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The value proposition of simulation-based education

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ABSTRACT

Simulation has become an integral part of physician education, and abundant evidence confirms that simulation-based education improves learners' skills and behaviors and is associated with improved patient outcomes. The resources required to implement simulation-based education, however, have led some stakeholders to question the overall value proposition of simulation-based education. This paper summarizes the information from a special panel on this topic and defines research priorities for the field. Future work should focus on both outcomes and costs, with robust measurement of resource investments, provider performance (in both simulation and real settings), patient outcomes, and impact on the health care organization. Increased attention to training practicing clinicians and health care teams is also essential. Clarifying the value proposition of simulation-based education will require a major national effort with funding from multiple sponsors and active engagement of a variety of stakeholders.

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Introduction

Simulation has become an integral part of physician education. Hundreds of articles confirm that simulation-based education improves learners' skills and behaviors^{1,2} and is associated with improved patient outcomes.³ Simulation also plays an important role in physician assessment.⁴ Indeed, simulation has become—as one writer put it—“an ethical imperative.”⁵

One of the major problems with simulation-based education is that it requires the use of resources including trained teachers, support staff, physical space, and learner time, in addition to the cost of acquiring and maintaining the simulators. The cumulative cost of these resources has led some stakeholders to question the overall value proposition of simulation-based education. Questions include: Is simulation worth the cost? How can educators make simulation more affordable? Who will pay for simulation-based education? Ongoing struggles with these and related questions led the

Division of Education at the American College of Surgeons (ACS) to convene a special panel on the “Value Proposition of Simulation-based Education” during the 2017 Annual ACS Surgical Simulation Meeting (10th Annual Meeting of the Consortium of ACS-Accredited Education Institutes). The purpose of this paper is to summarize information from the panel presentations and discussion, articulating a partial response to these questions and defining an agenda for future research in the field.

Among its many meanings, the term *value* refers to the “relative worth, utility, or importance” of an object⁶ compared with another object, the price paid, or the expected return on investment. When referring to procedures or programs (such as education), *value* often refers to cost effectiveness, or the ratio of benefits to costs. Both benefits and costs, and thus the perceived value, differ for different stakeholders, such as learners, faculty, education leaders, institutional financial leaders, patients, insurance providers, device manufacturers, and society. The benefits of simulation-based education can be realized in the direct impact on learners (eg, improved skills) and in the downstream impact on patients and other stakeholders. An entirely different meaning of the word *value* refers to “something (such as a principle or quality) intrinsically valuable or desirable,”⁶ as in the values (moral compass) of an individual or institution. This article addresses value through several of these diverse perspectives.

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The Value of Simulation-Based Education to Hospitals and Health Systems

The health care delivery systems in the United States are undergoing rapid transformational change in response to a variety of environmental pressures, including the demand for value creation, the rise of consumerism, the need for affordable care through cost reduction, and the declining reimbursement for health care delivery. Health care systems have begun this transformation by consolidating, integrating services, and redesigning care processes. These efforts require that new skills and competencies be acquired by the entire workforce of the system, but most importantly by the clinicians. For care to be delivered in an efficient and coordinated manner with the best possible outcomes, clinicians must function in high-performance teams, which requires the ability to communicate precisely, perform consistently, and deal with unexpected circumstances and situations. As health systems strive to optimize performance, simulation can provide an essential tool to help clinicians and other team members acquire critical skills and competencies.

The roles of simulation in assisting health systems achieve transformational goals include providing a laboratory for interprofessional team development,⁷ improving performance through initial skill acquisition and uncovering clinical variation, promoting efficiency in care delivery processes, allowing clinicians to practice skills and maintain competency, and providing a learning environment where clinicians with varying levels of proficiency can gain requisite experience in a safe setting. Simulation allows interprofessional teams to not only acquire and practice their technical skills but also to examine behaviors that enhance or detract from their performance as a team. Feedback can be immediate, from a faculty monitor or from reviewing a video-recorded training exercise. Videos can also be analyzed for non-value-added steps in the care process, miscommunications, and missed opportunities to optimize care without subjecting patients to harm. A 2011 survey on Medical Simulation in Medical Education conducted by The American Association of Medical Colleges revealed that both teaching hospitals and medical schools use multidisciplinary simulation to develop interprofessional teams.⁸ The most common uses of multidisciplinary simulation training involve patient care, interpersonal communication skills, team training, and critical thinking, all of which are critical in a transformed and optimized system of health care delivery. The Agency for Healthcare Research and Quality has characterized these essential benefits of simulation as putting patient safety first, optimizing learning conditions, providing valuable feedback, integrating multiple skills, and providing a test bed to identify gaps in technologies, procedures, and protocols.⁹

All these benefits can be illustrated by a recent case from a health care institution in the Pacific Northwest. In reviewing the literature on management of maternal cardiac arrest, the chief of obstetrics of the hospital found that the maternal mortality rate approached 100% within 5 minutes after onset of arrest.¹⁰ Management of this rare event requires an emergency Caesarean section delivery,¹¹ which at this hospital then required a minimum of 15 minutes. To address this gap, the leader used simulation to train the obstetric teams in the hospital in rapid response, management of the cardiac arrest, and performance of in-bed Caesarean without anesthesia support. Each labor and delivery room was equipped with supplies for emergency Caesarean section including scalpels readily available in a locked bedside drawer. A few months after training was complete, a previously healthy mother in the delivery unit experienced a cardiac arrest secondary to an amniotic fluid embolus. Rapid response by the obstetric team led to a successful in-bed Caesarean delivery within 5 minutes of the onset of arrest, and both mother and child were discharged within 10 days with no neurologic sequelae or other disability.

The successful management of this unexpected event, which would have been highly improbable without preparation using simulation-based education, highlights the responsibility of health care leaders to support continuous professional development. Simulation can support both the modeling of tasks to identify critical steps in care delivery as well as the training of interprofessional, high-performance teams required to execute those steps. Both elements are essential to delivering optimal patient care in a transformed health system.

The Value of Simulation-Based Education to Medical Liability Insurance Providers

Although not directly associated with faculty and learners, medical liability (eg, malpractice) insurance providers have much to gain from high-quality, simulation-based education. Malpractice claims among surgical specialties are high compared with other specialties in both number (frequency) and cost (severity).^{12,13} Liability insurance often represents a substantial portion of the expense of providing care both for hospitals and individual clinicians. Costs include not only the payments made to plaintiffs but also the costs of defending claims. Decreasing payouts, legal costs, and premiums benefit both the insurance company and the insured. One way to lower payouts is to distribute the costs of restoring injured patients among other health care stakeholders, as realized in the New York State Medical Indemnity Fund (http://www.dfs.ny.gov/insurance/mif/mif_indx.htm). A second way to decrease payouts is by imposing liability caps on pain and suffering.¹⁴ Third, providers can communicate effectively with patients and families after an adverse event. Most patients do not initiate a lawsuit after an adverse event; those who do initiate lawsuits often complain that their providers did not inform them adequately of the potential complications and/or were not forthcoming in explaining what happened after a complication occurred. Fourth, hospitals and clinicians can optimize their defensibility after an adverse event. Defensibility is supported by documentation that substantiates the decisions of the health care team and conversations with colleagues, patients, and families. Good documentation often supports a settlement of claim without payment. Finally, adverse events can be prevented in the first place. The latter 3 approaches—communication, documentation, and prevention—can all be promoted through provider education.

Simulation-based education can address technical skills, team performance, communication skills, and documentation skills and thereby decrease the risk of liability in surgery. Although they may not always realize it, liability insurers have a vested interest in supporting hospitals and clinicians in pursuing initiatives designed to improve the performance of surgeons and surgical teams. One such program designed to decrease the likelihood of an adverse event is procedure rehearsal, in which the imaging study of a patient is imported into a simulator, allowing a team to practice on that patient's unique anatomy before the procedure. Surgical teams can also undergo simulation-based disclosure training aimed at improving communication with patients and families after an adverse event. Finally, documentation of an event in the medical record can be incorporated into the simulation activity; this can then be appraised and used to provide feedback regarding the elements essential to mitigating the severity of a malpractice claim. Liability insurers can support implementation of simulation-based educational infrastructure and curricula (eg, through educational grants) and incentivize the participation of specific providers (eg, through insurance premium rebates).¹⁵⁻¹⁷ Liability insurers have supported simulation programs in surgery^{16,17} and other high-risk specialties, including anesthesiology, critical care medicine, emergency medicine, obstetrics, and percutaneous vascular interventions.^{15,18-20}

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