# Emergency Medicine Simulation: ACLS and Beyond

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Today's emergency medicine (EM) residents have an ever-expanding set of resources available to them. One of these is simulation. Residency programs have increasingly embraced simulation as part of resident training and its current role in EM continues to expand. Initially adopted by the aviation industry, simulation was chaperoned into current day medical training by Dr. David Gaba when he recreated an operating room environment in 1988 for the purpose of education. Since then, this modality of instruction has continued to gain popularity among anesthesia, EM, and surgical training programs. In 2002 Stanford developed a course specifically designed for EM residents that was modeled after Dr. Gaba's anesthesia program. The course used simulation mannequins, facilitators, actors, standardized patients and debriefing sessions for skill acquisition. The program was well received by its residents and has been extensively incorporated into the training program to teach core competencies, critical care, and teamwork in a safe environment. In 2003 a survey found only 29% of EM residencies used simulation, while 5 years later in 2008, more than 85% reported utilizing this training modality.[2] With the goal of advancing EM training and minimizing medical error, the Society of Academic Emergency Medicine, the Institute of Medicine, and the public have all encouraged the growing role of simulation in medical training.[3]

As a major adjunct to traditional teaching modalities, simulation grants EM faculty unobstructed focus on teaching without patient risk. According to Dr. C. Eric McCoy, Director of Emergency Medicine Resident Simulation at the University of California, Irvine, this medium "allows us to bridge the gap between medical school and direct patient care outside the previous paradigm of 'see one, do one, teach one.'" Simulated patient vignettes and cases have been shown to boost the comfort level of residents during resuscitations, airway management, procedural sedation, and other task training skills. Poised to gain the most from the integration of simulation into medical training are the advanced cardiac life support (ACLS) and pediatric advanced life support (PALS) algorithms. More true-to-life simulation models afford trainees more engaging roles in assessing, monitoring, and managing patients in extremis. Rather than the call-and-response discourse common in traditional ACLS advanced cardiac life support and PALS training, simulation mandates that users continually assess and reassess a patient's condition in real time and respond accordingly. Using "high fidelity" encounters, learners are realistically immersed in critical situations that facilitate prioritization and decision making under stress.

Residency training provides crucial experience in managing real adult codes, but these encounters are often infrequent. Pediatric codes, an even greater rarity, are often managed by trained subspecialists, a situation that precludes residents from valuable experience. Simulation provides consistent and standardized exposure to these high-risk, low-prevalence scenarios that residents might otherwise infrequently see during training. While generally well received by residents, simulation has yielded mixed results when compared to traditional ACLS and PALS instruction. Some studies show no difference in retention and performance rates, whereas Donoghue[5] and Delasobora[6] found residents trained with simulation performed better than those trained with traditional methods in PALS and ACLS algorithms, respectively.

As in traditional methods of teaching, simulations are developed based on the specific backgrounds and needs of the learners. Dr. Philip Harter, program director of Stanford's EM Residency Program explains, "Stanford's simulations for junior residents focus more toward reinforcing management of specific disease processes while senior residents partake in cases that add 'external crisis' as they grow more adept in managing multiple sick patients at once." In addition to catering to varied skill levels, simulation itself varies in scope and caliber. Simulation ranges from high-fidelity simulators that can mimic a repertoire of medical conditions to the smaller partial task trainers specifically designed to teach focused skills, such as intubation and central line placement.

Despite the numerous resources required for effective simulation, growing pressures placed upon residency training programs seemingly reinforce simulation's expanding role in EM. With more stringent restrictions on work hours set forth by the Accreditation Council for Graduate Medical Education, programs are discovering the benefit of using simulation to provide additional exposure outside of the clinical realm. Furthermore, simulated case scenarios allow for standardized exposure to high-risk, low-prevalence conditions that residents are expected to be familiar with by time they complete their training. Most faculty would agree simulation remains a reliable and engaging tool to improve medical knowledge, adherence to ACLS and PALS algorithms , and comfort with advanced procedures. However, studies showing the effect of simulation on clinical outcomes have been limited.[2,4] Despite expansion of simulation within resident training, additional research is needed to evaluate whether improvements in simulated performance translates into patient-based outcomes, such as satisfaction, mortality, and safety.

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