The laboratory staffing crunch

By Timothy Stegall, PhD, and M. Susan Stegall, MBA, MHSA, MT(ASCP)

Table 1. Fastest-growing occupations in the United States

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Projected percent growth, 2004-2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home health aides</td>
<td>56.0</td>
</tr>
<tr>
<td>Network systems and data communications analysts</td>
<td>54.6</td>
</tr>
<tr>
<td>Medical assistants</td>
<td>52.1</td>
</tr>
<tr>
<td>Physician assistants</td>
<td>49.6</td>
</tr>
<tr>
<td>Computer software engineers, applications</td>
<td>48.4</td>
</tr>
<tr>
<td>Physical therapist assistants</td>
<td>44.2</td>
</tr>
<tr>
<td>Dental hygienists</td>
<td>43.3</td>
</tr>
<tr>
<td>Computer software engineers, systems software</td>
<td>43.0</td>
</tr>
<tr>
<td>Dental assistants</td>
<td>42.7</td>
</tr>
<tr>
<td>Personal and home health care aides</td>
<td>41.0</td>
</tr>
<tr>
<td>Network and computer systems administrators</td>
<td>38.4</td>
</tr>
<tr>
<td>Database administrators</td>
<td>38.2</td>
</tr>
<tr>
<td>Physical therapists</td>
<td>36.7</td>
</tr>
<tr>
<td>Forensic science technicians</td>
<td>36.4</td>
</tr>
<tr>
<td>Veterinary technologists and technicians</td>
<td>35.3</td>
</tr>
<tr>
<td>Diagnostic medical sonographers</td>
<td>34.8</td>
</tr>
<tr>
<td>Physical therapist aides</td>
<td>34.4</td>
</tr>
<tr>
<td>Occupational therapist assistants</td>
<td>34.1</td>
</tr>
<tr>
<td>Medical scientists, except epidemiologists</td>
<td>34.1</td>
</tr>
<tr>
<td>Occupational therapists</td>
<td>33.6</td>
</tr>
</tbody>
</table>


Thirteen of the top 20 fastest-growing professions in the United States are in healthcare — and clinical laboratory technologists and technicians are not among those (see Table 1). In 2004, there were more than 302,000 people employed as clinical laboratory technologists and technicians in the United States with a projected growth rate of 22.7% through 2014. There will be a need for 81,000 new technologists and technicians to replace retirees and 69,000 to fill new positions (see Table 2) over the next eight years. The entry of the “baby-boomer” generation into retirement will create additional strain on laboratory hiring due to the loss of talent coupled with the increasing demand for laboratory services by the large number of aging boomers.

Laboratory managers are faced with a shrinking pool of potential workers and will need to compete effectively with many other occupations, including other healthcare professions, for that limited supply of workers. So, what should you do to ensure the future viability of your laboratory operations? As an industry, we have done a great job with strategic sensing (predicting the shortage) but not necessarily with strategic planning. This article explores some strategic actions that laboratory managers and supervisors can choose to employ to ensure an ongoing, strong laboratory program — even after their own retirement.

Long-range plans

One approach would be to do nothing and hope that the increasing demand for laboratory scientists results in an increased supply. Given the decreasing number of people available across the employment spectrum, this represents an unlikely scenario. In addition, there would be a lag of several years between the perceived need for more personnel and the ability to train new scientists, so the molehill would have become a mountain.

At the other end of the spectrum, forward-thinking healthcare systems are participating in the Bureau of Health Professions’ Kids into Health Careers program. Taking a long-term view of the problem, the program provides grants to encourage and inform minority and disadvantaged students of educational and career opportunities in health professions. Students as young as kindergarten level are given age-appropriate information about the variety of careers available in healthcare. This information is reinforced by presentations at the middle-school and high-school levels. The program is designed to increase the number of minority scientists in the employment pool and to expand the awareness of the students about health careers in general. The Kids into Health Careers program has a fourfold message:

- There are job opportunities in the healthcare field;
- Qualifying for a healthcare career is an achievable and rewarding goal;
- Financial aid is available; and
- This work fills a critical need in many medically underserved communities where primarily minority and disadvantaged people are not getting needed healthcare.

The goal is to prompt kids into thinking about healthcare careers as early as possible. Assistance is provided for minority and disadvantaged students in planning and preparing for post-secondary education in the healthcare professions. This enables them to adjust their academic curricula to a science-oriented cluster of classes and will provide them with the knowledge of what is required to achieve a career in healthcare.

Increasing interest in laboratories and health careers in general will do little, however, to alleviate the supply problem if there are no schools to provide training. Hospital systems that have operated allied health schools in the past may need to consider reopening these institutions. The need for trained personnel is not limited to laboratories, and allied health-training academies may provide a steady pipeline for all areas of the healthcare system. Medical schools may need to step forward and emphasize the need for allied health personnel to support physicians. Physicians and administrators need to be made aware that laboratory-test information accounts for up to 94% of the objective data in the medical record for patients and acquiring this information requires trained
The human-resource strategy: recruitment and retention

Your institution must formalize a laboratory-recruitment-and-retention plan that makes your institution the preferred place to work in your geographic area. It should become part of institutional strategy in order to build the laboratory’s reputation. The plan must account effectively for the need to staff the laboratory for 24 hours daily while acknowledging the fact that laboratory personnel are in short supply. Creating an affiliation with an existing medical-technology school should give your institution first pick of the graduating class each year and will help to solidify your reputation as an education-oriented laboratory.

The quality of the work environment is vital to maintaining high employee morale. Making improvements—continuously—based on employee surveys helps employees feel they are valued, supported, and wanted. Improving ergonomics and workplace safety prevents injuries and keeps productivity high while conveying management’s genuine concern for employee safety.

Better pay and benefit packages are consistently listed as the top reasons for laboratory scientists changing jobs. Today’s employees, however, are more focused on quality-of-life issues and are demanding greater flexibility from management regarding work schedules and benefit options. Avoiding mandatory overtime, to the greatest extent possible, relieves one of the biggest dissatisfiers cited by laboratory workers. Having a pool of temporary and part-time workers is becoming a necessity for most labs. Your recent retirees may be interested in part-time or vacation fill-in work, and laboratory workers who have left the field could be coaxed back into medical technology by a great work environment that values employees and respects what they bring to the table.

Larger laboratories and hospital systems have found that providing on-site day care is a big satisfier for employees with children and can aid in recruiting stay-at-home parents who have left the workforce to raise their children. Generous shift differentials and additional paid time-off help to staff evening and overnight shifts. Finally, a management staff that is truly responsive to employee needs will help to gain your employees’ trust and loyalty.

One statistic that frequently gets buried is the fact that nearly half of the current management in clinical laboratories will retire within the next 10 years. Establishing a “career ladder” within your organization will enable you to prepare the next generation of laboratory managers. A career ladder can insulate your lab from this succession planning pressure.

Operational changes: Lean and Six Sigma

Lean and Six Sigma have enabled labs to increase their efficiency and improve quality with no increase in staffing. Lean laboratory design restructures laboratory layouts to allow for the most efficient use of space and personnel. After mapping the current-state processes, the Lean team brainstorms the best configuration for the desired future state. Rather than dividing the lab into departments, the Lean laboratory places instruments of similar function together to be “operated” by as few people as possible. For example, a U-shaped, automated work cell consisting of two chemistry analyzers, a hematology analyzer, a coagulation analyzer, and an immunology analyzer can be configured. The work cell is operated by one person (see Figure 1). Specimens are loaded onto one analyzer and the operator moves to the next instrument. Completed specimens are removed from the instrument and the next specimens are loaded and the results are released. The operator continues this cycle of load, start, unload, release results. If the specimen load becomes too great for one person, a second person should be added to the work cell. The value-added operators and the work they perform are constantly supported by technical specialists, equipment troubleshooters, quality-control (QC) gurus, and supervisory staff. The ultimate goal is to achieve single-piece flow through the work cell with minimum delays in testing.

**Table 2. Projected employment for clinical laboratory technologists and technicians, 2004-2014.**

<table>
<thead>
<tr>
<th>Job title</th>
<th>2004</th>
<th>2014</th>
<th>Increased numbers due to:</th>
<th>Total openings due to growth and net replacements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Growth</td>
<td>Replacement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical and clinical laboratory technologists</td>
<td>156</td>
<td>188</td>
<td>32</td>
<td>42</td>
</tr>
<tr>
<td>Medical and clinical laboratory technicians</td>
<td>146</td>
<td>183</td>
<td>37</td>
<td>39</td>
</tr>
<tr>
<td>TOTAL</td>
<td>302</td>
<td>371</td>
<td>69</td>
<td>81</td>
</tr>
</tbody>
</table>

Note, however, that the need for the technical specialists will not and should not disappear in a Lean transformational environment. The role of the technical specialist will evolve into the troubleshooter with the responsibility of keeping everything running and supporting the value-adding workers. The supervisors and managers will also be available to aid the work-cell operator to ensure that there are no serious disruptions in service.

The introduction of Six Sigma analysis and standardized work practices will reduce variation in testing procedures and minimize the potential for human error. Most laboratories think that they already have standardized work practices because they have standard operating procedures. Frequently, work practices are not standardized among workers. The procedure manuals are generally tucked away on a shelf, and the lab scientists are performing the testing from memory. This often leads to procedural drift where the step-by-step procedure gradually changes over time and eventually leads to inconsistent results. When procedures fail QC repeatedly, work-arounds are often used to return the procedure to acceptable ranges. In reality, these work-arounds introduce greater variability to procedures and exacerbate the original problem.

Standardized work practices are not dictated by management but are established by the people who actually perform the work. Every operator must perform the testing process exactly the same way every time. This means that the same result will be achieved, no matter who ran the test. A copy of the standard is posted in each work area, and it is management’s responsibility to audit performance and to document any deviation from the standard. The audits can serve as competency checks and training evaluations for the work process.

Standardized work practices include specific, detailed methods for troubleshooting that seek the root causes of problems and avoid introducing variability into the testing practices. These troubleshooting methods enable the front-line workers to systematically evaluate a problem and then suggest remedies. Formal changes to the standard must go through a process-improvement committee before they are implemented. The clinical-laboratory personnel become actively involved in problem solving and improving procedures, and this continuous improvement process allows procedures to become as efficient as possible.

The end result is a stable, well-designed assay that gives highly reproducible results. The empowerment of the bench-level scientists to actively alter the way testing is performed helps to reinvigorate the experimentalist in them. The entire technical staff thus becomes involved in providing rapid, high-quality testing services that enable doctors to treat patients more quickly with the appropriate treatments. Appropriate treatments then allow patients to recover faster and be released from the hospital sooner, saving money and time at all stages of the patient value stream.

**Outsourcing laboratory operations**

Laboratories that are unable to cope with the shortage of trained personnel may face the prospect of either outsourcing more laboratory testing to a reference lab or forming a consolidated central laboratory with other hospitals in the area. The amount of testing that can be outsourced will depend on legal requirements, the distance from the reference lab, and requirements of the medical staff for immediate results for certain tests. The reference lab may even contract to supply testing at the local level. No matter how outsourcing is developed, there will always need to be some testing available locally to ensure good patient care.

**Equipment selection**

Selection of equipment will become ever more important for laboratories as the labor shortage unfolds. Highly reliable, walk-away technology will be the most desirable selection in order...
to minimize hands-on time by the laboratory staff. Valuable lab talent should never be tethered to an instrument. Instruments that require much “baby-sitting” should be targeted for replacement as soon as possible. If the instrument cannot be trusted to operate on its own, having someone watch it will do little good to correct this engineering problem.

Cross-training of laboratory personnel will be an imperative given the smaller numbers of people available.

Selecting inappropriate levels of automation is one of the biggest mistakes made by labs because they have not sought out the root cause of their current problems. Laboratory managers erroneously believe that automating their value-added processes will magically transform them into best-in-class performance (see Figure 2). Automation systems are expensive to buy and maintain; a thorough study of the laboratory’s processes should be conducted before any decisions are made. The goal is to make laboratory operations simpler and more efficient, not more complicated.

Your highly trained laboratory personnel are still your greatest resource for determining the proper level of automation to install. They are the experts and will be able to pinpoint the areas where automation can help and where it will just get in the way. Carefully mapping and timing all of the steps involved in obtaining lab results is crucial: collect specimens, transport them to the lab, sort them, process them, transport them to the testing areas, test them, release results, and store the specimens. Many of these steps have an automated solution, but you must decide what solution best fits your reality and when it should be implemented.

The laboratory staffing shortage is unfolding. This is not a time to take a “wait and see” approach. Your strategic response to this workplace threat should be proactive and focused on something you can implement and manage. This article suggests educational initiatives, human-resource-positioning strategies, Lean/Six Sigma approaches, and equipment/automation solutions that may help you resolve issues related to the lab staffing crunch.

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Timothy Stegall, PhD (Microbiology), is principal at 21st Century Laboratory Consulting, LLC in Salem, OH, and can be reached at timstegall@21CLLC.com. M. Susan Stegall, MBA, MHSA, MT(ASCP), is a managing member and can be reached at susan.stegall@sprickstegall.com.

Acknowledgement: The authors would like to thank Thomas P. Joseph for his suggestions and contributions to this article.

Advanced urinalysis technology and Lean management help a hospital lab improve productivity

By Kari Amacher, CLS(ASCP)

It is now axiomatic in the hospital lab industry that it takes two kinds of technology — not just one — to substantially improve the lab’s productivity. The first type is information technology and robotics as embodied in automated analyzers. It is widely recognized that automation will yield disappointing results unless it is matched with input from a second “technology” — management science.

“Don’t automate bad processes,” the saying goes. This means that management experts should review processes to make them as efficient as possible before the lab purchases new instruments. Otherwise, the end product will be a lab that, despite all the state-of-the-art equipment, is still producing well below its potential.

The urinalysis section of the lab at Fairview Ridges Hospital in Burnsville, MN, exemplifies the successful application of the automation-plus-management-science approach. Like many labs today, Fairview used Lean management principles to evaluate the lab’s overall processes and design to a maximally efficient workflow. One of the conclusions of the analysis was that the lab should automate where that was feasible, so that one staff person could monitor all the lab’s core instruments.

That innovation meant replacing the lab’s previous urinalysis instrument with a new analyzer that automated many processes that once had to be performed manually with the old system. Most importantly, the new analyzer automated microscopy. The previous system only automated the macroscopic aspect of urinalysis, not the microscopic. The new system automated the entire process.

Once the new system was installed, lab staff members began monitoring its turnaround times (TAT) to make sure they were within targets of under 25 minutes 90% of the time set for the lab’s core instruments as a whole. The fact that the target is being consistently hit in the urinalysis section is a testimony to the effectiveness of Fairview’s two-pronged approach.

Background

When applied to healthcare labs, Lean entails analyzing work activities or processes to eliminate waste, variation, and unnecessary motions that compromise efficient output. Lean was implemented at Fairview Ridges in Spring 2004, in large part because administration saw the need to improve the lab staff’s efficiency and productivity. The project commenced with the training of key personnel in the application of Lean principles.

Following the education phase, work processes were videotaped and dissected second by second so that every inefficient motion could be “edited out” and a more productive form of working could replace it. Analysis of the tapes determined what was and was not needed on each workbench, where it was needed, and in what order it was needed. All work processes were standardized to minimize time-consuming variation and wasted motion. The hospital then reconfigured the lab and purchased appropriate instruments to implement the recommendations of the Lean analysis.

In the current design, instruments that make up what the lab calls its core are arranged in a circle, and in an order such that technologists can move from one instrument to the next without having to go back and forth. (Core instruments are those that perform the highest volume tests at Fairview.) Per Fairview Ridges’ Lean evaluation, all the core instruments are automated and can be operated by one person. Thus, a single technologist per shift monitors the entire lab, moving around the circle from one instrument to the next. All confirmatory tests which must be performed manually are done outside the core.
Fairview Ridges acquired the automated urinalysis system in mid-2006, because it was a much better fit with this workflow design than its previous urinalysis system. Most importantly, the new system transformed urinalysis into a process that could be performed by a single technologist, and its automated features eliminated several steps requiring human intervention.

For instance, it performs virtually all confirmatory tests automatically, without human involvement. With the older technology, lab staff had to do confirmatory testing and microscopy manually for many samples. The new system automatically sends nearly all samples directly from macroscopy to microscopy. It utilizes a digital camera that takes 500 photos of each specimen, a great improvement over the mere five to six views studied on samples stained separately in microscopic analysis. This feature alone — replacing an older, time-consuming microscopy process with automated digital photos — saves a minimum of 10 to 15 minutes of manual labor for each sample requiring microscopic analysis. It also enables the lab to have a smoother workflow, with no additional steps to prep the sample for microscopy.

Finally, the test strips for the previous analyzer could be adversely affected by interfering substances or intensely colored urines. The new analyzer eliminates those problems by using a different formulation and technology for its strips. Only a small percentage of patient samples need any additional manual testing. Thus, in several different ways, the selected system allowed the urinalysis section to meet the lab’s Lean-based goals of minimizing human involvement, streamlining the workflow, and increasing staff productivity.

The proof is in the numbers

Lean at Fairview Ridges was not just a one-time fix. It is an ongoing process of continually compiling, reviewing, and reacting to TAT metrics. Additional efficiencies are sometimes found and implemented after an investigation of increased TAT. With the aid of a software program, Fairview measures TAT by tracking the highest volume test in each area: urinalysis, hemoglobin, potassium, PTT (partial thromboplastin time), and troponin TATs are monitored.

TAT data is evaluated for each shift. TAT is defined as the span between the time the sample is received in the lab to the time results are available electronically on the patient-care unit. The rationale for differentiating TAT by shift is that each shift sees different types of patients, different patient volumes, and different trends in tests that are ordered.

A Lean-oriented workflow re-evaluation can be triggered by either physician complaint or an upward trend in TAT metrics. The metrics are printed out daily and placed in a book for each shift to review. If the TAT goal of <25 minutes is not being met approximately 90% of the time, a technical supervisor re-examines the relevant process from a Lean perspective. Are steps being performed in the proper Lean order? Are technologists taking samples directly from the centrifuge to the analyzer, or are they adding other steps in-between? Is some necessary implement or other resource not readily available at the analyzer? Finding answers to these questions helps to pinpoint issues that need to be corrected. After identifying issues, technical supervisors make the necessary changes, whether this involves moving a supply or retraining staff. Staff members are also encouraged to make any necessary self-corrections after reviewing the metrics for their shift.

Again, Fairview Ridges replaced its older system primarily because the new one requires only one staff person to do the testing, and the value of the more automated instrument is also reflected in improved TAT. The previous analyzer performed macroscopic analysis within an acceptable time frame, but samples requiring microscopy met TAT goals an average of only 52% of the time. What is more, an estimated 75% of samples required microscopy, which meant that a substantial portion of urinalysis samples fell below Fairview’s TAT standard.

Since implementing the automated urinalysis system, macroscopic results have met the TAT target as much as 100% of the time, and microscopic TAT times are also at satisfactory levels. In fact, the system is so dependable on its combined macroscopic/microscopic TATs that Fairview Ridges now uses automated microscopy on all urinalysis samples.

The improved productivity in the lab’s urinalysis section is also evident in the FTE (full-time equivalent) numbers. Lean essentially made it possible for the lab to reduce its FTEs from 35 to 33. No staff was laid off — the reduction was achieved through attrition. Recently, FTEs have risen back to 35, but only because the lab is processing significantly higher test volumes following a reorganization.

Although labor savings were the largest factor driving the acquisition of the new urinalysis instrument, Fairview Ridges is enjoying several other benefits of the analyzer’s advanced technology. The analyzer does an excellent job identifying urinary casts — particles in the urine that can indicate renal involvement — and other problems. Because the previous analyzer required manual microscopy, centrifugation of the urine specimen was required, which can destroy some or all of the fragile casts, impairing the diagnostic quality of the microscope reading.

The new analyzer does not require the urine to be centrifuged. Because the urine is imaged with a digital camera instead, the casts are preserved and captured in the images. Plus, with 500 images per sample, data collected is statistically more accurate. In addition, the fast, accurate microscopy that is routine with the analyzer improves patient safety, because quicker discovery of renal problems contributes to faster diagnosis and treatment.

It also requires a smaller sample, which is an advantage with pediatric or low-volume specimens. The instrument allows technologists to dilute below-threshold samples and bring them up to appropriate volumes while maintaining the accuracy of results. All of the features mentioned above are advantages over Fairview Ridges’ previous technology.

Postscript

The Lean project at Fairview Ridges was an eye-opener for lab management. Prior to the Lean evaluation, managers felt that workflow and lab layout were already efficient, but Lean uncovered a number of issues — and addressed them. Since the original Lean analysis, additional instrumentation has been acquired and set up using Lean principles. Further analysis is still needed to make sure the altered workflow is maximally Lean. Future plans also include autoverification of urinalysis results, which will significantly improve urinalysis TAT beyond its already excellent levels. □

Kari Amacher, CLS(ASCP), is a clinical laboratory scientist and lead technologist for urinalysis, microbiology, point-of-care testing, and reference testing at Fairview Ridges Hospital Laboratory in Burnsville, MN. The equipment chosen by Fairview Ridges to replace its old system was Iris Diagnostics’ (Chatsworth, CA) iQ200 Automated Urinalysis System.