Current Status of Simulation-Based Training in Graduate Medical Education

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KEYWORDS

• Simulation • Technical skills • Proficiency-based training • Virtual reality
• Nontechnical skills

KEY POINTS

- The use of simulation in Graduate Medical Education (GME) has changed significantly in the past decade; this has been largely due to advances in technology and a fundamental shift in the principles and delivery of medical education.
- New requirements and mandates by governing bodies and accreditation organizations in GME have influenced the adoption of simulation.
- The most common application of simulation in GME is in technical skills. However, simulation can also be used to teach nontechnical skills.
- Simulation has become a cornerstone in the delivery of surgical education; several national curricula have been established and are based on integrating simulation into the educational curricula.
- The field of simulation in health care continues to grow; local, state, and national organizations and consortia have been established and are creating networks to foster research and collaborative efforts.

INTRODUCTION

The role of simulation in the current environment of GME has experienced a substantial transformation during the past decade. There has been a major paradigm shift in the format of medical teaching, highlighted by the incorporation of problem-based learning into the curricula of medical schools.[1] GME has likewise shifted, from the traditional apprenticeship model to more directed clinical skills training.[2] Concurrently, the nature of health care delivery in the United States has changed substantially during

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the same period, particularly affecting resident supervision and autonomy. These changes have created gaps in training, and the use of simulation has been expanded to help bridge these gaps. The accessibility and fidelity of simulation have clearly benefited from the technological advances of the Digital Age and will continue to grow in the future.

Simulation has long been used in various fields of medicine.[3,4] Advocates of simulation-based training in medical education posit that patient safety is improved when residents practice on simulators before performing procedures and operations on actual patients. There is a growing body of research that confirms the benefits of simulation-based training in terms of skill development and transfer of these skills to actual patients.[5–14]

Perhaps one of the most significant studies demonstrating the effectiveness of simulation-based training involved using a virtual reality (VR) platform (the Minimally Invasive Surgery Trainer—Virtual Reality, or MIST-VR) to train junior residents' basic technical skills, followed by operative performance assessment of a laparoscopic cholecystectomy.[5] This study was known as the VR to OR study; strict training criteria were established by experienced minimally invasive surgeons, and operative performance assessment was done by a blinded, 2-reviewer method comparing VR-trained to control subjects. This study was one of the first to demonstrate that a simulation-based training curriculum in an inanimate skills laboratory translated into improved performance in a real-world operating room environment.

MANDATES

Empirical data showing the benefit of simulation-based training coupled with recent fundamental changes in the delivery of GME and the implementation of various mandates for the inclusion of simulation-based training into surgical residency programs have accelerated the application of simulation in today's training curricula.

In 2006, members of the Residency Review Committee for Surgery (RRC-S) voted unanimously to require simulation training in surgery residency programs.[15] Programs were given 2 years to incorporate simulation-based skills education into their residency training curricula, with the understanding that these requirements could be met with low-tech simulators (eg, laparoscopic box trainers).[15]

In 2009, the American Board of Surgery (ABS) required all surgeons seeking board certification to have successfully passed the Fundamentals of Laparoscopic Surgery (FLS) examination. The FLS examination comprises 2 sections, a multiple choice examination that assesses basic knowledge of laparoscopic surgery and a manual skills examination that assesses technical performance on 5 exercises using inanimate objects placed in a laparoscopic box trainer.

Recently, the ABS mandated completion of the Flexible Endoscopy Curriculum (FEC) as a requirement for all general surgery residents graduating in the 2017–18 academic year and beyond. The FEC is designed to provide general surgery training programs with a stepwise, milestone-based curriculum that includes both didactic and hands-on training. On the successful completion of the FEC, a general surgery resident should possess the knowledge and skill to be a surgical endoscopist with the ability to provide endoscopic services to patients in any clinical setting. The FEC culminates in passing the Fundamentals of Endoscopic Surgery (FES) certification examination to be eligible to take the ABS certifying examination. The FES examination comprises 2 sections: A multiple-choice knowledge test and a technical skills examination on 5 exercises using the GI Mentor II (Simbionix USA, Cleveland, OH, USA) endoscopy simulator.