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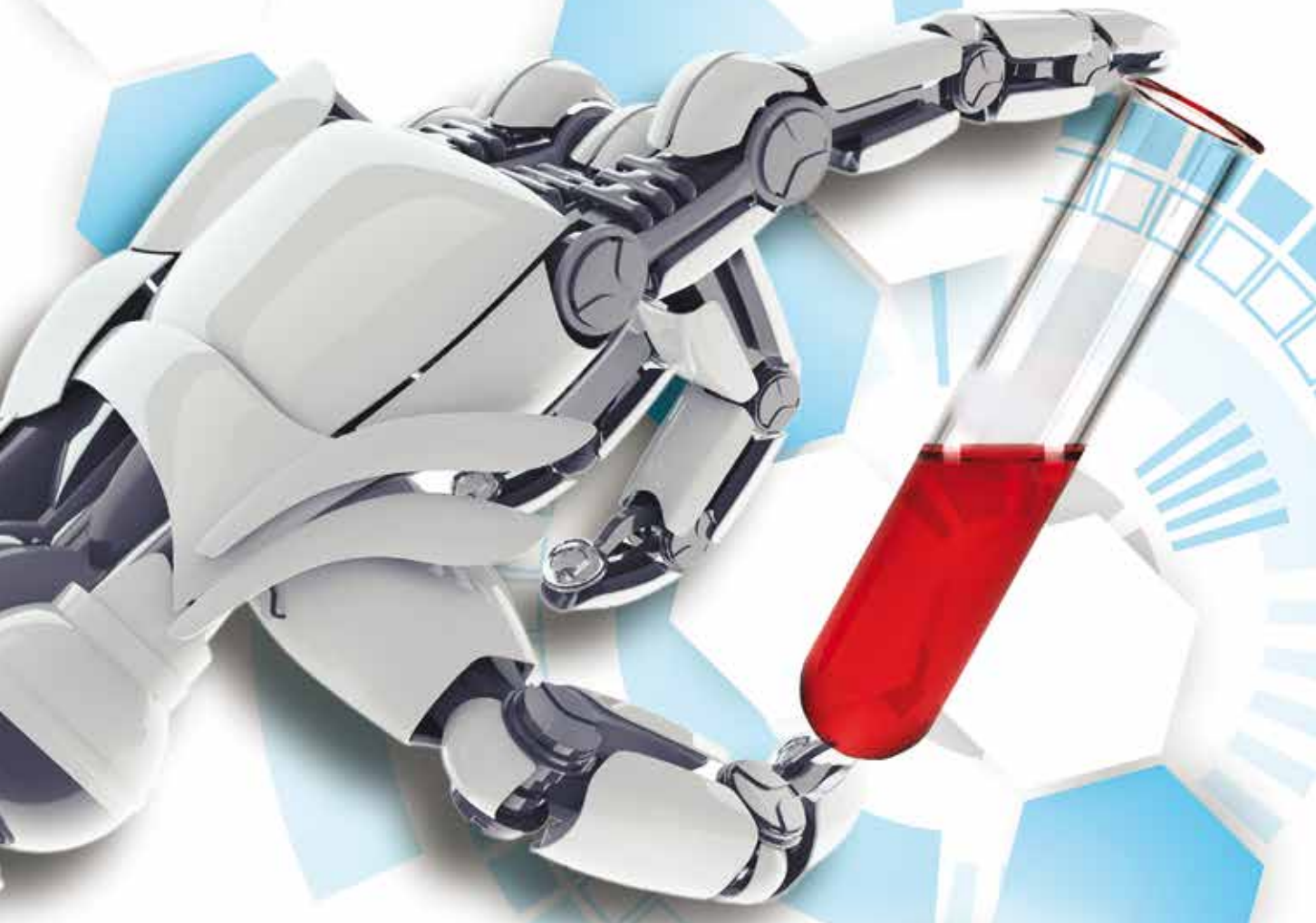

Technology and Innovation in the Laboratory

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By Kelly Swails, MT(ASCP)

Simulated Environments, Real Improvements

Simulation centers offer students from multiple departments the chance to learn in an immersive environment. With different parts of the healthcare team represented, all students have the opportunity to improve their skills and learn how to communicate for better patient care. Photos by Charlie Prince, courtesy of the Office of Interprofessional Simulation at the University of Alabama at Birmingham.

Educators are constantly in search of new ways to teach and inspire their students. For professors in the laboratory medicine fields, this need is further compounded by the essential duty of teaching students complex material while also developing leadership and communication skills. How can the latest innovation in healthcare education—simulation centers—help laboratory science and pathology educators achieve those goals?

Simulation is the process of recreating a complex, real-world scenario in an artificial environment. Whether practicing phlebotomy on a mannequin arm, performing a complete blood count on an unknown "patient" specimen, or dissecting a human heart to find an anatomic anomaly, clinical laboratory science and pathology programs have been doing simulations for years. And while simulation exercises allow students to learn in a safe environment, simulation centers take that artificial environment to the next level.

According to Chad Epps, MD, associate professor in the Schools of Health Professions, Nursing, Medicine, and Engineering at the University of Alabama at Birmingham and the president-elect of the Society for Simulation in Healthcare, "Simulation centers typically include classroom space, clinical space, areas to practice practical skills such as lumbar puncture, and space for debriefings." These types of amenities give educators plenty of opportunities to demonstrate proper techniques and procedures for their students. Jon Lomasney, MD, associate professor of Pathology at the Feinberg School of Medicine at Northwestern University, Chicago,

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adds that, "Centers provide simulation with enough fidelity to facilitate learning through immersion, reflection, feedback, and practice in a setting without risks." If a student makes an error, in other words, it's a learning experience, not a patient incident report.

Improving Education

According to Jane Lindsay Miller, PhD, director of the Academic Health Center Simulation Center and Interprofessional Education and Resource Center at the University of Minnesota, Minneapolis, 50 years of research—such as Dr. Howard Barrow's work with problem-based learning and simulated patients[1] and a National Institutes of Health meta-analysis on simulation-based education[2]—indicates that education programs that include simulation are more successful than lecture-only programs. With simulation centers, "We're not only teaching people the content, we're *applying* the content," she explains.

It's this application that encourages deeper learning, according to Dr. Lomasney, who uses Northwestern's simulation center to teach cardiac pathology. "It's not uncommon for a medical student to be so focused on the proper dissection of a heart that they're not really focused on the anatomical structures," he says. "I want the students to be able to hear a blowing holosystolic murmur, for instance, and be able to picture what is causing the sound. Until they can feel and see that pathology, it's hard to get a deep learning of the concept."

Pathologists aren't the only members of the laboratory team who can benefit from using a simulation center. Michelle Brown, MS, MLS(ASCP)^{CM}SBB^{CM}, assistant professor at the University of Alabama at Birmingham's Clinical Laboratory Science Program, believes that these centers are an important part of clinical laboratory science education. "In our student labs, we focus on the technical skills and psychomotor skills of performing a test. We use the simulation center to expand our students past just analyzing a specimen. In the student lab, a student might be given one sample and asked to perform a type and screen. However, when we run an interprofessional simulation, we provide multiple specimens for multiple departments on multiple patients. The students have to learn to prioritize and communicate critical values."

Dr. Miller notes that simulation centers are an effective way to teach and practice communication. "The great thing is, there are people who study the best way to disclose an error to a colleague," she says. "The approach is the same whether you're a laboratory professional calling a doctor or a doctor talking to a patient. There are better and worse ways to make that disclosure so you don't undermine your credibility but at the same time communicate what happened so everyone can move on." Medical and nursing students can also practice how to convey a sense of urgency to the laboratory, and laboratory science students can learn the best way to list their priorities for a clinician so everyone is on the same page.

What's interesting about the simulation model is that most of the learning happens once the gloves are off and the lab coats have been put away. The debriefing period at the end of a simulation gives students the opportunity to reflect on the performance, sometimes assisted by watching a video of the simulation. Techniques are discussed and performances are explored. Students and faculty can talk about what worked, what didn't, and what needs to happen differently in the future. "Not only can we approximate a scenario," notes Dr. Lomasney, "we can model how an expert would approach that patient or scenario and reason their way through it to get a diagnosis and initiate therapy."

Building a Team One Simulation at a Time

Cultivating teamwork is an additional benefit of using a simulation center. Historically speaking, the laboratory—and the professionals who work there—have been hidden in the metaphorical (and sometimes literal) basement of the healthcare facility. Ms. Brown says that "role clarity" has emerged as a benefit of performing simulations. "Understanding the nurse's role, the physician's assistant's role, or the clinical laboratory scientist's role comes to life when everyone has an active part in the decisions being made. The immersive environment really does make a difference. We can use simulation centers to establish that type of communication with students so everyone will have a greater comfort level in the real world," she says. In this way, simulation centers provide a way to teach laboratory professionals and pathologists how to be a part of the clinical care team.

The laboratory medicine field is evolving in such a way that pathologists and laboratory professionals act as consultants rather than as someone who only looks at a slide or runs a test. And with this evolution, Ms. Brown takes the importance

of simulation one step further: "There's a movement toward medical diagnostic teams, and the laboratory needs to be a part of that. Simulation is important for promoting ourselves." Simulation centers can also help change an outsider's perception of the laboratory, says Dr. Epps. "I've been on the side of patient care where there's a negative perception of laboratory professionals or the laboratory by clinicians. Through simulation and debriefing, however, clinicians begin to truly understand the workload of laboratory professionals. In addition, clinicians and laboratory professionals learn to communicate needs and priorities in an effective way."

According to Dr. Lomasney, a medical student might normally be exposed to a pathologist only in the classroom, but simulation centers can change that. "I think this is an important opportunity for our field. Medical students need to see that lab medicine is not a black box and that values don't just spit out of a machine," he says. There's no other specialty that touches every single patient who comes into a health system like pathology and clinical laboratory science does. I don't think most trainees or students recognize that. Simulation centers introduce that idea."

Sounds Wonderful! It Also Sounds Expensive.

Developing a facility like a simulation center that encompasses several departments requires a significant financial investment. Besides the clinical equipment, supplies, and mannequins, simulation centers also require audio-visual equipment to record simulations. However, these costs can be offset by the benefits such a center provides. According to Dr. Epps, "If you compare the financial investment of a simulation program to the avoided costs of errors, you would quickly see that there is a large return on investment." The return on investment—better patient outcomes and fewer errors—makes the investment worthwhile.

Dr. Miller agrees. "An upside is the value for the cost. People hear 'simulation center' and immediately think, 'Oh that will cost too much,' " she says, and explains that while a mannequin can cost tens of thousands or hundreds of thousands of dollars, that cost is not a direct indicator of cost to the users. "We create simulations that cost between 10 and 37 dollars per learner, so it's not a huge amount of money." Dr. Lomasney concedes that developing a simulation center is more costly in terms of education, but adds that it's important to remember that "it's more efficacious in terms of education dollars, improvements to patient safety, and patient outcomes."

Using Simulation Centers in the Future

Education doesn't stop once someone has earned a diploma or passed a board or certification exam. Simulation centers can be a place for working professionals to practice communication skills, perform tasks for competencies or maintenance of certification needs, or learn new skills they can take back to the bench.

"I could see simulations having a great deal of utility in terms of helping programs demonstrate that their students really have mastered critical skills as well as their knowledge," says Dr. Miller. "Simulation can be used not only to strengthen and cultivate those skills, but to demonstrate that students have achieved whatever level of mastery their program deems necessary." Dr. Epps agrees that centers have uses outside of student education. In anesthesiology, he notes, simulation is already being used for maintenance of certification purposes. Dr. Lomasney argues that simulation can also be used for a subject near and dear to laboratory professionals' and pathologists' hearts: proper test utilization. "Imagine simulating proper use of the laboratory in an emergency department scenario," he says. "What labs do you want to order and when? What results should come back in 30 minutes? Something of this nature would be useful for our colleagues who either over- or under-utilize laboratory services."

Competency assessments and maintenance of certification simulations take advantage of the centers that exist today. But moving forward, how can we expand the usefulness of this type of facility even more? Is there a way to get more return on investment? According to Dr. Epps, large-scale opportunities exist. "We can build simulation facilities that reflect our healthcare delivery system in its entirety, to the extent that they look like and operate like a hospital," he says. "We can have an emergency department, intensive care unit, patient care areas, laboratory, radiology. We can bring people in for an abbreviated shift and go through situations and test systems. A new laboratory process can be tested before real patient samples are ever brought in. That's where I see this heading."

Change is the only constant in health care, and it's imperative that clinical laboratory science and pathology education keep pace with changes in the industry. Using simulation centers will be a key component of programs in the future to promote deep learning and better prepare students for the challenges they'll face in the real world. In addition, simulation centers will play a role in integrating laboratory medicine with the clinical care team and moving laboratory professionals and pathologists beyond the laboratory's four walls.

References

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