Do more with less. Many laboratories across the country — under pressure to produce high-quality patient results in the face of difficult challenges — have adopted this mantra. In New York State, Centrex Clinical Laboratories (Centrex) confronted similar challenges. Reimbursements are declining. The pool of technical staff is dwindling due to recent state licensure of technologists and technicians. Area physicians constantly demand improvement of turnaround time (TAT). The lab’s in-house test menu grows longer, but there is no space to expand. Demand for the lab’s services is overwhelming at certain periods throughout the year; and, at other times, some lab staff members are idle. While Centrex strives for standardization across five laboratory locations and 19 patient-service centers, there is always some variation in process. Pressure to turn a profit has never been greater. Centrex lab professionals’ “burning platform” to change blazed hotter and hotter, but which way were they to turn?

Centrex’ Chief Executive Officer (CEO) John Finn had called in consultants periodically over the last several years to look at lab processes and to assess what needed to be done to improve the lab’s operations. Consultants came in for a week, presented their proposals, and left the lab staff to its own devices. Each time, many hours were spent gathering and analyzing lab data, however, bits and pieces of what was offered — never the whole package — were adopted by the lab.

During this same timeframe, Centrex representatives attended several LEAN/Six Sigma conferences around the country to learn about other healthcare organizations that had implemented this process-improvement strategy. LEAN thinking is all about 1) removing waste and variation that does not contribute to the customer’s definition of value, 2) standardizing work processes, and 3) keeping work flowing through the system. Although initially associated with automotive manufacturing, LEAN thinking has since been adapted to fields ranging from government, defense, banking, retailing, and healthcare.

At each conference, amazing stories presented by healthcare professionals gave examples of the improvements they had achieved, using LEAN and Six Sigma principles. Dramatically improving turnaround time, weathering the technical-staff-shortage storm, avoiding overall FTE-replacement, and, of course, reaping financial rewards were a few of the benefits. One constant theme came through from each organization with which the company reps talked regarding LEAN: If a lab does not have 100% support of its CEO, its board of directors, and all of senior management, its plan to use LEAN is doomed to fail. At Centrex, the lab discovered that it definitely had upper level support.

**Starting the LEAN process**

In 2006, CEO Finn visited a hospital laboratory in South Dakota that was two years into its LEAN journey. Impressed with the results at this site, he commissioned the implementation organization used there to start Centrex on its own journey. In January 2007, he met with all core lab staff to discuss future plans and encouraged everybody to keep an open mind. He cautioned that “going LEAN” would not be easy, acknowledging that change is difficult for most people. He also emphasized that no layoffs would occur as a result of implementing new principles. A project kick-off date was set for February 2007, and with the implementation specialist on his way, a “LEAN team” had to be chosen.

Team members would be relieved from their current positions to serve. Being a LEAN team member also would be a full-time job; there would be no part-time members. Members were selected from professionals with successful track records in their current positions. Heading up the team was the director of regulatory affairs; members were the technologist in charge of molecular diagnostics, the superviso
would be sorted by type and delivered to the appropriate functional area of the lab. Once there, specimens would often wait in another batch until the technologist was able to run them.

**Testing LEAN waters**

As they analyzed this process, LEAN team members noticed that hospital orders and specimens spent upwards of 99% of the time waiting. “By batching, the first order was paying a significant time penalty by waiting while all the other specimens were drawn,” says LEAN team member Todd Failing. Additional penalties were incurred while the orders where entered in the LIS and, again, while in the testing area. Multiple opportunities existed for errors to occur. Because work was handled in bulk, accidental mix-ups were easy. Additional re-work time was required once the specimens were received into the lab.

To solve this problem, the team redesigned the collection- and pre-analytical-work processes. Instead of batching orders, order labels are now sent to phlebotomists via the hospital’s pneumatic-tube network. A phlebotomist then draws a single patient and tubes that individual collection down to the lab where the order is entered and tested in single-piece-flow fashion.

The team found this process worked well on floors where the hospital has tubes. The team realized, however, that this method was not practical to perform on floors without a tube station. Therefore, it established standard work-in-process quantities and run-rules that helped the phlebotomy team keep the batch sizes to a minimum. The goal was to complete 30% of morning-round work by 6:00 a.m., 60% by 7:00 a.m., and 100% by 8:00 a.m. The 6:00 a.m. goal was met in April 2007, the first month of the new process. During the pilot, the team and staff knew they were on the right track when a hospital physician “complained” that he was getting results called too early in the morning. The LEAN team is monitoring improvements currently being made to the hospital that will allow them to overcome this constraint and bring them closer to achieving single-piece flow on all floors.

Pre-LEAN, the phlebotomists congregated and waited for orders in the lab’s central area after morning rounds, spending considerable idle time between blood draws. While inpatients waited in their hospital beds, the phlebotomists waited in an adjoining building to be called to duty. Each time a phlebotomist was dispatched, he would wheel his cart to a patient’s room; this involved much walking and elevator time. If a floor did not have its orders organized, phlebotomists would often get back to the lab after a draw only to be called right back to the same unit.

Thus, the hospital was divided into two zones, in addition to the emergency department (ED), with each zone including several nursing units. One phlebotomist was then stationed at each zone and at the ED instead of the lab. With the new

*Continues on page 34*
pre-analytical work process, the phlebotomist draws the patient and tubes the sample down, significantly cutting the time from order to draw, and from draw to its receipt in the laboratory, freeing up 2.5 phlebotomy FTEs.

**Pre-LEAN phlebotomy, batching; post-LEAN processing “pipe”**

On the outpatient side, the team made the conclusions that batching was causing unnecessary delay and providing multiple opportunities for errors. After arriving from patient service centers and client offices via courier, specimens would be sorted and racked by type (room temperature, frozen, refrigerated), and then placed in temporary storage. Individual central processing staff would walk to this location, take a rack or two filled with specimens, and return to their workstations where the racks would be entered into the LIS. Once all the specimens had been entered, they would be sorted by functional area and taken to the lab.

The LEAN team solved the batching problem by creating two LEAN cells or “pipes,” each configured so that orders would flow down the line in single-piece fashion. Work passed down the pipe was broken down in the order as it was received, entered into the LIS, and spun down (as required). A lab aide then walked the specimen directly from processing to the lab cell where they place it on the analyzer for analysis.

Initially, the LEAN team spent time understanding the flow of various types of work, since not all specimens require the same amount of work. About 60% of orders received from clients on paper requisitions needed complete order entry into the LIS. The other 40% of the work was already entered at one of the patient service centers and, therefore, only needed to be received. Additionally, the team observed that the volume of each type of work varied throughout the day. By working to smooth out the variations in demand and by designing “baton zones” to help smooth out the flow, the staff is able to process multiple types of work down the same line. In addition, the LEAN team and area managers developed a staffing model to help determine how many staff members were needed at each hour of the day. Depending on the hour of the day, each pipe may be staffed with up to four members. When asked what she thought of the “after” condition of the process, Char Benhoff, a senior processor states, “Getting used to the single-piece flow was a challenge at first; but after working with our new process, none of us would ever want to go back to the old way of handling specimens.”

Jack S. Zito, BS MT(ASCP) BB, is the director of regulatory affairs/LEAN team manager at Centrex Clinical Laboratories Inc. in New Hartford, NY. Contact him at jackz@centrexlabs.com. David A. Stewart, MSIE, is an implementation specialist with OpEx Inc. of Medford, OR.
Improve testing turnaround by looking beyond the lab
By Jan Weaver

When Jay Jones stepped out of the central lab and started asking questions about blood-gas testing turnaround time (TAT), he discovered a 12-minute gap.

“We thought we had excellent turnaround time, averaging about three minutes,” says Jones, director of chemistry and regional labs in the Department of Laboratory Medicine at Geisinger Health System, Danville, PA.

In the spirit of continuous improvement, he began to investigate further. “It was a matter of getting out of the lab, walking around, and asking questions. Physicians were reporting turnaround time at about 15 minutes!”

The investigation marked the beginning of a “friendly collaboration” between Geisinger’s lab and clinical departments. Jones initiated a study that examined the testing process “vein to brain,” that is, from the time the test is ordered to when the result is reported back to the clinician.

“It was only after we talked to the docs that we asked ourselves where delays were occurring,” says Jones.

Focusing first on the cardiovascular operating room (CVOR), Jones worked with all the stakeholders — the STAT lab, perfusionists, IT, physicians — to map the current process at Geisinger Medical Center, a 403-bed hospital in Danville. Mapping the workflow revealed that major testing bottlenecks were occurring in the pre- and post-analytical phases.

Even before the specimen crossed the threshold of the central lab, nine separate steps averaging a total of almost eight minutes were involved in ordering the test and collecting the specimen. These included the mundane and time-consuming manual tasks of preparing a paper requisition, labeling the syringe, and packaging the specimen for transport in the pneumatic tube. In the lab, specimen receipt, testing, and reporting (phoning the result to the CVOR staff) averaged 2.4 minutes. Mean sample transit time via pneumatic tube was about four minutes. Altogether, 36 testing transactions were timed on two shifts over two weeks in both the CVOR and the central lab. Jones has since implemented several process improvements in a “functional prototype” that is evolving as stakeholders provide input.

“We wanted to improve so that we could remain centralized,” noted Jones. Likewise, the physicians and nurses in the clinical departments “have 20 other things demanding their attention” and would prefer not having the additional responsibility of running blood gases, he says.

Information technology and automation are playing a key role in the solution being evaluated. For Jones, IT is the enabling component, allowing the lab to maintain control of testing while delivering fast turnaround at the point of care.

Geisinger’s central lab uses analyzers that feature an automatic sample-handling module designed to work with the manufacturer’s syringe. The syringe is pre-bar-coded and incorporates an integrated mixing ball. When placed on the analyzer, the sample is identified by the analyzer’s integrated bar-code scanner, then automatically mixed and aspirated. Both the analyzers and syringe are being used in the Jones’ model.

In the model, several pre- and post-analytical steps are eliminated through the use of middleware that links the analyzer in the lab to the CVOR’s “databahn,” computer terminals integrated with the perfusion pump that capture all patient events and transactions during a procedure. The middleware link, running within the analyzer manufacturer’s client-server hardware, automates transmission of the result report from the lab to the CVOR, eliminating several manual transactions in the process.

Use of the pre-bar-coded syringe facilitates sample registration as well as sample and patient ID match. In the future, when an instrument-generated order, or IGO, interface is implemented, paperless ordering will be possible.

“The greatest challenge has been getting all the stakeholders to contribute to the prototype,” comments Jones. “We have to do this in an environment that is highly regulated, so we have to practice ‘safe computing.’ We need to get sign-offs and make sure IT endorses [the client-server configuration] and network connections.”

Longer term, Jones sees the solution being implemented across the Geisinger enterprise at Geisinger Medical Center, the Geisinger Wyoming Valley and perhaps even the Geisinger South Wilkes-Barre facilities.

“Once we have established wireless connectivity in our prototype, we will want to bring it to other departments and other hospitals in the Geisinger system,” says Jones. Jones anticipates an improvement in total TAT of 30% to 60% if all recommend improvements are implemented. Even so, the job of process optimization requires continuous vigilance, which means the implementation will continue to evolve.

Jan Weaver is marketing services manager for Radiometer America in Westlake, OH, which provides solutions for acute-care testing. Reach her at jweaver@radiometeramerica.com.