



Simulation Compendium Now Available to Support Local Learners and Learning Leaders

By SimLEARN Staff

The transition to clinical simulation training and education can seem intimidating. Yet given the right tools and resources, establishing a clinical simulation training and education program can be very doable.

To support Veteran Health Administration (VHA) medical centers with the information necessary to begin the process, SimLEARN has worked with clinical simulation experts, in and outside of the VHA, to bring you a compendium with current information on training methods using typical simulation modalities. This compendium can serve as a resource for local staff, students and educators to facilitate the transition from traditional training to the exciting and clinically relevant simulation modalities used in today's nursing and medical schools.

The compendium, titled "Simulation Update: A Review of Simulation-Based Strategies for Healthcare, Education and Training," contains articles written especially for VHA learners and covers a broad range of simulation topics, including:

- Mannequin-Based Simulation
- Standardized Patient Simulation
- Virtual Environments
- Process Modeling
- Task Trainers and Haptics
- Virtual Patient Simulations

The compendium will be available in print and on CD-ROM, as well as on SimLEARN's new Web site, www.simlearn.va.gov.

We also recommend that you work with your local librarian to ensure that clinical simulation text references and journal sources are available at your local facility to keep staff motivated and informed. A list of potential text references and journals can also be accessed at SimLEARN's Web site.

We encourage you to reach out to your local colleagues within the Department of Defense, the medical community, the affiliate and other VA medical centers to begin routine sharing of information on technologies and learning practices. Though their priorities for curriculum topics may vary from your facility's priorities, the simulation training methods used are usually transportable and adaptable across a broad range of topics. ❖

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SimLEARN Online
To learn more about clinical simulation, visit www.simlearn.va.gov



NON-VA SIMULATION TRAINING

The SimLEARN program frequently receives questions about simulation training at nationally recognized non-VA centers. SimLEARN will provide reports from VA learners regarding their experiences at these national centers.

Center for Medical Simulation

*Dr. Rosalyn P. Scott, Dayton VA Medical Center,
Dayton, Ohio*

I recently attended the Comprehensive Instructor Workshop in Medical Simulation at the Center for Medical Simulation (CMS) in Cambridge. The course was jointly sponsored by CMS' Institute for Medical Simulation and the Harvard-MIT Division of Health Sciences and Technology. CMS, a non-profit organization, is one of the first groups to use simulation to improve patient safety, quality and education in health care. The courses offered at the Institute and the research conducted by CMS focus on communication, collaboration, crisis management and teamwork behaviors. The diverse faculty includes experts in clinical care, patient safety, biomedical engineering, organizational behavior and adult learning.

The Comprehensive Instructor Workshop, in addition to providing learning about simulation, was designed to help participants think and teach as an educator. We learned important principles of adult education, skill acquisition and organizational theory. The curriculum emphasized debriefing skills. Debriefing serves to explore, analyze and synthesize learners' actions, thought processes, emotional states and other information that can improve performance in real situations. The course is very experiential, using simulation activities to teach simulation and debriefing. By the end of the week-long experience, we had learned how to: build a challenging and safe learning environment; utilize effective debriefing techniques and avoid ineffective ones; prepare, build, conduct and debrief high-fidelity simulation scenarios; conceive potential simulation-based research projects; and advance an institutional simulation agenda.

One of the important benefits of attending activities

like this is sharing experiences with fellow participants and increasing one's network of simulation contacts. My class included civilian and military physicians, nurses and respiratory therapists from all over the United States, Canada and as far away as Singapore and Saudi Arabia.



Photo by: Dr. Rosalyn Scott

Participants at the Comprehensive Instructor Workshop are observed in a simulated training environment.

The experiences from this workshop have helped me formulate strategies to optimize team building at my VA medical center. After attending the course, I have established a multidisciplinary team that is going to identify the most important clinical issues in our center that would benefit from regularly scheduled simulation activities for staff and trainees. We will be working to offer continuing education credits for all of the disciplines involved. All staff members are very excited about this opportunity to learn together in a safe, supportive and non-threatening environment.

Center for Medical Simulation

www.harvardmedsim.org

Winter Institute for Simulation, Research and Education

*Dr. Kelly Goudreau, Portland VA Medical Center,
Portland, Ore.*

The Healthcare Simulation Instructor Development Course offered collaboratively by the Winter Institute for Simulation,

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Research and Education and the Gordon Center at the University of Miami, Miller School of Medicine, was an incredible experience. The 3-day program offered an instructional opportunity designed as a fundamental course for development of skills in health care simulation. Individuals from multiple disciplines – including actively practicing physicians, nurses, paramedics and educators of all types – participated in a hands-on interactive program that assisted all participants to become fully engaged as both learners and teachers in a simulated environment.

There were approximately 30 participants in the program divided into four multidisciplinary teams. The

aggregate group received didactic instruction on the following topics before being assigned to a particular type of simulator:

- Competency-based professional development
- Simulation terms and technologies
- Key principles for effective health care simulation
- Fundamental principles of adult educational strategies
- Integrating simulation into health care curricula
- Debriefing as a teaching technique and tool

The simulators the groups were assigned to included:

- Harvey – the Cardiac Simulator (created and manufactured on site)

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SimLEARN Center Names National Program Manager

Paula Molloy, Ph.D, has joined the Veterans Health Administration's (VHA) Employee Education System as Program Manager for the VHA National SimLEARN Center. In this role, she will serve as a member of the SimLEARN Center leadership team, with responsibility for center operations, strategic planning and policy development.

Dr. Molloy has worked in the academic, non-profit and Federal sectors, and brings over two decades of project and program management experience to her new position. In addition, she is a seasoned adult educator, conversant with the range of simulation-based medical education best practices and technologies. Dr. Molloy is a member of the Society for Simulation in Healthcare, the American Society for Training and Development, and the Project Management Institute.

Dr. Molloy has a Ph.D. and A.M. in Anthropology from Harvard University, and a B.A. in Anthropology from the University of Arizona. Her academic research emphasized



Paula Molloy, Ph.D.

applying quantitative and qualitative analyses toward understanding human organizational systems at a variety of scales. Dr. Molloy continues to employ this approach in the areas of strategic planning and management, most recently with the Department of Veterans Affairs (VA) Learning University (VALU). As a member of the VALU leadership team, Dr. Molloy served as the Director for Learning Infrastructure, with responsibility for the advancement of the VA Learning Management System and other VA enterprise learning technologies.

Prior to joining VA in 2007, Dr. Molloy served with the National Park Service and the Smithsonian Institution in Washington, DC. She has represented both agencies in government-to-government consultations, and frequently engaged the media on behalf of agency leadership. In addition, Dr. Molloy has authored numerous scholarly papers and public reports based on her work.

Dr. Molloy is married with two children, ages 14 and 21. She and her family are looking forward to making their home in Orlando and joining the “Medical City” community.

In other Sim LEARN organization news, Lygia Arcaro, MSN, MHA, RN, BC, was recently named National Director of Nursing Programs. For more information, visit www.simlearn.va.gov. Also, SimLEARN is in the final selection phase for the National Clinical Director. ❖



After a simulation scenario is completed, participants debrief with an experienced instructor to discuss any alternative solutions available at various points of the case, along with the pros and cons of those alternatives. Video recordings (not shown in this view) are used as appropriate to generate discussion.

VA Palo Alto Health Care System

Story and Photos by Dr. David Gaba

The Simulation Center at VA Palo Alto (California) Health Care System (VAPAHCS) is a key facility for patient safety education, training and research that has been in operation since July 1995. The investigators of the Simulation Center invented the modern hands-on patient simulator in 1986-1987. They built two generations of patient simulators themselves, after which private industry began to make simulators available commercially. The VAPAHCS Simulation Center now has five patient simulators: 3 Laerdal SimMan devices, 1 Laerdal SimBaby and 1 Laerdal ALS device.

The same group also is responsible for adapting Crew Resource Management training – a concept for team-based operations in high-pressure situations that

originated in aviation – into health care. This began in 1990, first with the Anesthesia Crisis Resource Management simulation course sequence, then expanding at VAPAHCS and at many other sites, with analogous courses in many other health care domains. Crisis Resource Management training in health care stresses leadership, teamwork and decision-making skills in crisis management, in addition to medical skills and knowledge. Participants practice these skills in highly realistic simulations involving complete interaction with all members of the operating room team, either in a single-discipline mode or in true combined-team simulations.

The Simulation Center is a 2,200 square foot facility dedicated to patient simulation for training and research in health care. The facility contains a fully-equipped replica of an operating room, while a second simulation room is configured with two bays for an intensive

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care unit, emergency department or ward rooms. In all parts of the facility, real clinical equipment is used. A sophisticated computerized audio-visual system in each room provides multiple views of the action in the simulation room, with digital recording for debriefing simulation participants or for research. A full-time “simulationist” runs the facility and prepares and operates simulators during simulation scenarios.

The VAPAHCS simulation group has the most extensive experience in mannequin-based simulation of any group in the VA system.

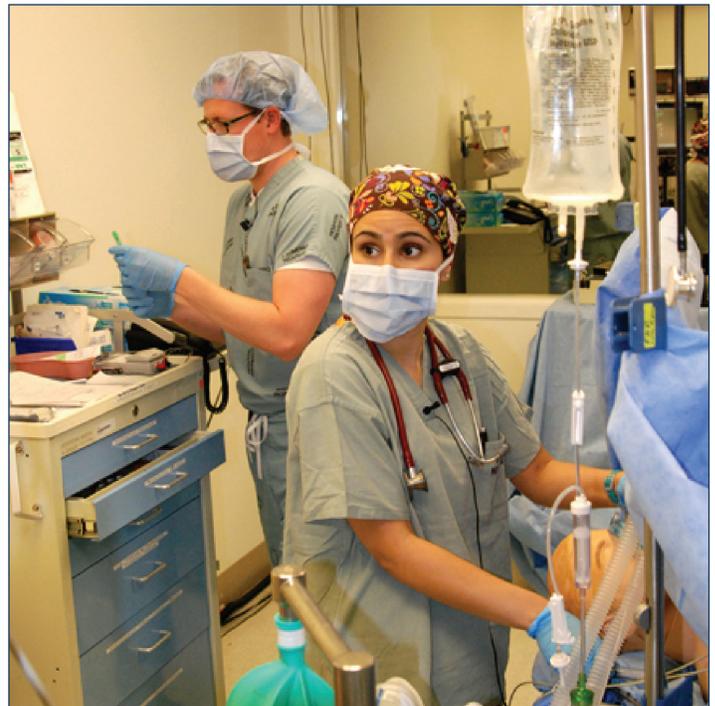
In addition to the work in the dedicated simulation center, the simulation group conducts in situ simulation sessions, often as unannounced mock events, taking the simulator to actual patient care units. In situ simulations provide both training for personnel and systems investigation in the real work environment.

This practice began in 1990 – first with the Anesthesia Crisis Resource Management simulation course sequence - before expanding at VAPAHCS and at many other sites, with analogous courses in many other healthcare domains.

The simulation team also operates a procedural skills lab. Cardiac surgeons at VAPAHCS operate a simulation facility to teach the surgical skills of cardiovascular surgery using active simulators, passive part-task trainer, and pig hearts. Combined team exercises involving cardiac surgeons, perfusionists, operating room nurse, and cardiac anesthesiologists are conducted in the Simulation Center.

The VAPAHCS simulation group has the most extensive experience in mannequin-based simulation of any group in the VA system. The unit has conducted instructor training for simulation center directors and instructors from all over the United States and around the world. The group also forms the nucleus of the extensive simulation teaching faculty at the Stanford University School of Medicine. ❖

Editor’s note: *The VAPAHCS Simulation Center is the West-coast satellite center of the VA’s new SimLEARN program. The Center is co-directed by VA staff physicians Drs. David Gaba and Steve Howard. VA-based instructors include Drs. Kyle Harrison, Geoff Lighthall and James Fann.*



Anesthesia residents conducting induction of anesthesia for simulated patient requiring highly emergent cardiac surgery, a scenario in the third level of Anesthesia Crisis Resource Management course.



Clinical staff practice operating room skills during a cardiac surgery simulation. The surgeon in this case is played by an experienced cardiac anesthesiologist. The scrub tech and anesthesia professionals are all third year anesthesia residents taking the simulation course.

VA SIMULATION SPOTLIGHT



This image and others in the article are screen captures from a video of Sim One, the first computer-controlled patient simulator, available for viewing at www.simlearn.va.gov.

The First Computer-Controlled Patient Simulator

By April Barnes and Dr. Rosalyn P. Scott

As simulation becomes an essential component of education, training, assessment and maintenance of professional certification throughout health care, it is difficult to believe that the first computer-controlled patient simulator was built 44 years ago!

In 1966, Dr. Stephen Abrahamson and Dr. Judson Denson developed “Sim One” at the University of Southern California to train anesthesiology residents in endotracheal intubation. Abrahamson, an engineer, and Denson, a physician, collaborated with Sierra Engineering and Aerojet General Corporation to form an interdisciplinary team of experts from medicine, engineering, education and computer science (Abrahamson 1974, Cooper & Taqueti 2004). Their original concept of simulating the functions of anesthesia machines was eventually expanded to simulation of the whole patient.

The concept for Sim One was a complex system that would realistically simulate both the tasks of endotracheal intubation and the physiological responses of the patient. The researchers expected Sim One “to show the feasibility of simulating the functions of a human being for training purposes and to show the effectiveness of using such a simulator in clinical training” (Abrahamson 1974).

The Sim One prototype was built with funds from

a \$272,000 grant from the U.S. Office of Education, after being rejected by the National Institutes of Health and military funding sources (Cooper & Taqueti 2004). Construction began on the simulator in January, 1966 and was completed the following year.

The Design of Sim One



Clinical experience was used throughout the design process to construct a state-of-the-art simulator with the most cutting-edge materials and technology available at the time. The working prototype of Sim One was a simulation system that included five components: computer, interface unit, instructor’s console, anesthesia machine and mannequin. Sim One was remarkably life-like and appeared as a patient lying on an operating table. The left arm was extended for intravenous injection, the right arm fitted with a blood pressure cuff and a stethoscope was taped over the approximate location of the heart (1974).



The mannequin replicated physiologic responses such as a chest that moved with breathing, blinking eyes, pupils that dilated and constricted and a jaw that opened and closed. Sim One also had a heartbeat, temporal and carotid pulse and blood pressure. The mouth was anatomically accurate with teeth, tongue, epiglottis, palate, aryepiglottic fold and an esophageal opening.

In addition to the life-like appearance, Sim One was constructed to “behave” and “respond” as a real patient would. Real time physiological responses to four drugs and two gases (oxygen and nitrous oxide) were automatically controlled by the computer (Abrahamson 1969). Physiologic and pharmacologic data were generated by the simulator and used for training and research purposes (Abrahamson 1974).

Early Evidence of the Value of Simulation

Abrahamson, Denson & Wolf (1969) conducted a landmark study on the effectiveness of Sim One as a training tool for anesthesia residents. They hypothesized

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that residents trained on the simulator would achieve predesignated criterion levels of performance in less time and with fewer operating room trials than residents without simulator training.



Anesthesia charts were submitted to the Anesthesiology Department and experts were asked, “On the basis of what you see on this chart, would you be willing to trust the anesthesiology resident in an operating room without supervision?” The raters gave each chart a plus (+) to indicate acceptable performance or minus (-) for unacceptable performance. Performance was measured by the number of operating trials necessary for the resident to consecutively achieve 4, 7 of 8 and 9 of 10 plus ratings. The number of days from date of arrival in the program to date of performance at a professional level of proficiency was also measured.



Results of the study showed that residents trained on Sim One achieved professional levels of performance in fewer elapsed days and in a smaller number of trials in the operating room than residents without simulator training. However, the study included a very small sample size with only one of five pairs of participants receiving simulator training. Simulator-trained anesthesiology residents achieved four consecutive plus (+) ratings in a mean number of 9.6 trials (17.0 days) compared to 18.6 trials (22.8 days) for those without simulator training. The differences between those trained on Sim One and the control group continued to grow for the 7 of 8 and 9 of 10 criteria. Despite the small sample size, the results of this study were interpreted to indicate that training with simulators produced a significant time saving in training and a significant lower threat to patient safety in the long term.



Sim One cost approximately \$100,000 to construct and the cost-effectiveness of the system was in question. Abrahamson and Denson embarked on a series of fifteen studies to measure the cost effectiveness over a 2-year

period (Hoffman 1975). They also continued to search for additional applications for Sim One and modified it in 1971 for training health professionals in domains other than anesthesia. Health professionals including residents, medical students, nurses, inhalation therapists, ward attendants and others were trained with Sim One and compared to peers trained with conventional methods. Data were collected on metrics such as learning gain per unit of time, amount of student time required to reach criterion levels of performance and investment of faculty time necessary for student learning. The results of the studies found that use of Sim One for training respirator application, induction of anesthesia, measurement of pulse and respiration were highly effective for all but emergency intubation. Results showed that simulation training seemed to be more effective for increasing student performance level per unit of time than saving faculty time by using simulation in a self-instructional mode. Overall, the series of studies seemed to show that the use of simulators for health-care training could be cost effective.

Despite the results of these studies, Sim One was not widely accepted at the time. It was considered too expensive for commercialization, and there was a general resistance to any alternative to the conventional apprenticeship model of training. Some also speculate the narrow vision of applications for the simulator failed to create enough demand (Cooper & Taqueti 2004). Unfortunately, only one Sim One was constructed and was not maintained; however, video footage of early uses of the device are extant, and can be viewed at the SimLEARN Web site at www.simlearn.va.gov.

For more recent evidence on the value of simulation, see McGaghie, W. A Critical Review of Simulation-Based Medical Education. *Medical Education*, January 2010. ❖

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Winter Institute for Simulation

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- Adult simulation mannequin
- Standardized patient
- Infant simulation mannequin

The teams spent the remaining time developing, programming and refining a simulation experience using their device/person. The other teams experienced the prepared simulations as learners. Debriefing included both how to debrief the learning experience and a constructive peer critique of the learning methods used. I highly recommend this experience for the novice simulation instructor as a means to both teach and learn about simulation as a teaching methodology.

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Mayo Clinic Multidisciplinary Simulation Center

*Dr. Chad S. Kessler, Jesse Brown,
VA Medical Center, Chicago*



I recently set off to sunny Rochester, Minn., in January for an instructor development course in simulation-based education design and debriefing. I came back with a chill, but not from the weather. The three-day course had an action-packed agenda focusing on fundamentals of simulation education, scenario development, scenario implementation and debriefing. The interdisciplinary team that leads the course was engaging, energizing and

really focused on teamwork and collaboration. By the end of the program, all 12 participants (limited to 12, which was nice) were close friends and colleagues; to this day, I still e-mail with peers I met at this conference. In my class alone, there was a true representation of many specialties including nurses, physicians (internal medicine, anesthesiology, emergency medicine, etc.), respiratory therapists and disaster management folks. It was truly a multidisciplinary conference.

In addition to the 3-day agenda, there was an optional fourth day of simulation center creation titled "From the Ground Up: Simulation Center Building Blocks." This final day was truly a marvelous experience for anyone in the process of standing up a simulation center. We had eight participants in our class ranging from investment people looking at funding simulation centers to senior associate deans for education at major universities. The one-day curriculum focused on center creation with respect to design and implementation issues, how to create a business plan, equipment evaluation and purchasing, and finished with a conversation around systems and processes needed to successfully run a center. There was ample time to discuss with the course faculty, including round-table discussions and a panel lunch.

The material provided was excellent and serves as a useful reference for education and design back home. I continue to use the principles I learned at Mayo in my everyday simulation life and beyond. I feel that this instructor training class offers a wonderful team environment, excellent fundamentals of simulation education, scenario development and implementation and debriefing. In addition, the added bonus of the simulation design course was the cherry on top. If you are in the market for an instructor training course or design course, it is worth your while to look into the Mayo instructor Training Course in Rochester. ❖

*Mayo Clinic Multidisciplinary Simulation Center
www.mayo.edu/simulationcenter/*



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