PLAYING THE IMITATION GAME: IMPROVING HEALTHCARE QUALITY WITH PATIENT SIMULATION

BY MARTIN WARTERS, MA; NIMISH MEHTA, PHD, MBA, CHCP; SUSAN R. GRADY, MSN, RN-BC

VIGNETTE 1*

Sheila is a virtual patient who was diagnosed with rheumatoid arthritis (RA) 2 years ago and initially treated with sulfasalazine. Six months later, her symptoms had not improved and treatment was switched to methotrexate (MTX) 25 mg/wk; however, now her joint symptoms have worsened. She feels fatigued and has morning stiffness.

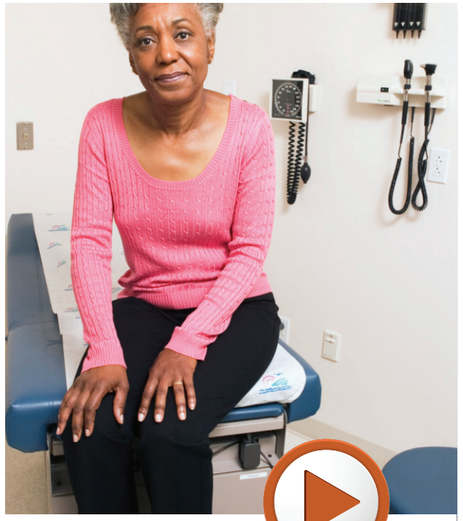
After taking a virtual history by selecting scripted questions and test options, you diagnose MTX resistance and increase the MTX dose. On selection of this option, expert feedback tells you that this option is not considered an effective option for patients with an inadequate response to MTX, and further, that the recently updated American College of Rheumatology guidelines suggest switching to a biologic agent at this stage. Sheila gives you the opportunity to apply these recent updates to the RA treatment algorithm and to see her outcomes.

*The simplicity of this case vignette belies the complexity of this type of patient encounter within the capabilities of a simulation platform, but is presented here as conceptual

Overview

Health professionals encounter many complex clinical scenarios in their daily practice. To be prepared to deal effectively and competently with a range of patient presentations and clinical experiences, clinicians need to be aware of an accumulating array of diagnostic, therapeutic, and care management innovations and to consider a vast repository of biomedical and clinical information for a given patient. Therefore, clinicians need exposure to education that will help them develop the necessary skills for patient assessment, diagnosis, and evaluation; teach them how to recognize symptoms and treatment adverse effects; and explore complex clinical scenarios that need critical thinking and collaboration.

Virtual patient simulation (VPS) is a proven educational modality that provides opportunities for clinicians to execute clinical tasks and test newly acquired knowledge in scenarios similar to those they can anticipate in a clinical setting, without putting either their patients or themselves at risk. VPS-based educational activities provide opportunities for learners to apply relevant clinical knowledge, make appropriate decisions, and practice skills in a consequence-free learning environment. Throughout an educational activity, learners receive feedback on their



REFERENCES:

1. Gaba DM. The future vision of simulation in healthcare. *Simul Healthc.* 2007;2:126-135.
2. Konia M, Yao A. Simulation-a new educational paradigm? *J Biomed Res.* 2013;27:75-80.
3. Lucey CR. Medical education: part of the problem and part of the solution. *JAMA Intern Med.* 2013;173:1639-1643.
4. Aggarwal R, Mytton OT, Derbrew M, et al. Training and simulation for patient safety. *Qual Saf Health Care.* 2010;19 Suppl 2:i34-43.
5. Healthcare SfSi. About simulation. 2015. Accessed April 20, 2015.
6. Passiment M SH, Huang G. Medical Simulation in *Medical Education: Results of an AAMC Survey.* America Association of Medical Colleges 2011.
7. Damassa DA ST. SImulation TEchnologies in Higher Education: Uses, Trends, and Implications ECAR *Research Bulletin.* 2010;3.
8. Ross AJ, Kodate N, Anderson JE, Thomas L, Jaye P. Review of simulation studies in anaesthesia journals, 2001-2010: mapping and content analysis. *Br J Anaesth.* 2012;109:99-109.
9. Curtis MT, DiazGranados D, Feldman M. Judicious use of simulation technology in continuing medical education. *J Contin Educ Health Prof.* 2012;32:255-260.
10. Wayne DB, Siddall VJ, Butter J, et al. A longitudinal study of internal medicine residents' retention of advanced cardiac life support skills. *Acad Med.* 2006;81:S9-S12.
11. Cook DA, Hatala R, Brydges R, et al. Technology-enhanced simulation for health professions education: a systematic review and meta-analysis. *JAMA.* 2011;306:978-988.
12. McGaghie WC, Issenberg SB, Petrusa ER, Scalese RJ. A critical review of simulation-based medical education research: 2003-2009. *Med Educ.* 2010;44:50-63.
13. Crofts JF BC, Ellis D, et al Management of shoulder dystocia: skill retention 6 and 12 months after training *Obstet Gynecol* 2007;110:1069-1074.
14. Boet S BB, Naik VN, et al. Complex procedural skills are retained for minimum of 1 yr after a single high-fidelity simulation training session. *Br J Anaesth.* 2011;107:533-539.
15. Downing SM, Yudkowsky, R. *Assessment in health professions education.* New York, NY: Routledge; 2009.
16. Cook DA, Brydges R, Zendejas B, Hamstra SJ, Hatala R. Mastery learning for health professionals using technology-enhanced simulation: a systematic review and meta-analysis. *Acad Med.* 2013;88:1178-1186.
17. Issenberg SB ea. Features and uses of high-fidelity medical simulations that lead to effective learning: A BEME systematic review. *Med Teach.* 2005;27:10-28.
18. Weinschreider J, Dadiz R. Back to basics: creating a simulation program for patient safety. *J Healthc Qual.* 2009;31:29-36; quiz 37.
19. Ziv A, Wolpe PR, Small SD, Glick S. Simulation-based medical education: an ethical imperative. *Acad Med.* 2003;78:783-788.
20. Yee N, Bailenson J. The Proteus Effect: The effect of transformed self-representation on behavior. *Human Communication Research.* 2007;33:271-290.
21. Huang G RR, Candler C. Virtual patient simulation at US and Canadian medical schools. *Acad Med.* 2007;82:446-451.
22. Issa N SM, Santacaterina S, Shapiro M, Wang E, Mayer RE, DaRosa DA. Applying multimedia design principles enhances learning in medical education. *Med Educ.* 2011;45:818-826.
23. Huwendiek S RF, Bosse H-M, de Leng BA, van der Vleuten CPM, Haag M,Hoffman GF, Tönshoff B. Design principles for virtual patients: a focus group study among students. *Med Educ.* 2009;43:580-588.
24. Salas E, Paige JT, Rosen MA. Creating new realities in healthcare: the status of simulation-based training as a patient safety improvement strategy. *BMJ Qual Saf.* 2013;22:449-452.

decisions, potential consequences, and where necessary, alternative decisions they could have made. An ideal VPS also allows for identification of healthcare provider preferences for certain decisions when more than one decision is plausible, as well as the rationales behind those decisions. When designed with these principles in mind, VPS-based education has the potential to not only enhance provider performance but also improve patient outcomes and healthcare quality.

Evidence-Based Education: From Flexner to Flexibility

Education for healthcare professionals has been steadily shifting from the passive, nonparticipant medical education model outlined by Abraham Flexner in the early 20th century to formats that support deep learning, which are designed to ensure clinicians can translate their learning into high-quality, low-cost, safe clinical practice.[1-3] In medical education, **competency-based learning** has largely replaced the objectives-based, "see one, do one" approach. More widely in healthcare education, **interactive, experiential** learning has replaced passive information delivery, and lifelong, **continuous** learning has emerged as the preeminent continuing education model best suited to support the needs of an evolving healthcare system and the healthcare professionals charged with delivering patient care.[2-4] Such a model is especially pertinent for modern healthcare delivery because the volume of biomedical knowledge continues to accumulate rapidly, and the clinical information clinicians must consider for a given patient is vast.[2,4]

As part of the welcome trend toward experiential education for health professionals, **simulation-based education** has emerged as a flexible innovation with the potential to not only deepen and reinforce learning but also change clinical behavior and improve patient outcomes.

What is Simulation-Based Education?

SIMULATION IN HEALTHCARE EDUCATION REPLACES OR AMPLIFIES REAL PATIENT EXPERIENCES WITH GUIDED EXPERIENCES DESIGNED TO REPLICATE REAL HEALTH ENCOUNTERS. USING INTERACTIVE MODALITIES SUCH AS LIFELIKE MANNEQUINS. PHYSICAL MODELS. STANDARDIZED OR VIRTUAL PATIENTS. OR SCREEN-BASED PATIENTS.[5-6]

Simulation is broadly defined as an educational modality that replicates clinical practice in a controlled, authentic environment.[6] In healthcare education, simulations vary in their levels of sophistication and complexity from physical and physiological mannequins, such as Resusci®-Anne and SimOne, pioneered in the 1960s to teach clinicians how to manage critical cardiac and anesthetic events, to devices and part-task trainers designed to support procedural skill practice and live actors, standardized patients, and other highly stylized and digital solutions.[5,7-8]

Simulation has expanded as an education modality in part because of time constraints for learning, and the challenges for healthcare professionals of keeping up to date with rapidly emerging clinical and scientific data. Accordingly, simulation-based education in medical and nursing schools has been steadily growing to teach and assess clinical knowledge; complex, technical skills that require repetitive practice (e.g., catheter insertion, blood draw, endoscopic procedures); and low-frequency events that require high acuity (e.g., cardiac arrest procedures).[6,7] Relatedly, hospitals and other healthcare organizations are increasingly using simulation in team training as part of their response to public pressures to improve patient safety and quality of care.[4]

Nonetheless, there are particular challenges to the widespread adoption of real-life simulation (i.e., mannequins or standardized patients), not least because this approach can be expensive when the cost of simulation facilities, initial investment into and ongoing maintenance of equipment, and technical support for virtual worlds are considered.[8] These modalities are also constrained by the need for one-to-one interaction with the user, limiting the number of simultaneous training sessions.

A BROAD RANGE OF SIMULATIONS IS USED TO AMPLIFY PATIENT EXPERIENCES. MIRROR REAL-WORLD CLINICAL REASONING CHALLENGES. AND ENABLE CLINICIANS TO PRACTICE PROCEDURAL OR SURGICAL SKILLS IN SCENARIOS THAT REPLICATE REAL HEALTH ENCOUNTERS.[1]

Virtual Patient Simulation: A Proven Education Modality

As part of this trend toward simulation, computerized, online clinical case simulations, or VPS, have emerged as an especially appealing particular educational resource. Notably, more than 60% of medical schools now provide some type of curriculum using online virtual patient cases,[6] and VPS is increasingly endorsed as an evidence-based, interactive learning format in continuing education for healthcare professionals.[9]

Effective VPS is characterized by credible, case-based, situated learning activities that address the complexity of specific clinical domains and support transfer of knowledge and skills beyond the specific learning situation. Learners encounter virtual patients in an adaptive, controlled, and safe environment that is specifically designed to provide an authentic approximation of clinical practice. This environment allows learners to assume the role of an active protagonist who is treating a real patient, presenting with real concerns and issues, and supports experiential learning by giving health professionals control over their pace of learning.

A robust body of research consistently associates simulation-based healthcare education such as VPS with better outcomes for knowledge, skill, behavior change, faster learning, and better long-term retention.[4,8,10-14]

So which education design features uniquely position VPS to support these outcomes?

First, the VPS format provides learners with spaces that allow them **freedom to experiment** as well as permission to fail and learn from their mistakes.[2] Second, direct process and outcome **feedback** on learners' decisions and actions concerning each individual patient case, combined with opportunities to review decisions and the consequences of those decisions, allow learners to make real-time clinical course corrections. This process of review and reflection in response to feedback supports behavior change by building a repertoire of patient encounters and clinical problem solving, which learners can transfer from virtual to real clinical settings.[15]

Third, based on the educational principle of **deliberate practice**, simulation-based healthcare education formats, such as VPS, help learners achieve success through repetition with increasing levels of difficulty. This approach can help learners progress from novice to mastery levels of competence through a knowledge-in-action process that, when integrated within a curriculum and supported by clearly defined performance and outcomes metrics, has a larger effect on skill development and patient outcomes than nonmastery learning.[16] Mastery learning builds confidence in clinical decision-making by ensuring learners achieve a rigorously defined benchmark before progressing to the next level. For healthcare professionals,

Research shows that simulation-based education in healthcare is effective when it includes the following features:[2,4,9,17]

FUNCTIONAL FIDELITY in the responsiveness of and range of variation in virtual patients

FREEDOM to make and learn from mistakes without peer judgment

FEEDBACK or personalized, constructive, diagnostic debriefs that allow learners to review the consequences of their choices or actions

FORMATIVE ASSESSMENT that establishes a clear performance baseline and allows learners to view and track their progress

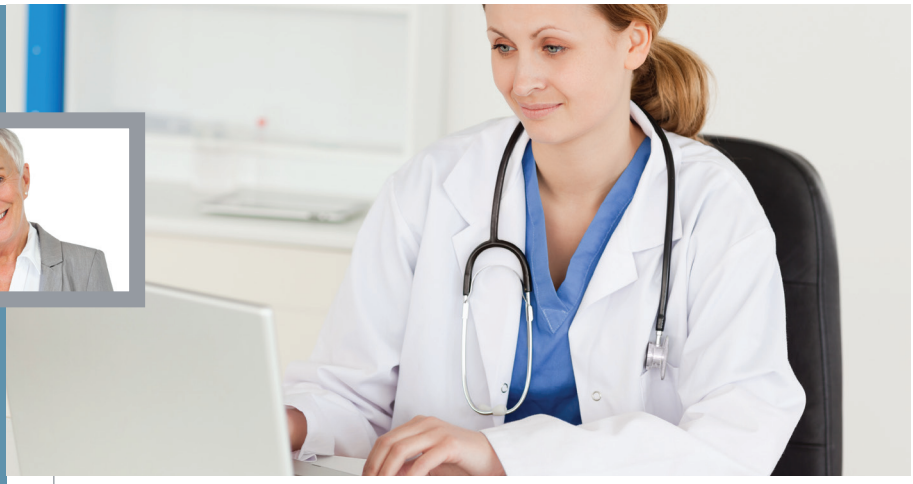
OPPORTUNITIES TO REPEAT actions or choices and plan for behavior change according to objective indicators of performance

VIGNETTE 2

In response to instant, formative, guidance on your treatment selections, you determine that a combination treatment with MTX and biologic agents is the most suitable for this patient, Guidance on your final selected option tells you that this follows the most-up-to-date guidelines for treating RA.

The guidance includes the approval status, efficacy/tolerability profiles, evidence-based recommendations, recent clinical trial data, and/or alternative treatment options for this patient.

In the after-action review of your performance, you learn that the Key Opinion Leader who authored this case recently treated a similar patient to Sheila in real life, and at a 4-week follow-up saw decreased disease activity.



MedSims is Medscape Education's proprietary simulation-based education architecture. MedSims virtual patient simulations enhance learning via visually appealing and immersive experiences that target multiple learning styles and incorporate formative assessments with powerful metrics and clinical guidance on performance for a given scenario. MedSims has the unique advantage of capturing clinicians' decisions and preferences as they would in real-life practice and providing insights into the rationales for their treatment selections out of the several available therapies.

Accelerate clinician learning and patient outcomes via VPS. To learn more, visit Medscape.org/vision or contact Chris Hoffman at choffman@medscape.net.

that also means faster transfer of learning to real-world practice,[1] especially when accompanied by the National Committee for Quality Assurance's (NCQA) formula for improvement: measure, analyze, improve, and repeat.

LEARNING AND SKILL DEVELOPMENT ARE ACCELERATED WHEN LEARNERS HAVE PERMISSION TO FAIL AND LEARN FROM THEIR MISTAKES.

From the Imitation Game to Real-World Success

VPS has come of age as a vital education modality furnished to close the gap between seeing and doing; knowing and knowing how, and in so doing, can reduce the burden of clinical training on patients and establish consistent standards in clinician proficiency.[1,8] Although the science of simulation is still developing, having been stimulated by a recent $5 million grant from the Agency for Healthcare Research and Quality's (AHRQ) patient safety program, the value of simulation-based education such as VPS for improving performance has been validated by many studies across different clinical settings and disciplines.[18,19] Overall, these studies point to the downstream benefits of this educational modality for reducing medical error,[19] creating direct efficiencies in care, improving patient outcomes, and, potentially in achieving the goals of the Triple Aim: to deliver better care, improve health, and lower costs.[1] In short, what is learned in the simulated environment — applying relevant clinical knowledge, making appropriate decisions, and practicing skills — transfers well to real-world situations and translates into changed behavior.[7,20]

In the last decade, the wider availability of broadband internet and access to sophisticated multimedia devices have made high-fidelity VPS experiences both attainable and more accessible to learners.[7] Such VPS fidelity will be critical for reaching Millennial clinicians and beyond — a generation already immersed in multimedia and web-based games and more fully engaged by electronic media and audio-visual stimulation than previous generations.[21-23] When aligned with instructional design accompanied by clear learning objectives, authentic scenarios, constructive feedback, and opportunities for repetition,[24] VPS in continuing education is especially appropriate for deliberate practice in patient assessment, diagnosis, and evaluation skills; recognizing symptoms and treatment adverse effects; and exploring complex clinical scenarios.

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