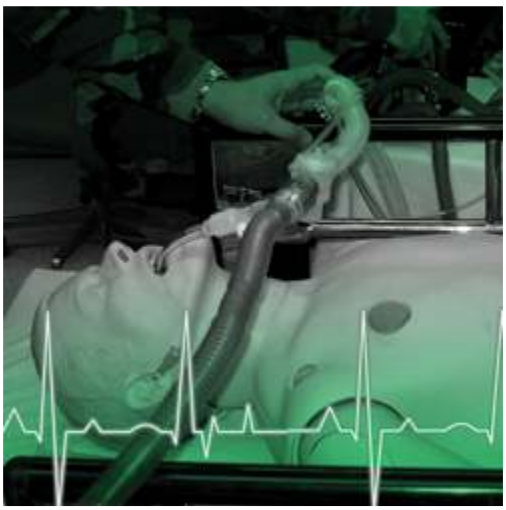
Train as You Operate

Written by Marty Kauchak



Increasingly real looking, functional training devices help improve military medical skills.

Patient simulators and other devices provide a hefty measure of reality for both new and veteran health care professionals. Technology today can simulate a heart rate, blood pressure and other characteristics with a high degree of fidelity, allowing health care providers to learn and rehearse procedures through the continuum of learning—from beginning classes to rehearsal procedures for actual patient treatment.

Unlike with real-world medical procedures, users of simulators and trainers have more freedom to make mistakes, repeat tasks and get feedback from teachers and classmates. Still, in keeping with the popular Department of Defense motto of "train as you fight," the medical community with its increasingly sophisticated and realistic training devices aims as much as possible to "train as you operate."

As more-capable devices enter service, DoD's reliance on them has also increased. One major user is the Navy medicine, manpower, personnel, training and education (NavMedMPTE) directorate, whose medical treatment facilities and learning centers employ patient simulators and other devices for both initial and refresher training.

"Computerized simulators come in a variety of models and can be very sophisticated, depending on the needs of the student," said Leo Grassi, department head of NavMedMPTE. "The computer programs for

simulators make them breathe, have a heart beat, blink their eyes, tear, moan and bleed. The newer models have forehead perspiration and leak fluid from the ears."

Along with adult male and female simulators that are used for cardiac, trauma, surgical, and anesthesia training, the Navy Maternal Child departments also use a simulator that "gives birth" and delivers a simulator baby. It can be programmed to have a seizure prior to delivery. Currently there are 10 Navy medical treatment facilities that use the OB trainer, while Navy learning centers also use simulators for classroom training.

Air Force Lieutenant Colonel Craig Rice, DC, commander, 381 TRS, noted the Sarasota, Fla.-based Medical Education Technologies Inc. (METI) human patient simulator (HPS) and the Wappingers Falls, N.Y.-based Laerdal Medical SimMan simulation devices are used in TRS medical readiness courses in his command.

"The METI device is the least mobile but most sophisticated," Rice said. "It is like a fire-and-forget weapon. Once you start a simulation, the instructor can stay hands-off or provide inputs as desired. It uses multiple computers and an Internet connection to download information [and provide] simulation updates and responses to student procedure inputs."

The dedicated computer server system allows for real-time responses to hundreds of drugs that must be scanned prior to administration. The simulator responds to invasive procedures in the same manner, making it useful for medical emergency and routine medical procedure training. The SimMan product offers less sophistication but more mobility, and can be used on a stand-alone basis away from Internet connectivity, Rice said. Some common training uses at the 381 TRS for these devices include conducting mock code blue training; simulating cardiac rhythms; and providing training on routine and emergency invasive or noninvasive procedures.

Air Force Colonel Jeffrey Bailey, M.D., director of the Center for Sustainment of Trauma and Readiness Skills (C-STARS) in St. Louis and an associate professor of surgery at Saint Louis University, noted that his center's patient simulators and other devices support training in equipment; the placement of IVs and central lines; emergent airway management; and thoracic decompression.

The robotic human patient simulators at the recently opened Emergency Trauma Simulation Lab, which supports Bailey's C-STARS site, are programmed and moulaged to simulate battle casualties that are then cared for by a resuscitation team. Simulation sessions are directed, videoed and observed by instructors sitting behind one-way glass who then review simulations with the students, Bailey said.

DoD also uses manikins and related devices for dental training. Rice noted that simulation heads—anatomically correct and complete with human jaw bones and teeth structures—are used in the dental assistant course for training in digital radiology and hands-on, four-handed dental procedures. Interactive simulation aids such as "virtual" trays with more than 25 instruments and types of supplies let students repeatedly practice various skills. For instance, trainees are timed in properly arranging items on the virtual trays, and get negative feedback when they make mistakes and applause when they do it right.

Looking more generally at the use of training devices in the medical community, select patient simulators and task trainers from Laerdal and METI provide a snapshot of devices available to teachers and students. Laerdal's latest model of patient simulator, for instance, is the wireless SimMan3G, which is compatible with Laerdal's video system, to provide support in debriefing students.

Laerdal's product portfolio also includes training devices for specific tasks, including a blood pressure arm, an adult IV arm and a torso designed for instruction in the care of patients with respiratory conditions and the practice of gastrointestinal care procedures via nasal and oral access.

The METI HPS, meanwhile, is a patient simulator designed for training in anesthesia administration, respiratory care and critical care. Features include drug recognition and response, respiratory gas exchange, anesthesia delivery and patient monitoring on real physiological clinical monitors. METI's iStan has fully articulated motion, life-like skin, reactive eyes and wireless control. METI's Emergency Care Simulator includes airway, pulmonary and cardiovascular systems for use in emergency training, remediation and certification.

High-quality patient simulators and other training devices don't come cheap, noted Rice, and even the most sophisticated patient simulator for the most part lack the sensory impact of real trauma, with odors, leaking bodily fluids and other characteristics. "These sensory impacts are part of the fog and friction of battling for a patient's life that trainees need to experience prior to providing care to real patients," Rice said. "Perhaps the motion picture special effects industry should be enlisted?"

But companies are trying to mimic the blood loss and appearance of wounds in training devices, to give medics-in-training and other medical professionals a more realistic learning environment. Willow Grove, Penn.- based Techline Trauma, for instance, makes a range of clinically accurate moulage that can be strapped onto people acting as reallife test dummies. Originally developed as part of a research project for the U.S. Army, the company now is developing the moulage commercially, touting the polymer-based products' rugged, realistic-looking features as ideal for training, particularly when mock patients mimic the thrashing, shouting and other signs of fear and shock that can be common with battlefield wounds.

Combined with the highly realistic moulage— such as what appear to be severed arms or legs—medical personnel can indeed get some sense of the fog of war, according to Techline Vice President David Parry, who said that the Army at the start of the war in Iraq had been using somewhat makeshift techniques for training combat personnel to deal with blast wounds, gunshot wounds and other types of wounds. For example, to approximate packing a wound, trainers would make a fist and have trainees "pack" the fist as if were a wound.

"The Army had seen an awful lot of people early on that were dying that shouldn't have," Parry said. "They saw wounds they felt were survivable wounds and were wondering, 'Where is the breakdown?' It ended up that the breakdown was psychological. It's one thing to see a simulation, but when it's your buddy, your reaction time can slow down. [With our moulage] you can see the blood pumping, the people are screaming, and we can add odors as well."

The look and feel of training devices do indeed count for a lot, experts say. Virtual reality programs may be helpful, but they can't help medical personnel as easily develop such things as "muscle memory," in which treating certain wounds become a remembered movement or motion, like swinging a tennis racket or some other movement in sports.

To improve the value of training devices generally, C-STARS' Bailey has a few suggestions, including developing enhanced body motor activity, including capacity for programmed phonation; better internal and external anatomic features; full internal wireless-directed anatomy and physiology; improved physiology for practicing treatments, such as placement of endotracheal tubes, chest tubes, IV lines and other equipment; and better Internet-based training.

Making manikins physically tougher would be a good idea as well, the Navy's Grassi observed: "An adult-sized manikin with all of the computer components can weigh 120 pounds. Manikin skin isn't always durable and easily splits. Results of monitoring a manikin simulator in a helicopter environment are not accurate." ♦

Back to Top