

Lab shoots for better phlebotomy service, satisfied patients

Kevin B. O'Reilly

March 2016—Try running a race and tying your shoes at the same time. That is the kind of challenge laboratories face when they endeavor to refine their processes while providing all the usual services clinicians and patients expect. When laboratory leaders at Brigham and Women's Hospital in Boston surveyed the landscape of their phlebotomy operations, they spotted many opportunities for improvement through Lean Kaizen events as well as technology that reduces the risk of human error.

On the outpatient side, patients showing up for blood draws encountered long waits, felt confused about when a phlebotomist would see them, and were even in the dark on the main outpatient phlebotomy area's operating hours.

On the inpatient side, blood draw times varied widely from phlebotomist to phlebotomist, it often took more than half an hour after phlebotomists started work for them to draw their first patient, and the rate of preanalytical errors such as wrongly labeled specimens was too high.

Across inpatient and outpatient operations, the Brigham team—led by Milenko Tanasijevic, MD, MBA, and Stacy Melanson, MD, PhD—measured the phlebotomy capacity required at different times of the day and week and found that suboptimal staffing contributed to delays in collection and, consequently, longer patient waits and turnaround times.

Theirs is a multiyear project that has achieved dramatic improvements, among them a 76 percent reduction in average patient wait times and a 41 percent cut in specimen labeling errors.

The most recent aim was to further reduce preanalytical errors such as mislabeled or unlabeled specimens. Earlier implementation of a barcode-based, handheld positive patient identification system in inpatient phlebotomy helped to achieve the 41 percent cut in labeling errors, from 5.45 to 3.2 per 10,000 specimens (Morrison AP, et al. *Am J Clin Pathol.* 2010;133:870-877).

There were still opportunities to decrease preanalytical errors, however. At the time, Brigham employed homegrown hospital and laboratory information systems that lacked electronic order communication, so phlebotomists and nurses drawing blood worked with paper requisitions. While the patient's wristband barcode had to match the patient identified in the handheld system, that patient was selected manually based on the paper requisition. That meant the phlebotomist doing the draw could accidentally mismatch the requisition and the labeled tubes or draw the wrong tube type.



Dr. Melanson

In May 2015, Brigham went live with the Epic hospital information system, which communicates orders electronically to the newly adopted Sunquest LIS. This allows, Dr. Melanson said, for a "fully interfaced" positive patient identification system, made by Sunquest, that eliminates several opportunities for human error. This was

especially important for nurses drawing blood in the emergency department and on the inpatient floors, as they had much higher rates of preanalytical errors than did phlebotomists and did not previously use the aforementioned standalone positive patient ID system.

Brigham tailored the new system to fit the workflow needs of nurses.

“With the standard version you bring the handheld device into the room, scan the patient, view collection instructions, such as tube type specific to that patient, and print labels at the bedside,” said Dr. Melanson, Brigham’s medical director of phlebotomy and associate medical director of chemistry. But this meant nurses, who didn’t know which tubes they would need, had to leave the room to get the correct tubes and then return to complete the draw, whereas phlebotomists have all the tubes they need in their carts.

Nurses “wanted to know what to draw before they went into the room,” she said. The tailored product allows the nurses to print the specimen labels centrally using a print label task in Epic and then use the labels to determine which tubes to draw for the tests ordered.

“Then the nurses get the tubes and go into the patient rooms to scan the labels against the patient’s wristband,” said Dr. Melanson, who is an associate professor of pathology at Harvard Medical School. “The nurses are instructed to proceed only if the labels match the wristband and positive patient identification has been confirmed.”

The early going shows a “significant decrease” in preanalytical errors for nurses in the inpatient and ED settings, Dr. Melanson tells CAP TODAY. She, Dr. Tanasijevic, and colleagues plan to submit the data for peer-reviewed publication.

There were several glitches to overcome with the transition to Epic and Sunquest, the Brigham laboratory leaders say. One was a failure to merge clinician orders appropriately, resulting in redundant orders. The nurses would note the superfluous orders and collect only the specimens needed. However, it would appear in the system that a sample collection was missed. That problem has improved since optimizing the merging logic, but another arose.

“We did have technical difficulties in the beginning, with label printers not working or there being a significant delay in labels printing,” Dr. Melanson says. “When something’s not working properly, it is not conducive to using the system appropriately.” Early on, there would be delays of as long as 10 or 15 minutes between when nurses clicked to print the labels and when they would be printed. Understandably frustrated by the wait, nurses turned to error-prone paper requisitions to get their work done.

“We have engaged our colleagues in nursing,” Dr. Melanson says. “In many cases, if nurses weren’t fully compliant with the product we would follow up to obtain feedback and determine the issue. We have a specimen collection workgroup, which is multidisciplinary, that reviews problems and continues to optimize the product, whether it’s a technical or training issue or another issue.”

Nurses have responded well to the new method of specimen collection, says Dr. Tanasijevic, director of clinical laboratories at Brigham and the Dana-Farber Cancer Institute.

“The nursing team has embraced it as one of the most important ways of ensuring accurate patient collection,” says Dr. Tanasijevic, who is also vice chair for clinical pathology and quality at Brigham and an associate professor of pathology at Harvard. “That’s where it all starts. And I’d say we had 100 percent buy-in from the nursing and clinical teams.”

Dr. Melanson says Brigham’s accomplishment in reducing collection errors among the nursing staff is something the team is proud of.

“That’s an area that’s challenging in most locations,” she says.

The work that brought them to this point began in 2008 with dissatisfied patients in Brigham's outpatient phlebotomy areas.

In the outpatient areas, "the average patient wait time during the high-volume times, usually in the morning and the late afternoon, was 21 minutes, and that would account for 60 to 75 percent of the total visit time," Dr. Tanasijevic said during a session at the American Association for Clinical Chemistry's 2015 annual meeting.

"Obviously, patients weren't happy. They were not happy with the length of the wait, but also they were not happy about the fact that nobody told them how long they were going to wait, and they didn't know their place in line. And they would show up at the lab before opening hours because there was no clear messaging about the hours of operation," he added.

The primary outpatient phlebotomy area, staffed by eight phlebotomists at peak times, drew samples from about 200 patients a day.

Before doing any Kaizen events, personnel were selected from the phlebotomy staff to take part in the project, with their schedules rearranged so they had the time to do so. Patient volume, staffing, and patient wait time by hour and day of the week were measured. Patients also were quizzed about their satisfaction through a survey using a five-point scale. Four phlebotomists, one chemistry medical technologist, and one laboratory technician from the accessioning area took part in a four-day Kaizen event, working with Lean leaders from Brigham's Center for Clinical Excellence.

They identified a number of problems, Dr. Tanasijevic said.

"Our phlebotomists...were performing many nonvalue-added tasks that had nothing to do with the blood draws," he said. For example, the team found redundancies in labeling and checks that did not improve safety but did increase how long it took phlebotomists to move from one patient to the next.

"The key to Lean is standardization of processes. Without standardizing the processes, you don't have a shot of making the defects visible," Dr. Tanasijevic said. "Once you standardize the processes, the defects declare themselves. Then you have a chance of improving on them."

Involving the people working day to day in the outpatient phlebotomy area was critical to spotting ways to cut down on wait times.

"Little things helped greatly," Dr. Tanasijevic said. "For instance, prior to Lean, patients gave us their urine samples after the blood draw, which led to increases in their visit time. After Lean, they provided the urine sample while they were waiting to be called. It seems simple, but it was invisible to leadership. Front-line staff noticed this. So we changed it immediately."

The team also introduced a numbering system, similar to the kind used at deli counters, to help patients understand when it was their turn and how many people were due to be called before them. A time clock was used to track patient arrivals and measure wait times. (Soon, the tickets patients take upon arrival will be barcoded, so that arrival and collect times can be recorded electronically.)

"We also improved expectations using the numbering system," Dr. Tanasijevic said. "Patients knew they should plan on a 10- or 15-minute wait. There was also less anxiety about someone moving ahead of them in line."

Signs displayed throughout the phlebotomy area now list the hours, which were expanded by a half hour in the morning to accommodate the rush, and Brigham introduced the role of a "meeter and greeter." Phlebotomists take turns daily serving this function.

Within months, the average wait time fell to five minutes, from the pre-Lean average of 21 minutes (Melanson SE, et al. *Am J Clin Pathol.* 2009;132:914-919). Patient satisfaction scores also rose dramatically. Pre-Lean, 62 percent of patients felt their questions were answered. That rose to 85 percent five months after the Kaizen event. Forty-

four percent felt informed about wait times; that share rose to 82 percent post-Lean. As for satisfaction with the wait time, that rose from 44 percent pre-Lean to 85 percent post-Lean.

Brigham's laboratory leaders moved to expand the approach to its 13 other outpatient draw sites. The goal they set was for 90 percent of patients at all sites to spend less than 10 minutes waiting. They hypothesized that optimal deployment of their outpatient phlebotomists would be key to improving the experience across all outpatient sites.

They analyzed patient volumes and staffing for each weekday to develop a staffing tool dubbed "estimated capacity," which is equal to the number of phlebotomists multiplied by the time interval (each 30 minutes the site is open) divided by the service time per draw. Phlebotomists at four outpatient phlebotomy locations were observed during a 16-day period for a total of 169 draws. The 90th percentile of service time (accession and patient draw) was 10 minutes.

"You look at those numbers, and you try to come up with a metric that normalizes for different places...and it turns out you can draw nine patients every half hour if you have three phlebotomists," Dr. Tanasijevic said. "That was the expectation."

After doing this work at the first site, they found that one site was short-handed during its busiest hours, 7 am to 8:30 am and 3 pm to 4:30 pm.

"We were grossly understaffed," Dr. Tanasijevic said. "We had one phlebotomist when we needed two."

Another phlebotomy site was overstaffed, and one phlebotomist was relocated to the first understaffed site. That change did not affect the second site's wait times, which were less than 10 minutes 93 percent of the time. Where nearly 40 percent of patients had been waiting longer than 10 minutes during the busiest times, the added phlebotomist helped the Brigham site hit its goal of seeing 90 percent of patients within 10 minutes of arrival (Mijailovic AS, et al. *Arch Pathol Lab Med*. 2014;138:929-935).

Better deployment of staff also improved the performance of Brigham's inpatient phlebotomy service. The hospital's inpatient phlebotomists perform about half of all blood draws (virtually all patients without central lines), amounting to about 600 to 650 draws daily. About 60 percent of the draws are performed between 5 am and 11 am.

"One of the things we were looking at was: Are results ready for rounds at 8 or 8:30 in the morning when physicians are seeing patients?" Dr. Melanson said. "It's very challenging when you only have 16 to 18 phlebotomists [in the morning] and you need to get the patients drawn and the results back."

As was done in the outpatient setting, the Brigham team measured the estimated capacity of its inpatient phlebotomists, finding it to be about five to seven patient draws per hour. The volume of draws in the early morning outpaced the available staff, while after 9:30 am there were more phlebotomists than needed to do the work. "We did a reorganization of the staffing," Dr. Melanson said.

"We staggered the shifts. The primary change was creating four part-time positions. Instead of having phlebotomists work from 5 [am] to 1:30 [pm], we switched several phlebotomists to 5 to 9 am or 9:30 shifts. They came in for the morning rounds and then left when the volume decreased."

Before the staffing changes, the Brigham team had conducted four Lean events over nine months aimed at reducing variation in how inpatient draws were done, cutting the excess movement required of phlebotomists and helping them get to their first draw more quickly after starting work.

The first Kaizen event focused on supply management. The Brigham team found 55 pounds of expired items to be disposed of. Supplies in cabinets were reorganized by how often they were used, and each item was labeled and

stored in a single designated place. All phlebotomy carts were standardized, and each phlebotomist was assigned equipment such as handheld devices and barcode scanners to ensure a sense of accountability.

One problem that hampered early morning starts was that phlebotomists arrived to find that equipment needed to be charged.

“We put a lot of this duty on the shift that had more capacity,” Dr. Melanson said. “The night shift is not as busy so, okay, it’s your job to make sure carts are ready for the day shift when they come in, and that devices are charged so that when they get in they can get out to the floor and start drawing the patients immediately.”

A second Kaizen event focused on improving communication among phlebotomists by, for example, doing away with pagers in favor of cellphones. Meanwhile, each shift got a “team leader” to track when phlebotomists finished their assigned rounds so they could be sent to help other phlebotomists with their rounds or address stat requests.

The third Kaizen event focused on the wide variation in the blood draw process among the phlebotomists. While phlebotomists drew an average of five to seven patients per hour, “we had some who were only drawing a few patients per hour and some that were drawing 12,” Dr. Melanson said.

Spaghetti diagrams showed phlebotomists were walking all over the units to do their work as a result of the order in which they did the blood draws. After that finding, phlebotomists’ workflow was changed so they drew patients in order of room number and their carts were placed in or near the rooms to cut travel times. A one-page diagram highlighted safety checks and helped phlebotomists remember often overlooked steps. The phlebotomists were trained on the new process, audited, and retrained when needed.

The Brigham laboratory team turned over to the nursing teams the decisions about which patients’ draws had priority.

“We’re not going to be able to get everyone done within half an hour. We have a big hospital with almost 800 beds, and we do not have 50 phlebotomists to go upstairs and get all the labs done. We’re working with 16 to 18 phlebotomists and we need to prioritize where we’re going,” Dr. Melanson said.

All of that Lean work, in addition to the staffing changes, yielded improvements. The percentage of phlebotomists starting at 5 am who drew their first patient by 5:30 had dipped as low as 40 percent. That share rose to a solid level of 70 percent or as high as 80 percent for many consecutive months. Meanwhile, at least 90 percent of phlebotomists completed their 8 am rounds by 9:30 (Le RD, et al. J Clin Pathol. 2014;67:724–730).

“Lean isn’t a slow marathon,” Dr. Melanson told the AACC crowd. “It’s a rapid race, where you’re on the go and still have to do everything you normally do. You’re making changes on the fly and trying to improve this rapidly moving process as you go along.”

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