advance FOR ADMINISTRATORS OF THE
LABORATORY
www.advanceweb.com/laboratory

LESSONS LEARNED IN LAB AUTOMATION

A look at what U.S. Laboratories can learn from Europe

By Franz Walt

There is no doubt that an automation system is a significant investment for any laboratory. However, ongoing trends such as increasing test volumes and staffing challenges continue to drive the need for total lab automation (TLA) solutions -- sample tracks with direct interfaces between pre- and/or post-analytical components and diagnostic testing instruments.

Currently, TLA solutions are more prevalent in European laboratories, many of which have been automated for years and have already installed their second or even third generation automation systems. By contrast, in the United States, there are still a number of mid- to high-volume laboratories that are automating for the first time.

This begs the question, "What can U.S. laboratories learn from the automation experiences of their European counterparts?" In this article, we will explore how some leading European laboratories have used automation to drive clinical and workflow excellence and address important, evolving market trends in laboratory testing.

Don't be afraid to mix it up

While Europe has a longer history with automation, U.S. laboratories have increasingly looked to these solutions to reduce costs and increase efficiency in high-volume test environments in recent years -- a trend we expect to continue. When thinking about automation, what we can learn from European laboratories is that it need not be limited only to clinical chemistry and high-volume immunoassay testing. We have seen automation pioneers in Europe successfully integrate multidisciplinary testing -- including chemistry, immunoassay, hematology and hemostasis testing, as well as a broad portfolio of pre- and post-analytical tasks onto a single sample track. As the technology has evolved, European laboratories are benefiting further from their willingness to incorporate both routine and STAT testing into the automated environment.

An instructive success story is the Hospital Clínic de Barcelona. Its laboratory service, the Biomedical Diagnostic Center (CDB), processes 500,000 orders from hospital patients annually, as well as 135,000 orders from other hospital centers and private laboratories. In 2001, the Hospital Clínic de Barcelona became one of the first labs in the world to implement a multidisciplinary core laboratory along with an integrated track for routine chemistry and immunoassay testing. Over the next 12 years, this initial commitment and continued in-

vestment in automation has enabled the laboratory to support 5 percent annual growth, while its budget for reagents has stayed flat. Just by moving to one serum tube per patient, the laboratory was able to save €600,000 in tube costs alone.

Most recently, in 2014, the Hospital Clínic de Barcelona upgraded its existing track to a next-generation automation solution that supports individual tube routing and STAT prioritization, leverages point-in-space sampling for even greater efficiency and automates pre- and post-analytical processes to free technical staff from repetitive, low-value tasks. New, high-volume hematology and coagulation analyzers were also added to the track.

As a result of these updates, the laboratory was able to streamline routine and STAT testing, most significantly in the area of hematology and hemostasis testing, while actually decreasing the total number of instruments in the laboratory. Previously, the core laboratory used five hematology analyzers: three for routine testing and two for STAT samples. After the update, the laboratory was able to eliminate one analyzer and perform testing from just one tube while delivering STAT hematology tests in just 25 minutes. Similarly, once integrated onto the track, the two new coagulation analyzers were able to handle the full routine and STAT testing workload previously processed by four different analyzers. This allowed the laboratory to reassign another technician and save on reagent maintenance, service contracts and the physical footprint in a facility where space is precious.

Everyone can win

While economic conditions are currently changing the U.S. in vitro diagnostics market by driving laboratory mergers and affiliations, Europe has been moving in this direction for some time. Fortunately, automation and advanced IT solutions have enabled European health systems to adapt to changing market conditions via a hub-and-spoke approach to diagnostic testing. Rather than each hospital laboratory in a healthcare network offering full testing services, a main laboratory provides full testing while satellite laboratories focus on urgent and/or inpatient care in the hub-and-spoke model. This approach can help laboratories better utilize resources and enhance efficiencies without compromising quality or reliability of results.

The National Health Service (NHS) Tayside, based in Dundee, Scotland, is an example of how adopting a hub-and-spoke approach can be beneficial for both laboratories and patient care. In 2012, NHS installed a new automation system as part of its commitment to reduce waste and variation and deliver cost-effective, patient-centric care. NHS Tayside has two laboratories: the Blood Sciences Lab, located in the 900-bed Ninewells Hospital in Dundee, and a second laboratory at the 260-bed Perth Royal Infirmary (PRI). Since installing the new automation system, the Ninewells laboratory now handles 100 percent of the general-practice testing in the entire region. It has been able to take on 73 percent of the testing that the PRI had historically conducted, enabling the smaller PRI laboratory to focus exclusively on acute admissions and inpatient testing.

Thinking beyond cost savings

The Ninewells laboratory processes 7000 tubes a day, a 20 percent increase in workload with no additional staff. Despite increases in laboratory volume of about 5 percent per year since 2012, samples no longer back up. Median turnaround time is 41 minutes with 95 percent of the work completed in 67 minutes. The 75-foot track employs a variety of modules to reduce manual handling of samples and ease test re-runs and add-on testing. As important as the efficiency achievements have been, perhaps a more exciting benefit of automation has been Tayside's ability to elevate staff responsibilities so that biomedical and clinical scientists are less involved with daily throughput and more focused on quality and collaborative support of caregivers.

In addition, the clinical value of automation is now beginning to be understood by staff outside of the laboratory. For example, the ability of the laboratory's data-management system to take data from analyzers on the automation track can be used to support secondary, cascade testing. Clinical and laboratory teams at Tayside are now collaborating along these lines to develop simple user interfaces powered by complex algorithms to enable the investigation of liver disease.

The new automation system is also helping Tayside to add new test protocols to improve quality of care. In fact, the laboratory recently received its first new immunoassay funding in 5 years after demonstrating how to generate 38 antibiotic-free days per month in the ICU by introducing procalcitonin testing at the starting or stopping of antibiotics. This new protocol can help shorten a patient's ICU stay, as well as reduce selection pressures on antibiotic-resistant microbes associated with hospital-acquired infections.

Franz Walt is president of laboratory diagnostics at Siemens Healthcare.

The above examples are specific and unique to each laboratory, but can provide valuable insights for U.S. laboratories that are considering automation for the first time. They show the powerful benefits of automation and demonstrate how the right system can help laboratories meet the evolving needs of the in vitro diagnostic testing market. For more information about these and other Siemens customer experiences, please visit http://www.healthcare.siemens.com/laboratory-automation/case-studies. The outcomes achieved by the Siemens customers described herein were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption) there can be no guarantee that others will achieve the same results.