Chapter 3
Simulation Technology in Anesthesia Education

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ABSTRACT

This chapter provides an overview of increasing role of simulation technology in anesthesia education. A brief history of the role of simulation is discussed, spanning across the introduction of the first medical simulators of the 18th century to the role of modern simulation technology in education today. The capacity in which anesthesia education is conducted has dramatically improved with the advancement in simulation technology and use of part-task and full-body simulation trainers. In this chapter, focus is placed on the indications and utility of simulation for airway management, bronchoscopy, and central line placement education, as well as whole-body simulation models and their role in practicing complex scenarios. Key elements that ensure a successful simulation scenario are outlined, and the advantages and barriers to the use of simulation technology in anesthesia education are discussed.

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INTRODUCTION

Since the late 20th century, anesthesia has served as a leader in the advancement of medical education by integrating technology and simulation into educational practices. Simulation can be defined as being the imitation of real processes or situations for the practice of skills, problem solving, and judgment; and it is often combined with software-based simulation, mannequins, and virtual reality to facilitate learning (Rosen, 2008). The incorporation of simulation technology for educational purposes advances not only students' acquisition of procedural skills but also improves patient care and safety (Jones, Passos-Neto, & Braghiroli, 2015). The importance of improving patient safety was brought to light in 2000 when the National Institute of Medicine report *To Err is Human* revealed that the number of deaths due to medical errors in the US exceeded the numbers deaths caused by breast cancer, motor vehicle accidents, and AIDS (Kohn, Corrigan, & Donaldson, 1999). Still more contemporary estimates suggest that each year, as many as 400,000 American patients die due to medical errors, making medical errors the third leading cause of death in the United States (James, 2013). These alarming statistics and the increased demand to improve patient safety have influenced educational institutions to contemplate new methods of instruction in order to curve these numbers. Simulation technology is one method being used to improve medical education.

Before the advent of simulation-based education, the old paradigm of medical education largely consisted of an apprenticeship model in which trainees work with attending physicians to care for their patients and in which clinical decisions are shared among the attending physicians, residents, and medical students. While this "hands-on" model was sufficient for more commonplace medical problems, it did not adequately provide students and residents with experience in handling risky procedures (Jones et al., 2015). Alternatively, simulation provides a safe and controlled environment in which inexperienced trainees can rehearse high-risk procedures without posing a risk to actual patients (James, 2013). Simulation also permits for customization; allowing students to gain valuable experiences in technical training, communication, or even leadership skills—with unlimited repetition (Jones et al., 2015). This repetition enables students to learn from their mistakes so to master the correct response or technical skill. Richard Satava summarizes, "The greatest power of virtual reality is the ability to try and fail without consequence to animal or patient. It is only through failure – and learning the cause of failure – that the true pathway to success lies" (Satava, 2001). Simulation affords students the ability to make mistakes in a stress-free environment, discuss poor decisions, explore better options, and retain memories that improve patient care. Thus, simulation provides an innovative approach to medical education—one in which trainees can practice medical skills to be better prepared for clinical encounters, thereby potentially

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