

Improve Dx

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Using Simulation to Improve Diagnosis

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Newsletter Editor

Simulation is a technique used to immerse students in models of real-world situations where they may explore, learn, and practice with time, focus, and feedback not usually available. In healthcare, simulation allows students and clinicians to develop new knowledge, skills, and behaviors without putting patients at risk.

Anesthesiologists were early adopters of simulation technology for medical education, with early programs such as the Sim One simulator in the 1960s and an early '70s.¹ In the 1980s, innovators, including David Gaba, MD, in California, and Jeffrey Cooper, PhD, in Massachusetts, applied techniques used in aviation to improve crisis management and knowledge from the study of human error to improve the performance of medical teams.¹ Since then, simulation-based learning has become a standard feature in the education of physicians and nurses and ongoing training across healthcare.

Simulation training often focuses on patient safety by improving skills that promote effective communication, teamwork, and leadership. Is there a way to use simulation to improve diagnostic decision making more directly?

David Gaba is associate dean for immersive and simulation-based learning and professor of anesthesiology at Stanford University and founder and co-director of the Patient Simulation Center of Innovation at the Veterans Affairs Palo Alto Health Care System, both in California. When asked if lessons about diagnosis can be teased out of simulation scenarios on other topics, he responds that to separate diagnosis from the overall task of healthcare would be to create “false isolation.” In healthcare, complexity is the norm, especially in dynamic domains such as emergency medicine, anesthesia, and intensive care. The process of arriving at a diagnosis is interwoven with

other aspects of patient care, which are all subject to errors and system problems. To figure out how best to use simulation to improve diagnosis, Gaba says to start by identifying the dominant problems and then design training accordingly.

Problems such as bad handoffs, faulty record keeping, and inadequate communication are important but not unique to diagnostic error. Critical thinking and decision making—also not unique to diagnosis—represent hallmarks of diagnostic acumen and are fertile ground for simulation-based learning. On the Society to Improve Diagnosis in Medicine (SIDM) email discussion group, Pat Croskerry, MD, reflected on the importance of critical thinking in medical education:

The evidence is now very clear that dramatic improvements in problem solving can be achieved using critical-thinking training. More than ever before, we need to be graduating physicians who can think critically. It won't be the

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answer to all problems in diagnostic failure, but it will help in a significant way (SIDM listserv, August 16, 2014).

Simulation Methods

High-Fidelity Simulation

Each simulation technique offers distinct advantages, with high-fidelity simulation offering the most immersive learning experience. Dedicated simulation centers replicate clinical environments and allow learners to use actual equipment and high-tech mannequins and to engage with colleagues in realistic settings. Gaba adds, "Simulations can also be done in the actual clinical work environment, a technique known as in-situ simulation" (email communication, August 2014). As with all simulation platforms, high-fidelity simulation presents learners with scenarios that have been designed and scripted to address specific problems and learning objectives.

Standardized Patients

Another style of simulation brings trained actors into clinical environments to role play usually as patients (occasionally in other roles) to introduce clinicians to specific challenges and to offer feedback in real time from trained observers. In healthcare, these "standardized patients" work with scripted questions, improvise within scenarios, and give feedback to students about their performance. They help students and clinicians gain skill and confidence in conducting difficult conversations such as error disclosure as well as physical examinations and patient histories.²

As they create scenarios, designers anticipate how participants will react, but their control can go only so far. Scenarios can pose ethical dilemmas and complex processes, but it's not practical to expect to be able to force someone to make a wrong diagnosis. What can be learned reliably is how people work together and what their thought processes are.

Debriefing

All simulation platforms offer students methods for reflecting on their experiences during the simulation. In high-fidelity simulation, which participants

experience as a group, discussion of the scenario is referred to as the "debrief," where most learning takes place.

Marjorie Podraza Stiegler, MD, is an anesthesiologist and director of the Consortium of Anesthesiology Patient Safety and Experiential Learning (CAPSEL) at the University of North Carolina (UNC), Chapel Hill. Stiegler studies errors that are made not for lack of knowledge but linked rather to cognitive dysfunctions caused by things such as insufficient awareness, feelings toward the patient, and lack of perceived vulnerability.³ Using simulation-based learning with residents at UNC, she finds that learning about cognitive processing happens during debriefing and does not have to be based on forcing students to make specific errors in simulation. In fact, forcing learners to make mistakes can be counter-productive:

It's very hard to create scenarios for the express purpose of promoting a diagnostic error because learning shuts down when the residents feel tricked. We have a scenario that poses a diagnostic challenge that everybody gets wrong the first time but reasonably so. If we focused the debrief on the mistake, then we would get all the defensiveness you'd expect: "You tricked me! That's not how things go in real life. If it had been real, I would have known what to do." Instead, we focus the debrief on the process of decision making, exploring how diagnoses gets made. That keeps people engaged. The meat is in the debrief; the scenario is just a springboard to discussion and learning (oral communication, August 18, 2014).

More limited or technical forms of simulation, such as training to place central lines or perform intubation, do not rely as heavily on debriefing for learning. Fanning and Gaba point out that "the learning objectives, target population, and modalities of simulation will drive whether a debriefing is useful, and if so how in-depth the debriefing process needs to be."^{4(p121)}

Virtual Patients

High-fidelity simulation is often difficult to apply on a large scale. The training may call for a specific environment or specialized equipment and requires professional time to develop and implement scenarios. Virtual patient simulation (VPS) offers an alternative that may be effective at addressing diagnostic decision making as well as other aspects of patient care in an efficient format.

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VPS has been used as part of a comprehensive simulation program, SimLEARN, which was established at the Veterans Health Administration in 2009.⁵ At the Department of Veterans Affairs National Center for Patient Safety (NCPS), Linda Williams, program specialist, and Douglas Paull, director of medical simulation, have worked to apply VPS specifically to patient safety problems.

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- Jeffrey B. Cooper, PhD
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Among the techniques they use is a computer-based platform that offers virtual patient cases to learners who review patient-specific data and resources such as history, test results, and images, and work their way through treatment decisions.⁶ In a branched-narrative model, each decision leads to new options, with the case unfolding as the learner makes choices. At the end, learners receive a summary of the case and sometimes suggestions for additional education and training. This model offers scalability

and efficiency but lacks the dynamism and complexity offered by live, high-fidelity simulation, which are especially relevant for learning about cognitive processes including diagnosis. The NCPS is optimistic that a model currently being developed by Daniel Nystrom will one day advance the capabilities of the virtual patient platform.

Nystrom has used work domain analysis (WDA) to address diagnostic decision-making in a new model for virtual patient platforms. He defines WDA as “a cognitive engineering technique that extracts information from training documents and interviews with subject matter experts to create a hierarchal representation that describes a work domain” (email communication, August 2014). WDA

captures a multifaceted picture of what is involved, in this case, in reaching a medical diagnosis. The simulation platform includes dynamic factors such as elapsed time and the patient’s condition. While the earlier VPS model offers multiple options or branches at each decision

point, each branch is a predetermined linear path. Options and conditions in the new model change on the fly, more closely resembling the process of reaching a diagnosis in real life. NCPS is enthusiastic about this new theoretical framework, and studies are ongoing to collect data to report about its efficacy.



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Evidence of Effectiveness

The effects of high-fidelity simulation are difficult to measure, so decisions about applying this technique to different aspects of healthcare are based primarily on experience and face value. David Cook, MD, has studied the effectiveness of simulation-based training and found that it is at least as effective as other instructional methods.⁷ Understanding the value of different kinds of simulation used for different purposes as well as the relative costs and benefits will, however, require further study. Cook and his colleagues suggest that “Future research should clarify the mechanisms of effective simulation-based education: what worked, for whom, in what contexts?”⁸(pe876)

It seems reasonable to believe that the dynamics of decision-making and cognitive factors involved in the diagnostic process can be revealed, discussed, and improved through the use of simulation. Understanding what is meant by “diagnostic error” and what causes it will help inform the use of simulation as well as other methods for improvement.

References

- 1 Burden, AR. Simulation in anesthesiology. *Anesthesiology News*. 2011 October; 23–27. http://www.anesthesiologynews.com/download/Simulation_ANSE2011_WM.pdf. Accessed August 30, 2014.
- 2 Agency for Healthcare Research and Quality. Simulation training. Patient safety primer. AHRQ PSNet. <http://psnet.ahrq.gov/primer.aspx?primerID=25>. Accessed August 24, 2014.
- 3 Stiegler MP, Tung, A. Cognitive processes in anesthesiology decision making. *Anesthesiology*. 2014;120(1):204–217.
- 4 Fanning RM, Gaba DM. The role of debriefing in simulation-based learning. *Simul Healthc*. 2007;2(2):115–125.
- 5 US Department of Veterans Affairs. VHA SimLEARN. About us. http://www.simlearn.va.gov/SIMLEARN/about_us.asp. Accessed August 30, 2014.
- 6 McGee JB. Virtual patient platforms. *Patient Safety & Quality Healthcare*. 2012;9(3):40–44. <http://www.psqh.com/mayjune-2012/1289-virtual-patient-platforms.html>. Accessed August 30, 2014.
- 7 Cook DA. The literature on health care simulation education: what does it show? Perspectives on safety. *AHRQ Web M&M*. March 2013. <http://webmm.ahrq.gov/perspective.aspx?perspectiveID=138>. Accessed August 30, 2014.
- 8 Cook DA, Hamstra SJ, Brydges R, et al. Comparative effectiveness of instructional design features in simulation-based education: systematic review and meta-analysis. *Medical Teacher*. 2013;35:e867–e898.

IOM Study Committee on Diagnostic Error Meets for Second Time

By Mark L. Graber,
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The second session of the Institute of Medicine's (IOM) Study Committee on Diagnostic Error met on August 7, 2014. This second session strove to provide opportunities for a wide range of experts—several of whom are SIDM Board and committee members—to share their insights on the problems affecting safe, timely, and effective diagnosis.

Heidi Julavits began the formal presentation portion of the meeting by sharing her experience as a patient in the diagnostic process. She is an author and editor who has recently published on the issue.¹

Tejal Gandhi and David Newman-Toker provided perspectives on diagnostic error and its place in the patient safety movement. Gordon Schiff, Hardeep Singh, Michael Kanter, and David Classen talked about the importance of electronic health records and decision support systems in finding, studying, and preventing diagnostic errors.

Leonard Berlin and Jeff Myers reviewed diagnostic errors from the perspective of the diagnosis support services: radiology, the clinical laboratory, and pathology services. Barbara Brandt and Eduardo Salas talked about the value of teams and involving interdisciplinary staff in efforts to curb diagnostic errors. Bob Trowbridge discussed how to involve clinicians in reporting diagnostic errors, and Allen Kachalia reviewed legal aspects relating to diagnostic errors.

To access materials and stay up-to-date on the committee's progress, visit the project's webpage: <http://www.iom.edu/activities/quality/diagnosticerrorhealthcare.aspx>. The next open meeting of the committee will be held November 5 and 6, 2014, in Washington, DC.

Reference

1 Julavits H. Diagnose this! How to be your own best doctor. *Harper's Magazine*. April 2014;328:25-35.

NEWS FROM THE FIELD

Diagnostic Errors Are Most Common Cause of 'Catastrophic' Payouts

Catastrophic medical malpractice payouts in the United States. Bixenstine PJ, Shore AD, Mehtsun WT, et al. *J Healthc Qual*. 2013;36(4):43-53.

In this study, researchers examined seven years of data from the National Practitioner Data Base (NPDB) and found that diagnostic error was the most common cause of cases with catastrophic payouts and the most common cause of all paid claims. Bixenstine, Shore, Mehtsun, and colleagues studied all paid claims in the NPDB from January 1, 2004, to December 31, 2010, and extracted data on patients, providers, and the characteristics of each claim. Allegations related to diagnosis comprised 34.2% of paid claims of \$1 million or more during this period. Next came claims related to obstetrics (21.8%) and surgery (17.8%). Among specialties, the highest incidence of paid claims over \$1 million occurred in anesthesia, followed by obstetrics and surgery. Diagnosis represented 32.1% of non-catastrophic payouts and 32.2% of all paid claims.

As reported in an article published one year ago,¹ a different group of researchers analyzed all paid claims in the NPDB across 25 years, from 1986 through 2010. Similar to the 2014 study, they found that diagnostic error was associated with the largest number of paid claims (28.6%) and the highest proportion of total payments (35.2%). Both teams of researchers are affiliated with Johns Hopkins University.

Reference

1 Saber Tehrani AS, Lee H, Mathews SC, et al. 25-year summary of US malpractice claims for diagnostic errors 1986-2010: an analysis from the National Practitioner Data Bank. *BMJ Qual Saf*. 2013;22(8):672-680.