the lab to another. "It's called a sneaker network," quips D'Mello.

This can cause delays – when staff don't pick up and deliver samples as soon as they're ready. Moreover, errors and mishaps can occur when people are handling the samples. And the materials – blood samples – are potentially dangerous; better a machine handles them than people.

The integrated Roche machine, in contrast, 'hands-off' samples to the next stage of the cycle without delays, keeps potentially hazardous blood components isolated, and never loses track of a tube.

"Everything is automatically barcoded," says D'Mello. "The samples are much easier to track and find." He points out a cold storage room where thousands of different samples are kept, in temporary storage, and asks, "How would you like to find one in here, at 2 in the morning, if it wasn't bar-coded?"

Without barcodes and scanners, it would be like finding the proverbial needle in the haystack. A very cold haystack.

D'Mello points out that the rising pressure on labs will make the case for automation even more urgent in the future. "The population is aging, and there is increasing demand for lab tests," he says, noting that Mount Sinai Hospital's lab test volume is growing by about 10 percent annually.

"There are new tests being developed all the time, like molecular genetics, which is one of the fastest growing areas," says D'Mello. "There's an emphasis on early detection of disease, and on tailoring therapies to the genetic make-up of patients."

At the same time, "there's a shortage of trained technologists and lab physicians," says D'Mello. "So there's a strong case for automation. We'll need it to make labs more responsive to rapidly changing clinical demands.

Jason Tutty, marketing manager for Roche Diagnostics Canada, observes that across Canada, skilled lab workers are getting harder to find. "It makes sense to automate the front-end processing," says Tutty, "so your staff can do high-value work in other parts of the lab."