Riverside Medical Center Puts

LEAN IN THE LABORATORY

The most common—and predictable—response to Lean efforts is the universal complaint that "Lean won't work *here* because we're different." Industrial product manufacturers claim they don't do enough volume to benefit from Lean principles. Computer makers argue that the laws of lean won't apply because they build customized products. I've even had automaker executives beg off from the system because, in their words, "we're not Japanese."

The improved "core cell" lab layout emphasizes visibility and accessibility.

In hospitals, you often find similar resistance. Some clinical caregivers say they fear "assembly line medicine," implying that assembly lines care only about speed, at the expense of quality. Of course, a hospital is not an automotive factory, but lean thinkers will recognize that "lean assembly line medicine" would improve safety (for patients and employees) and quality, while also reducing waiting times and costs. While each patient is unique, lean hospitals can utilize standardized process to support their caregivers in delivering true "value-added" work.

Hospitals are, indeed, different, but many of the business pressures hospitals face would be familiar to, say, an auto supplier. Hospitals are under severe cost pressures. Healthcare costs have been rising approximately 10% annually, but that does not translate into payers wanting to pay more for a service or treatment. Hospital profit margins are low, averaging 5.2% nationwide in 2003, according to a Deloitte

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& Touche study. Margins are half that in New England and the Mid-Atlantic states.

Quality and safety are high-priority concerns in both industries, but the challenge is greater in healthcare. An Institute of Medicine study estimated that 98,000 avoidable deaths occur in American hospitals each year from hospital-acquired infections and medical mistakes, including administering the wrong drugs or incorrect dosages. Implementing lean methods such as standard work, error proofing, and 5S would proactively prevent errors.

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Hospitals do, however, face some unique pressures. There are nationwide shortages in skilled positions, such as nurses, pharmacists, and medical technologists, making it difficult to find enough people to meet rising patient demand. That said, many hospitals fall back on "cost-cutting" measures that might seem familiar to manufacturers—mandated across-the-board headcount reductions and downsizing, closing units and eliminating hospital beds, often reducing the availability of care.

Thankfully, lean provides an alternative to traditional finance-driven cost cutting by defining and improving processes and finding ways to increase the value provided

Riverside lean team considering possible lab layouts. They used a paper scale model, rather than computers, to facilitate the group process.

to patients and physicians. Lean hospitals are solving problems that overworked employees struggle with daily, thereby increasing employee satisfaction and morale which, in a people-driven industry, leads to improved care and patient satisfaction.

Riverside Medical Center in Kankakee, IL (about 60 miles south of Chicago) has taken the lean journey. Riverside is a 336-bed facility facing typical challenges: rising costs, declining reimbursements, and limited resources. CEO Phil Kambic explains, "Lab costs were skyrocketing, supply chain costs were increasing, performance was degrading in terms of turnaround times, and the Emergency Department (ED) was complaining."

In July 2006, my employer, ValuMetrix Sevices, was hired to coach the laboratory along its lean journey. Having spent more than two decades at Riverside, Kambic says that the hospital had been through "a lot of different management fads" and some of those consultant-driven exercises were unsuccessful. Although he was sold on the "sound management principles behind lean," he admits, "I was skeptical."

To lead the effort, a dedicated "lean team" of two medical technologists, a pharmacy technician, a lab assistant and a graduate student was formed. It was important to have a mix of employees with a deep understanding of current processes and some "fresh eyes" looking at the process. In this case, a pharmacy technician was on the team because administrators hoped the pharmacy could be the next stop for lean.

For 14 weeks—from July to early October 2006—the team devoted 100% of its time to the lean implementation process. This was a not a series of kaizen events, but rather an in-depth redesign of lab processes. After initial lean training, the team's analysis of the current situation found the existing lab layout and processes drove wasted motion and delayed turnaround times.

Among the lean team's findings:

- Isolated department islands in the lab caused techs to walk back and forth to perform tests, resulting in wasted motion and delayed turnaround times.
- Batching of specimens by phlebotomists and in the specimen processing area caused bottlenecks and slowed test results.
- Workspaces and inventory storage were unorganized, with excess inventory and regular local stock-outs of supplies.
- There was a lack of "standard work"—techs had their individual ways of performing tasks, adding to inefficiency and inconsistency.
- No metrics were posted so that staff could see results of their performance.

The team designed a new lab layout, focused on reducing systemic waste. The team also introduced standard work, 5S, and visual management in multiple areas, and implemented a visual kanban system for organizing and reordering supplies.

Janika Baki, a Riverside med tech and lean team member, initially didn't know much about lean and had her doubts. "Once we got down to moving instruments around

and putting everything in place," she says, she started to understand how standard work and the new "core cell layout" could eliminate waste and reduce turnaround times.

The "red tag" area for temporary storage of items that were cleared out during the initial 5S sweep.

As with many mass-production factories, most hospital laboratories are designed in a departmental layout, even if the lab is a single open room. This is an historical artifact, which dates from the time when academic specialties such as chemistry and urinalysis were located in different rooms or floors. As hospitals created unified clinical laboratories, managers continued to organize the layout by departments, even though most technologists were generalists. As testing became more automated, many laboratories still adhered to the "one machine, one tech" approach. Even with "walk-away" instruments, technicians often stood and watched an instrument, "just in case."

Additionally, the physical separation of departments made it difficult for lab employees to communicate or assist each other when workloads in one department were high. The lab layout didn't consider the flow of specimens, such as tubes of blood. Chemistry, a high-volume testing area, was in the back, far from the point where specimens arrived. A straight path from receiving to testing was blocked by a large supply storage cabinet (not the best use of prime real estate).

The newly created lean "core lab" layout considered the flow of products (specimens), operators (technicians and lab assistants), information, and material (replenishment of test reagents and other consumable supplies). Department boundaries were broken down, creating a single U-shaped cell with different automated instruments next to the specimen receiving department to encourage single-piece flow of specimens. With the old layout, it was tempting (and locally efficient) to batch up specimens for delivery to distant test departments. With the new layout, specimen travel distance for chemistry tests was reduced by 54%, from 146 to 67' (44.5–20.4 m).

In another effort to reduce wasteful walking, key supplies were stored in more convenient locations (as part of the 5S implementation), and delivered daily by a single kanban replenishment run from the stockroom. Employees no longer had to interrupt their testing work to replenish test reagents or supplies. As with a manufacturing cell, the lab transitioned to a mindset where the value-adding med techs needed to be able to continue their testing work without interruption. With the lean system, hematology techs' walking distance per hour was estimated to decrease by more than half.

The team also focused on improving the pre-lab flow of specimens. Before lean, phlebotomists were locally efficient, sending large batches of specimens to the lab to minimize the number of walking trips to "tube stations" (going to eight patient rooms in a row, then to the tube station at the end of the hall). Administrators emphasized that the primary patient care goal was to get specimens to the lab promptly. Some hospitals actually add phlebotomists, knowing "draw per hour" productivity worsens with the extra walking required for smaller batches. With lean, phlebotomists have standard routes and standard work to ensure they are not being asked to work too quickly at the expense of patient interaction.

Standard work was created for different lab roles, including med techs and lab assistants. With the goal of "letting med techs be med techs," focused on their technical skills, tasks that did not require med tech expertise (such as restocking supplies) were shifted to the standard work of lower-paid lab assistants. To help prioritize tasks and ensure balanced workloads, daily routines were established for each shift. Ensuring that regular tasks, such as instrument calibration, were done during nonpeak times was beneficial.

Heijunka, or level loading, is difficult to implement in a hospital lab setting.

The lean team created a document that was refined based on input from lab personnel. It emphasized that the people doing the work had to create their own "standard work:" it couldn't come from a consultant or management.

The lean concept of heijunka, or level loading, is difficult to implement in a hospital lab setting. Labs typically receive a large "spike" of specimens between 4 and 7 am. This non-level demand for testing is primarily driven by physicians who typically visit their admitted patients early in the morning. This "morning rounds" behavior is deeply engrained in the hospital culture, so efforts to evenly spread the testing workload over a 24-hr period would be received with skepticism, if not laughter.

While demand is non-level, the internal customers—the doctors—have constant turnaround time expectations

regardless of how busy the lab is. Therefore, labs are unable to level-load their production by holding a "raw material" inventory of lab specimens and extending turnaround times. There is also a quality element, where most test results are more accurate with fresher patient specimens.

Before the Lean process was begun, supplies were often disorganized, and even hidden: Employees often hoarded supplies because they were uncertain of the replenishment process.

The lab and the hospital realize the lack of level loading increases costs, since more resources (employees and instruments) are required for that morning spike. The most effective approaches have been to level out the employees' workloads by using "slow times" in productive ways, including cross-training and problem-solving activities. Some hospital labs are making better use of their excess afternoon testing capacity by taking on "reference lab" testing work from outside doctors' offices (testing that can be done under less pressured time frames).

As in a manufacturing implementation, the lab's lean efforts and new layout freed up significant space. The lab had been "busting at the seams," says Dr. John Jurica, Riverside's vice president of medical affairs, and there had been discussion of moving the lab into larger quarters. That is no longer necessary, because the new layout freed up 228 ft^2 (21 m^2) of space that can be used for future expansion into different types of testing (including insourcing testing work that is currently outsourced).

There was also an increase in "mental space," explains Dr. Mark Pool, medical director of the lab: "Lean freed up people to look at new ways to improve patient care." Before lean, he says, "All our staff had time to do was crank out the daily work." The lab recently collected data on how to reduce some duplicative testing, Dr. Pool says, "which we couldn't even contemplate a year ago because nobody had time."

For the lab's Administrative Director, Stephanie Mitchell, the biggest lean impact has been the reduction in turnaround times. In June 2006, for example, the average turnaround for an inpatient potassium test was 74 min. By January 2007—three months after lean implementation—it was 40 min, down almost 46%. Troponin tests for the Emergency Department averaged 54 min in June 2006, and were cut 37%, to 34 min, by January 2007.

When lean was first implemented in October, the percentage of lab test results available on doctors' charts by 7 am was 62%. Between November 2006 and January 2007, that amount increased to 85% and was sustained at 82% for March 2007.

"We have improved our quality," Mitchell says, "and we can measure that improvement." She conducts daily audits of lab processes (including standard work compliance), and metrics are posted daily, so the lab staff can see how the system is performing. Daily (as opposed to monthly) performance data allows the lab to speed up its process improvement cycles by making sure a "bad day" doesn't get lost in the mix of the monthly average.

Lean is not a "project" that ends after an initial timeframe, Riverside realized. For lean to be successful, an organization needs a few "true believers" to take ownership of the process, Dr. Pool says. At Riverside, one of those true believers was Mitchell, whose commitment and enthusiasm helped persuade senior management to go forward with the implementation despite its costs.

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In the lab itself, buy-in and ownership were critical—and more complicated—because in addition to asking employees to change how they had been doing their work for many years, there was the unfounded but real fear that the initiative would eliminate jobs. Initially, Dr. Pool says, people at all levels were skeptical of the lean initiative, particularly in the lab, where many thought it was "just another administration-driven novelty act on how to cut more people."

A typical benchtop, now with visual controls, 5S organization, and a two-bin kanban system.

Better-organized stock area, with 5S and kanban system.

New visual metrics display is updated daily, showing key lab metrics and trends, color coded to show "red, yellow, green" status. Daily supervisor audits of standard work and lean practices are also posted here.

However, because of the leadership of Mitchell and the lean team, and an accurate portrayal of lean management as a long-term commitment to quality, "the tide has turned," Dr. Pool says. Mitchell estimated that as of February 2007, about four months after lean implementation, "we have about 90% buy-in in the core part of the lab."

She knows, however, that resistance could still undercut the lean effort. "Change is hard," Mitchell says. And moving to standard work, where techs accustomed to operating in one particular area now have to learn multiple processes and skills, can make longtime employees resistant.

Managing in a lean way means there are always challenges and new processes that require streamlining. "You never get to lean Nirvana," Dr. Pool says, "but we're on the road." What is important, he adds, is that every improvement in the lab "means better patient care."

Nowhere is that more evident than in the Emergency Department, one of the lab's key customers.

Prior to lean, Mitchell says, "we weren't able to give the ED the service they needed." Dr. Steven Decker, chairman of Riverside's Department of Emergency Medicine, observes: "Getting a cardiac panel back from the lab in an hour just wasn't going to happen." Proper turnaround times for arterial blood gas tests are 10 to 15 min, and the lab was "not even close." Lab services could sometimes take so long, Decker says, that "there were times I had forgotten I had ordered a test."

Since lean implementation, Dr. Decker says, turnaround times "are definitely faster. All the docs agree." In fact, there are occasions now when test results are back so quickly that "the lab is no longer the rate-limiting step in the process," he adds. Lab employees recognize that the phones are no longer ringing with physicians or nurses asking for results.

Riverside's leadership is now looking at bringing the lean approach to other areas, such as the lab's Microbiology area, and other departments, such as the pharmacy and surgical instrument sterilization. They join a growing number of hospitals that are implementing lean, and understand that it is more than just a toolkit, a cost-cutting method, or a project.

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Successful lean hospitals are moving from "we did a lean project" to "this is our new way of doing things." They focus on goals and keeping the end—the "why"—in mind rather than focusing on which lean tools they are implementing. Lean hospitals are also transitioning from the "results only" mentality to a collaborative process focus. This is the lean mentality that has so much potential for improving hospitals and healthcare. Nationally, there is a long way to go, however: With almost 6000 hospitals in the US alone, there is much work to be done before we can all reap the benefits of lean healthcare: improved quality, reduced waiting times, reduced costs, and satisfied employees.

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