



Pittsburgh Regional Healthcare Initiative

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Medical simulators come of age

The man on the ground has stopped breathing. He has a pulse. A physician is on the scene, ready to insert the laryngoscope to open this man's airway. The physician doesn't have much time before the man sustains brain damage from lack of oxygen.

Steadily, coolly, he thrusts the man's head back and inserts the speculum. He tries once, then again. The soft tissues in the

82% of all who attempt the difficult airway simulation fail the first time. By the fifth try, 100% pass.

**—John Schaeffer, MD
Director, WISER Center
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man's mouth and throat begin to swell, further reducing the chance that the doctor can succeed. Now wielding a scalpel, the physician makes an incision in the man's trachea, hoping to place a tracheotomy tube. But even this last-ditch effort fails. With the physician still working frantically, the man's pulse becomes fainter, then fainter still. "Stop," calls the instructor.

Had this been a real man, he would have died. But this patient is a Laerdal SimMan, a computerized mannequin used, in this case, to simulate a difficult-to-open adult airway. SimMan resides at the Peter M. Winter Institute for Simulation Education and Research (or WISER Center), allied with the Safar Center for Resuscitation and Research at the University of Pittsburgh.

"Don't feel too bad," says the instructor. "Seventy-five percent of doctors fail this simulation the first time."

By the fifth try, 100% of the people attempting the simulation—usually physicians, nurses and emergency medical technicians—will successfully open the airway.

While the first basic flight simulators came into use in aviation before World War II, modern technology has only recently made simulators for human conditions feasible. The ability to train students using realistic simulators seems to be providing the same revolutionary effect on physician training that it's had on pilot training. The old medical adage, "See one, do one, teach one," is yielding. Medical "practice" now implies "practicing" on mannequins first.

How did the WISER Center get started?

The WISER Center namesake, Peter Winter, as chairman of the Department of Anesthesiology and Critical Care Medicine at the University of Pittsburgh, realized the importance of establishing a simulation center for training Department personnel in the early 1990s. The Department obtained the only simulator available then, at the high cost of over \$250,000. By adding computers, anesthesia machines, monitors, and ventilators, the



Physicians, nurses, and paramedics train on SimMan at the WISER Center at the University of Pittsburgh. The simulators track the clinician's every move, for later review and critique of both individual and team.

group was soon able to simulate an operating room, an ICU bed, or a bay in the emergency department.

In 1996, Drs. Renae Gonzales (director from 1994-1996) and John Schaefer (director 1996-present) designed and patented a difficult-airway simulator that was more functional, affordable, and portable than the full-sized version. A Texas company, Medical Plastics Laboratory, later acquired by the Laerdal Corporation, undertook commercial manufacture of this new simulator (AirMan) that has also been incorporated into a "full-scale" human simulator (SimMan). Like flight simulators, these human body simulators provide an eerily realistic experience, from the skin to the pulse, to the feel of underlying organs.

Based on the success of the first training programs, soon other departments (Surgery, Medicine, Emergency Medicine), as well as the schools of Medicine and Nursing, and hospital

administration expressed interest in expanding the program through a larger, interdisciplinary facility. This expanded training mission, coupled with an interdisciplinary initiative in educational research and an expanded effort in continuing medical education for patient safety, led to the partnership that established WISER in the year 2000.

Build your own satellite facility

From one simulator in 1994, WISER has grown into an 1100-square foot facility with 16 full size simulators and a number of partial body task trainers, a large lecture hall fully equipped with personal computers, notepad/laptops and other up-to-date intellectual technology. Faculty have developed a broad range of curricula, using performance evaluations that included Internet, CD-ROM, Palm-based, and digital video-based components. WISER serves as the training resource for the 20-hospital UPMC health system and The University of Pittsburgh health science. In 2003, the center saw over 6000 trainees.



A classroom like no other. The SimMan simulators reside in a realistic hospital atmosphere in the 1100-square foot WISER Center.

WISER staff have contributed to both the technical design and software programming of the SimMan platform. Today, WISER's computerized simulations can be downloaded by anyone with a SimMan, making it possible for any center to become a satellite simulation facility. (Prices on the SimMan have also come down from the initial \$250,000 to about \$20,000 each.)



A physician attempts to open a difficult airway in the SimMan. In the very realistic world of medical simulations, the "patient" has vital signs, pulse, blood pressure, tissues that can swell, and even skin that feels "human."



“Real” simulations

Recently a group of Board members from the Pittsburgh Regional Healthcare Initiative (PRHI), including former Treasury Secretary Paul O’Neill, toured the WISER facility and watched several types of simulations:

- John Schaefer, M.D, Assistant Director of Anesthesia and Director of WISER, conducted the difficult airway simulation in a room flanked with curtains that simulated a Pittsburgh street corner.
- Michael Mohr, MD, Visiting Instructor of Anesthesiology, displayed the various torso simulators used to practice aseptic insertion of central lines (IV lines leading directly to the heart). Practicing this procedure is important because of the potential serious risks to patients of errant punctures and infections.
- Michael DeVita, MD, Associate Professor of Critical Care Medicine, simulated a crisis team training session. In this session, the Sim Patient goes into cardiac arrest, triggering a “Code Blue.” Sundry staff members from all over the hospital run to the room to help. These staffers may be colleagues, or they may never have met, but their charge at that moment is to form a cohesive team and resuscitate this person. The Code is choreographed as to where each person stands, who takes charge and so on. Having the chance to rehearse not only the procedures, but the team-building, is invaluable.
- Lying in another bed down the hall is a very small SimBaby, a pediatric simulator. Melinda Fiedor, MD, NRSA Fellow and Clinical Instructor for Critical Care Medicine, demonstrates the intricacy of safely opening an airway in an infant. Babies, she reminds onlookers, are not small adults.

In a sentiment often echoed by people who tour the facility, O’Neill said, “Once you’ve seen the WISER Center, you never want anyone working on you who hasn’t gone through these simulations.”

