ADVIA WorkCell CDX automation solution integrates clinical chemistry, immunoassay, specimen processing management, centrifugation, and decapping.

Lab Mechanics

While research is increasingly showing the benefits of automating laboratory processes as labs continue to face rising demand for their services, experts agree that human touch is still essential. An automated, integrated system helps the clinical laboratory at White Plains Hospital achieve performance, business, and patient safety objectives.[1]

Less cost, increased productivity. Less error, more speed. Less hands-on drudgery, more time for complex tasks. Research is showing that automating laboratory processes can help labs meet the overwhelming demand to do more with less.

Analytics were the first area to become predominantly automated, but robotics and digital processes have extended into the pre- and post-analytical stages, where their impact has been marked. Sarkozi et al. found that the introduction of a robotics system for peri-analytical automation in one laboratory brought a large improvement in productivity as well as a decrease in operational cost.[2]

In the study, the number of reported test results per employee per year within that laboratory increased from 10,600 to 104,558 while the cost per test decreased from US$0.79 to US$0.15.[2] "It enabled us to significantly increase our workload together with a reduction of personnel. In addition, stats are handled easily and there are benefits such as safer working conditions and improved sample identification, which are difficult to quantify at this stage,"[2] wrote the authors.

In a separate journal article, Da Rin wrote: "It has been estimated that more than 2,000 clinical laboratories worldwide use total or subtotal automation supporting pre-analytic activities, with a high rate of increase compared to 2007."[3] The clinical laboratory of White Plains Hospital Center, a not-for-profit healthcare organization serving Westchester County, New York, USA, is one of those laboratories.

The facility has installed automated chemistry and immunoassay systems and added an automated workstation that integrates clinical chemistry, immunoassay, specimen processing management, centrifugation, and decapping. The main motivation for the acquisition was patient safety, but the benefits have impacted all aspects of the laboratory's operation, from a 94-percent reduction in aliquoting to a 554-percent increase in annual billings.

Wanting It All

The decision to add or upgrade automation in the laboratory is often based on a risk-benefit analysis that takes into account current and future needs and objectives. Considerations include the laboratory's patient population and testing menu, volume, space, staffing, business goals, and budget.

Some labs may just wish to automate their processes, allowing little room for growth, but primarily improving the quality of their service. Other labs may want to automate to increase their capac-

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>
> Marilyn Leonard,
> Chemistry Supervisor,
> White Plains Hospital Center,
> White Plains, New York, USA

[1] Individual results may vary.

[2] Sarkozi L, Simson E, and Ramanathan L. The effects of total laboratory automation on the management of a clinical chemistry laboratory. Retrospective analysis of 36 years. *Clin Chim Acta*. 2003 Mar; 329(1-2):89-94.

[3] Da Rin G. Pre-analytical workstations: a tool for reducing laboratory errors. *Clin Chim Acta*. 2009 Jun; 404(1):68-74. Epub 2009 Mar 18.

When installing an automated workstation, Marilyn Leonard and Matt Palazola aimed to increase patient safety. The benefits, however, have impacted all aspects of the laboratory's operation.

ities and permit an increase in revenues through outreach. White Plains wanted to do it all.

The primary objective in its acquisition of the ADVIA WorkCell® CDX automation solution by Siemens Healthcare's Diagnostics Division in Deerfield, Illinois, USA, was to reduce patient errors, largely through the elimination of aliquoting. In 2003, the hospital had issued a proclamation to meet The Joint Commission's standards for performance improvement and error reduction declared the previous year. Reducing the manual handling of tubes and specimens in the laboratory would minimize the opportunities for error.

"We instituted a 'We will not aliquot' objective," says Marilyn Leonard, the laboratory's chemistry supervisor. Aliquots were not the only targeted objective, however. The laboratory also wanted the new instrument to help grow volume capacity, speed turnaround time, increase revenues, reduce blood draws, maximize space, and integrate with existing systems.

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> Matt Palazola, MS, Administrative Director, Clinical Diagnostic Services, White Plains Hospital Center, White Plains, New York, USA

Choosing Wisely

Although it seems a tall order, many laboratories have a similar laundry list of needs. The best way to maximize their investment and subsequent performance is, therefore, to approach automation with their specific list in mind and a method to measure success.

Included on that list should be the infrastructure requirements, both physical and digital. Every laboratory has a unique framework, which may include a laboratory information system (LIS), middleware, existing automated systems, space limitations, and staffing requirements. For instance, White Plains had a weight-bearing wall in the laboratory that constrained the available space. "We looked at systems that were monstrous and way too long to fit into our space," says Leonard. The instrument they selected occupies 320 square feet, a good fit for the lab.

The solution would also fit in with the existing instrumentation (which includes other Siemens systems), information systems (also Siemens) and consumables (which included multiple tube sizes). "Some vendors said we'd have to draw two tubes or we could only use one tube size," says Leonard.

Having It All

The selected instrument provides not only for multiple tube sizes, but also supports primary tube sampling: A single primary tube is intelligently routed to all required instruments, reducing aliquots. The efficiency permits a reduction in tube size and draw volume, an objective included on White Plains' list.

Aliquots were a major focus for the laboratory because technologists aliquoted

two-thirds of tubes at least once, and in many instances, up to seven times. Each time the technologist handles a tube presents an opportunity to introduce error. Hence, the patient safety measure to eliminate aliquots.

The "no aliquot" policy has not yet been completely achieved, but the number of aliquots has been reduced by more than 94 percent. Technologists process approximately 800 fewer aliquot tubes a day and aliquot only samples that need to be frozen, about 50 parathyroid hormone (PTH) and Immunoglobulin E (IgE) samples daily. The laboratory has switched to 7.5 milliliter (ml) tubes, down from ten ml.

The associated decrease in consumption of tubes and labels has saved the facility money, and the reduction in manual handling has saved the technologists time. "We use the strength of our techs for validating test results, not delivering specimens," says Leonard.

Productivity is, therefore, up. Before installing the integrated system, the laboratory processed 400 chemistry samples a day. Post-installation, that number rose to 1,200. And, the capacity has not yet been maximized; the system can handle 400 tubes an hour. "This has allowed us to shift from batch testing to routine testing 24/7," says Leonard.

Routine results are now typically available within one hour, half the time taken previously; stats are delivered in slightly less time. "A methadone clinic sends us 300 samples at once, and each one has five screens. It used to take up to 17 hours to process these, whereas we can do them in an hour [with the new system]," says Matt Palazola, MS, Administrative Director of Clinical Diagnostic Services at White Plains.

The laboratory has also been able to expand its testing menu and outreach, bringing nearly two dozen tests in-house and allowing test volume to increase by 350 percent over the past six years. Profitability has improved as well. Outreach now comprises 30 percent to 45 percent of White Plains' testing volume and generates more than US$500,000 per month in revenue. Overall gross billings have increased 554 percent since 2006; the laboratory bills roughly US$4.6 million a month.

Naturally, management is happy with these results, as are the technologists, who feel neither overworked nor bored. "I can promise the techs that they will not be doing the same thing every day," says Leonard.

The system has improved recruiting and retention efforts. Leonard notes that the prestige drew seven new hires and has contributed to a low turnover. "The system helps us retain staff because it provides technicians with a good quality of life," says Palazola.

The phone is not constantly ringing – physician calls have been halved – the system and optional decapper have reduced the risk of repetitive strain injuries such as carpal tunnel syndrome, and job security has not changed. One full-time employee was lost to attrition and another redeployed to handle a newly adopted molecular assay, but there have been no reductions in force as a result of automating the laboratory.

The cost for these improvements has been minimal – comparatively – having risen 17 percent, a figure well below the increases in volume and revenue, both of which continue to rise. Minimal downtime has helped to maximize the investment. The system has gone down only once – during a blackout. Use of the associated networking solution ensures the system continues to function even if the LIS is down. "When our hospital information system is down, other departments wonder how they're going to manage. When it comes to chemistry, we just print and fax the results, which really makes life easy," says Leonard.

Reliability is a benefit that helps to ensure the laboratory continues to deliver results that are timely, clinically relevant, and profitable. "We could have never managed the growth in testing volume without automation," says Leonard. With the right automation, White Plains' chemistry laboratory has increased its turnaround, revenue, and patient safety while decreasing sample sizes, manual labor, and, ultimately, cost.

Summary

Challenge:

- Reduce patient errors, largely through the elimination of aliquoting
- Speed turnaround time
- Grow volume capacity
- Increase revenues
- Reduce blood draws
- Maximize space
- Integrate with existing systems

Solution:

- Install ADVIA WorkCell CDX automation solution

Result:

- Reduction of aliquots by more than 94 percent, saving time and money
- Processing of 1,200 chemistry samples a day, up from 400 pre-installation
- Routine results available within one hour, half the time taken previously
- Expanded test menu and outreach
- 350 percent increase in testing volume – 30 to 45 percent of White Plains' testing volume, generating more than US$500,000 a month in revenue
- 554 percent increase in gross billings compared to only 17 percent rise in costs
- Improved recruiting and retention efforts, low staff turnover
- Reduced risk of repetitive strain injuries

Further Information

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