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Medical Education

Thoughts on Patient Safety Education and the Role of Simulation

Patient simulation in medical education is an effective tool to teach response skills needed to ensure patient safety.

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There is widespread recognition that the level of preventable injuries to patients from medical mismanagement is unacceptably high. The weight of expert opinion in many fields—sociology, organizational psychology, safety science, engineering, health policy and a range of risky industries—considers systems effects to be the overarching contributors to the problem. The definition of "system" in this context includes not only health care professionals and institutions but influences entirely external to health care delivery, such as regulatory bodies, purchasers, device manufacturers, and health law professionals among others—all of which play major roles in shaping the playing field.

Given this array of external influences, some have said that individual training is never a root cause of complex systems failure; the US medical training is the best in the world, and the endless dilemmas of broken, complex systems trump the rare case of individual incompetence. Do education and training have a place in such a world view?

One response to this question is that training and education are *always* root causes of success and failure in complex, risky work. Like working conditions (staffing, the built environment), training is outside the control of practitioners at the point of care. Providing the best possible training is a core component of idealized systems design—and, more to the point, innovative and continuous learning and training is one of the four legs of the high reliability, organizational theory table (the other three being leadership, culture of safety, and redundant systems design).

Health care training and practice are notorious for a variety of tensions that together have helped create the system that predictably produces the current annual epidemic of medical injuries. Care is given by a variety of specialists and disciplines working closely under stressful conditions, yet training of the various "tribes" occurs in isolation that reinforces individual cultures and norms. Care is given by "teams," yet classic notions and skills associated with high performance teamwork are never taught to health care professionals. Dangerous, risky procedures are performed by novices or experienced clinicians learning new approaches on actual patients under conditions of, at best, implied consent. The introduction of new complex medical devices into actual care, and the exposure of new employees and trainees to existing medical devices occurs with little or no effective systematic training in the operation and trouble-shooting of these devices. Practitioners' exposure to the range of possible classic events, problems, diseases, crises, and surprises occurs ad hoc, as a by-product of the apprenticeship training model. Hence, the level of experience and competence varies widely among those who have completed training or the first cycles of independent, certified practice.

Natural experiments, templates, and position papers in patient safety education and training have accelerated since the *To Err is Human* Institute of Medicine report in 1999, and several federal projects funded by the Agency for Healthcare Research and Quality to major national organizations in 2001 to 2004 have begun to address the issue. Validated, reproducible curricula that favorably change behaviors or develop competencies that improve patient safety outcomes have yet to be shared or generalized.

Patient safety education—"safety 101"—for health care professionals usually includes learning about safety science as it relates to individual performance, human factors, teams, organizations, and factors external to the industry. They must also understand key aspects of voluntary and mandatory reporting, case investigation and process improvement methods (eg, failure mode, root cause, task analysis), cultures of blame vs cultures of safety and reliability, legal and ethical issues, and the roles of informatics, simulation, systems design, and various stakeholders including patients themselves. This long list is not fully inclusive and demonstrates the challenges medical educators and administrators face when trying to find resources and fit safety-related material into an already full curriculum.

Nodes of safety curricula frequently develop organically around medical simulation facilities and centers. These centers are ideal places to anchor safety curricula and experiment with them because of the expensive price tags and institutional commitments that go with simulation tools of varying fidelity, their magnet-like attraction of clinicians devoted to innovative teaching and learning opportunities, and the ability to transfer concepts easily from aviation and other risky industry models to health care safety.

A number of reviews and editorials have summarized the potential functionalities of medical simulation training. The approach is not a panacea, but clearly offers some unique options for improving the status quo. The cost/benefit ratio has not been established, but that is a ticklish and complex problem that plagues much smaller issues (eg, the value of pulse oximetry) as well as many larger training issues that approach the big system level.

Benefits of Simulation-based Medical Training

First and foremost, this type of training uncouples patient injury from learning and sends a message to all stakeholders including the public that patients are not a commodity for training. Second, learning opportunities can be custom-designed to maximize the training process for teachers and learners. Learning theory has shown that trainees learn differently, at different rates, have different needs, and benefit most from experiential methods that enable the most efficient "transfer" from practice to operations. Third, simulation fosters social justice, in that the great majority of novice training occurs at academic medical centers where vulnerable inner city populations receive care. Fourth, simulation techniques are ideally adapted to learning error management skills. Rich, immediate feedback can be provided while allowing tasks and events to unfold to the degree necessary to accomplish learning objectives. In actual, operational environments, dangerous errors must be corrected at once, often by those with the most experience, and little time is available for post-event debriefing. Nuanced data from real events is often not captured, and the ability to replay the experience is impossible.

Individuals can be allowed to fail in simulations and, thus, learn to manage those consequences while developing a more realistic model of the functionalities—and limits—of the system they are working in. This is an important point: the common mindset about simulation imagines the approach well-suited to learning what has been called stick-and-rudder skills in aviation, or lower level but complex hands-on skills using real tools and dolls of varying complexity and cost. But one of the most powerful applications of simulation technology and video feedback may be the teaching of meta cognitive skills or thinking about thinking. These include situation awareness, team management, ability to generate options, and insight into coping with complexity. The most effective way to learn these skills is through perceptual-based scenarios that immerse learners in environments where they suspend disbelief, feel real risk, and become embedded in the flow of near-actual events. Many aspects of the system can be brought into simulation, from pharmacy to out-of-hospital specialist and primary care consultation, thus reproducing aspects of larger organizational issues of care for reproducible training and research.

A number of approaches can be taken to incorporate simulation into patient safety education. Cardiac arrest or code teams can use complex computerized manikins and video feedback to train in generic team and procedural skills. Rare but potentially lethal events that occur in emergency centers, intensive care units, operating rooms, and even physicians' offices can be worked up into realistic scenarios that reproduce enough of the cues of real practice to allow individuals and interdisciplinary groups and teams of practitioners to both increase their awareness and improve their technical and behavioral skills. Institutions with enough resources can mock up rooms with computerized manikins and standardized patient actors. Here, under the direction of hidden scenario controllers, a team equipped with wireless headsets can carry out a full range of higher fidelity exercises that test the mettle of clinicians and even administrators and managers. Innovative applications of simulation include replaying actual sentinel events to gain insight into what actually may have happened, training practitioners to deal with difficult patients and situations (giving bad news and discussing end-of-life care or medical errors) and using simulation tools to explain complex, arcane medical technicalities to juries swayed by poor patient outcomes and hindsight bias. Many other simulation tools exist in addition to complex computerized manikins, including part task procedural trainers and virtual reality tools, and these approaches can be combined to accomplish learning objectives.

All of these suggestions have been successfully put into practice. All gain from a core set of functions common to simulation approaches, ie, the ability to both standardize and customize learning, uncouple learning from patient injury, collect rich data on performance for feedback and improved assessment—both formative and summative—and, uniquely, allow failures to progress without consequence. Well-developed, institutionalized simulation programs also create safety culture, which may well be the best defense against the failure of complex systems.

Related Resources

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