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Simulation in the operating room

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Simulation has become a significant training tool in the operating room (OR). It can be used in both simple task training and complex scenarios. The challenge for simulation in the OR is how to translate that which is learned, and perceived to beneficial, into behavioral change and improved patient outcomes. Simulation in the developing world is progressing, but is still hampered by a shortage of material, personnel funding.

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Introduction

The operating room (OR) is one of the most complex and challenging environments that health-care workers must perform in. Crises in the OR are believed to be rare but according to a World Health Organization news release from 2007, at least 50% of all adverse events in developed countries occurred in the OR. In addition to this alarming fact, their outcomes can be potentially devastating. Surgical care in developing countries is also hampered by a low number of adequately trained staff and poor facilities [1]. Simulation has been advocated as a way to prepare health-care professionals better to effectively manage these crises.

Simulation in health care, and specifically in anesthesiology, takes on many forms. An Institute of Medicine report in 2010 sought to address the problem of inconsistent professional health-care workforce training and suggested a redesign of continuing education. The report defined simulation as "The act of imitating a situation or process through something analogous. Examples include using an actor to play a patient, a computerized mannequin to imitate the behavior of a patient, a computer program to imitate a case scenario, and an animation to mimic the spread of infectious disease in a population." [2] This broad definition does not only refer to high-fidelity simulation.

Within anesthesiology, simulation experiences can range from purely computer-based simulations, to simple partial-task trainers for airway management training, to elaborate courses employing full-scale high-fidelity simulation. These courses have been traditionally offered to trainees, but there are also cases where board-certified practitioners have been tested. The authors' own department requires physicians applying for credentials to practice anesthesiology to first satisfactorily complete its own continuing medical education course on the management of the difficult airway.

Simulation is a very useful tool and has been found to be highly effective in health-care training [3]. It is regarded as being superior to traditional training methodologies in both technical and nontechnical skills such as teamwork [4]. More recently, the American Board of Anesthesiology has adopted simulation as a key component of its maintenance of certification program (MOCA) that is an effort to ensure continuing competency in the specialty.

However, questions still remain about the validity of the data that are generated by simulation courses and studies involving simulation. One of the primary challenges is determining how to translate the performance that occurs in the simulated environment to the clinical realm in a meaningful way. Another challenge is implementing simulation in the developing world in such a way that maximizes the constructive effect while keeping a rein on cost in locations that often do not have an abundance of fiscal or personnel resources to be adequately trained to conduct contextually appropriate high-quality simulations.

The promise of full-scale high-fidelity simulation rose to prominence in 1988 with the first Anesthesia Patient Safety Foundation (APSF) simulation meeting. This was followed the next year by the Anesthesia Simulation Curriculum Conference, which was also sponsored by the APSF [5]. In this chapter, we attempt to focus on a number of ways in which simulation is being used in the OR today and on some of the barriers to wider implementation that exist. We will also explore some of the long-term challenges which simulation will need to overcome in proving itself useful in the coming decades. This will include a perspective from the developing world where often monetary and material resources are more limited.

Simulation-based education in medical education

The benefits of simulation-based education in several competencies relevant to the OR and beyond have been described at many levels of clinical education. Paige et al. demonstrated that even the most junior medical trainees benefit from simulation-based education in OR team training. Undergraduate nursing students, nurse anesthesia students, and medical students were arranged into multidisciplinary teams and exposed to two standardized intraoperative emergencies in a high-fidelity simulated OR environment which was followed by a structured debriefing. These authors clearly demonstrated statistically significant increases in participants' self-reported efficacy for team-based competencies. In addition, there was a statistically significant increase in mean observer performance scores for

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