Review Article

Virtual Simulations in Online Nursing Education: Align With Quality Matters

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Abstract: Simulation has become commonplace yet must be expanded for distance/online nursing students. Evidence-based simulation entities (e-simulations, video simulation, and telepresence simulation) provide asynchronous and synchronous options. For quality assurance, the selected modality is best when aligned with Quality Matters (QM™) standards in the form of component design standards for ease of student and faculty use. A variety of simulation modalities are reviewed for component (simulation) design to provide high-quality simulation aligned with course design, delivery, and objectives for online/distance nursing students.


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Current Norms: Simulation and Online Learning

Simulation learning activities within specific space and time restraints have become commonplace in face-to-face campus-based nursing school environments. As experiential learning, “simulation has the potential to change the face of nursing education as it opens doors for students to experience today’s complex and challenging patients and it enhances their critical thinking skills” (Davis, Kimble, & Gunby, 2014, p. 149).

The distinct advantage of simulation is that it is an authentic, realistic, safe practice environment where the student can in fact “do no harm.” And, within this process of learning, the student may engage in deliberate practice, “a systematic, recursive approach to developing mastery of the representative tasks of a domain” (Chee, 2014, p. 250). Likewise, technical simulation modes often allow for repeatability for enhancing one’s performance or revising an undesirable consequence. To culminate a simulation process, debriefing and/or feedback is customary to ensure student perceptions are correct and guard against errors in an actual clinical practice setting.

Simulation, as an established synchronous learning modality, via a simulation laboratory, has been very limited for the online distance nursing student. Thus, this
advantageous learning strategy, simulation, should become an equal opportunity for online distance nursing students via synchronous and asynchronous virtual access and delivery.

Online learning is and has been on the rise for more than a decade. According to Snyder, deBrey and Dillow (2018), 29.8% of undergraduate students were enrolled in an online course as of fall 2015 (p. 475). Of these, 14.4% were taking online courses exclusively (Snyder et al., 2018, p. 475). Nursing, despite being a discipline that routinely requires face-to-face interaction because of clinical requirements, has pushed forward seeking opportunity in the online, cyberspace continuum as a format for educating nurses. For the most part, this has generally been in graduate-level programs and degree completion programs. Many other prelicensure nursing programs offer hybrid courses, whereas few innovative programs are completely online.

The rise in exploitation of online education has fostered the development of best practice standards for content delivery. Most notably, a nonprofit quality assurance organization, Quality Matters (QM), developed an instrument in the form of a rubric that is used to ensure if online course designs meet standards that have been set to enhance student success in a virtual classroom. The QM rubric is based on best practices regarding effective online learning and provides a set of eight general standards and 43 specific standards used to align and assess the quality of an online course and its components (Quality Matters, 2018). Thus, this rubric should be used as a resource to thoughtfully incorporate simulation technologies into online medical-surgical nursing courses.

**Defining a Void**

Aligned with the need for simulation for online distance nursing students is a call from the National League of Nursing (NLN) Vision (2012). This directive expresses a priority for research in nursing education to study “the use and cost-effectiveness of technologies (e.g., online, simulation, telehealth) to expand capacity in nursing education” (NLN Board, 2012, p. 3). Although there is research regarding the use of virtual technologies (e-simulation, video simulation, telepresence simulation) in nursing education (Bogossian, Cooper, Cant, Porter, & Forbes, 2015; Cant & Cooper, 2014; Foronda et al., 2017; Rudolph et al., 2017), there is a void regarding a specific process for selection, integration, and implementation of various simulation modalities into existing online nursing courses. Therefore, the purpose of this review is to present a plausible framework, based on QM, to aid in the selection and integration of a variety of virtual simulation modes to promote online student success and faculty satisfaction.

**Selection of Simulation Resources: Accentuating the Positive**

Creativity, collaboration, continuity, cost-effectiveness, and conservation of faculty time drove the initial selection and review of the various simulation resources. However, the final choice, integration and implementation of simulation modalities, were based on accentuating positive essential as geared to facilitate student success and reflect faculty endorsement.

Accentuating the positives, it is requisite that a simulation modality be interactive and stimulating for learners and provides a foundation of continued exploration. Simulations must also enable controlled and structured outcomes with the inherent ability to align with course content and objectives. Likewise, there must be risk-free, trial and error learning within a real-life scenario with feedback through prompts or debriefing. The virtual nature of the simulations should allow for wide availability, time flexibility, single- or multiple-user interaction, and self-pacing. Ease of use and secure access are also important details for positive virtual simulations. Limited expenditure of teaching resources and cost-effectiveness of virtual simulations are important essentials as well.

In review of simulation entities, a close match to the positive essentials was the ultimate goal for selection. In addition, it was a requisite that selected means of simulation addressed pertinent student learning needs (e.g., head-to-toe assessment, intravenous insertion). As such, four specific simulation entities that “accentuate the positive” have been established and incorporated into a sequence of online medical-surgical clinical courses. These simulation modalities include a situational e-simulation (Shadow Health® Assessment), a technical e-simulation (mySmartHealthcare®), staged video simulation, and robotic telepresence (Double Robotics) simulation. Table 1 outlines the “fit” of each simulation component in relation to their positive attributes.

Once a determination had been made on the chosen simulation resources, a review of all situational e-simulations

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**Key Points**

- Simulation, an advantageous learning strategy, and the unquestionable attributes of virtual simulation entities warrant their use in online undergraduate nursing education.
- The choice of virtual simulations should be directed and evaluated by an alignment to QM standards in the form of component standards to ensure student success and preserve faculty resources.
- Educators are responsible to assess, evaluate, and research the impact of virtual simulation modalities.
from Shadow Health Assessment were studied to assess best fit in the medical-surgical curriculum. Likewise, the technical e-simulations from MySmartHealthCare® were reviewed and categorized according to best fit in the curriculum. Three video simulations were created and easily fell into the junior- and senior-level medical-surgical courses. Owing to the novel use of the telepresence robots, this simulation was reserved for senior-level students only. After placement decisions, all simulations were selected for use as a compliment to clinical hours or as a replacement for clinical hours.

Integration: QM™ Rubric

To fully incorporate simulation technologies in a tiered series of online medical-surgical nursing courses, following QM™ standards would be key to student success as the standards reflect current research on effective online learning. Thus, an online medical-surgical nursing course, certified by QM™, provided a standardized framework. The QM™ eight general standards germane to course design in higher education acknowledge course overview and introduction, learning objectives, assessment/measurement, instructional materials, course activities/learner interaction, course technology, learner support, and accessibility/usability (Quality Matters, 2018).

According to Legon (2015), “the Rubric encourages a variety of approaches to meeting particular standards. . . . [and] wide variation is permitted and encouraged to assure that courses retain their individuality …” (p. 167). Pickens and Witte (2015) adapted QM benchmarks for inclusion of embedded librarian content into various online courses. As such, “all distance education stakeholders” could benefit from the added resources as developed with the standards as a guide (Pickens & Witte, 2015, p. 125). In a similar manner, the eight standard categories, somewhat adjusted, also framed the chosen simulation modalities, allowing for course consistency and quality assurance in the select online medical-surgical nursing courses.

<table>
<thead>
<tr>
<th>Accentuate the Positive</th>
<th>Shadow Health e-Simulation</th>
<th>MySmartHealthcare e-Simulation</th>
<th>Video Simulation</th>
<th>Telepresence Simulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interactive and stimulating for learners</td>
<td>Yes</td>
<td>Yes</td>
<td>Observation and DB debriefing</td>
<td>Yes</td>
</tr>
<tr>
<td>Single-user or multiple-user interaction</td>
<td>Single user</td>
<td>Single user</td>
<td>Single user</td>
<td>Multiuser</td>
</tr>
<tr>
<td>Essence of real-life scenarios</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Enable controlled/structured outcomes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Enable trial and error learning</td>
<td>Yes</td>
<td>Yes</td>
<td>Observe role model</td>
<td>Yes</td>
</tr>
<tr>
<td>Provide a risk-free setting</td>
<td>Yes</td>
<td>Self-sustaining</td>
<td>Self-sustaining (development time)</td>
<td>Yes</td>
</tr>
<tr>
<td>Less expenditure of teaching resources</td>
<td>Yes</td>
<td>Self-sustaining</td>
<td>Yes</td>
<td>Faculty involved</td>
</tr>
<tr>
<td>Provide a foundation for continued exploration</td>
<td>Yes</td>
<td>Individual password</td>
<td>Yes</td>
<td>Group password</td>
</tr>
<tr>
<td>Secure access</td>
<td>Yes</td>
<td>Individual password</td>
<td>Yes</td>
<td>Group password</td>
</tr>
<tr>
<td>Feedback through prompts or debriefing</td>
<td>Prompts and reflection</td>
<td>Tutorial and prompts</td>
<td>Discussion board debriefing</td>
<td>Debriefing</td>
</tr>
<tr>
<td>Wide availability</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Limited</td>
</tr>
<tr>
<td>Ease of use</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Self-paced</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Ability to align with course content</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Ability to align with course outcomes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cost-effective</td>
<td>$100 lifetime</td>
<td>Free via simulation center</td>
<td>Yes</td>
<td>Start-up expense</td>
</tr>
<tr>
<td>Time flexibility (asynchronous)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Synchronous</td>
</tr>
</tbody>
</table>

Table 1: Positive Attributes of Simulation Modalities

Derived and expanded from Cant & Cooper, 2014.
the video simulation, and drive the telepresence robot in a live simulation. Beyond this, further alignment to the QM rubric include clear learning objectives tiered to course objectives available through the e-simulations or as developed by faculty for video and robotic telepresence simulation. Likewise, the ease, variety, and accuracy of assessment strategies are paramount. Expectedly, the better the simulation entity aligned with the QM rubric, the greater the ease of implementation, evaluation, and preservation of faculty time. In turn, the greater the ease of use, the greater the ability to expand usability, a benefit to both students and faculty.

The Simulation Entities: The Specifics

The e-Simulations

According to Guzic et al. (2012), “the cognitive, practical, and didactic benefits of computer-controlled simulation training are that it enables individuals to learn, practice, and repeat procedures as often as necessary to correct mistakes, perfect techniques, and optimize clinical outcomes” (p. 460). Likewise, Cant and Cooper (2014) conclude that Web-based simulation has inherent benefits that are above and beyond those of a traditional simulation. The technology offers repeatability, accessibility, and feasibility and “allows integration of multiple ways of learning” (Cant & Cooper, 2014, p. 1440). Thus, the use of evidence-based e-simulation was determined to be an essential for enhanced student learning in an online nursing curriculum.

Shadow Health®

Shadow Health® has developed a “conceptual framework to operationalize clinical reasoning within virtual patient simulations” (Shadow Health, 2018). Thus, this situational e-simulation was chosen to assist students with the development of assessment and communication skills. Via a self-paced interaction with diverse Digital Standardized Patients™ students are able to process through a patient interview, examination, and documentation. Thorough simulation objectives readily aligned with course module

<table>
<thead>
<tr>
<th>Table 2 Simulation Alignment With General Standards for Component Design</th>
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</thead>
<tbody>
<tr>
<td>General Standard Component Design</td>
</tr>
<tr>
<td>Product/component introduction</td>
</tr>
<tr>
<td>Simulation learning objectives/competencies</td>
</tr>
<tr>
<td>Assessment and measurement</td>
</tr>
<tr>
<td>Content aligns with course module materials</td>
</tr>
<tr>
<td>Learner interaction via simulation modality</td>
</tr>
<tr>
<td>Technology requirements to “RUN” simulation modality</td>
</tr>
<tr>
<td>Learner support (built into product and/or otherwise available)</td>
</tr>
<tr>
<td>Accessibility (within constraints of physical performance requirements for nursing students); ease of use</td>
</tr>
</tbody>
</table>

Based on QM™ general standards.
objectives. In all assignments, students are also engaged in a self-reflection. Feedback is provided, and a Student Performance Index™ is generated at completion.

This e-simulation product has exceptional introductory components, the Digital Clinical Experience Orientation and the Conversation Concept Lab. Likewise, an avatar preceptor is available to students throughout simulation experiences. For the most part, Shadow Health® offers 24/7 availability for student concerns and operation issues. The lifetime subscription to the health assessment component is quite reasonable given that the product is used through multiple courses.

On the faculty side, Shadow Health® requires a basic setup before each academic semester or quarter, albeit there is ample help and friendly reminders from their staff. In addition, there is the opportunity to customize assignments and assessments. For purposes of our courses, students submit their performance index to the course learning management system for grading. This process simplifies grading immensely, although detailed student reports may be easily viewed on the product website via instructor login.

MySmartHealthcare®

To aid in skill exposure and development, MySmartHealthcare®, a series of technical e-simulations was selected. The focus of these e-simulations is on “key skills and core competency development through highly interactive and powerfully engaging simulations that require decision-making” (MySmartHealthcare, 2017). As such, the self-paced e-simulations include skills that registered nurses will perform (foley insertion, nasogastric tube insertion) and those they may observe or assist with (adult intubation, central line insertion).

MySmartHealthcare® has basic introductory components and promotes student success by allowing multiple attempts to meet performance levels. Detailed objectives align within the broader course outcome. Feedback is also provided, and a performance certificate with a percentage score is generated at completion. Benchmarks are set by faculty, and students may submit their performance certificate to the course learning management system once they have met the requirement. This e-simulation is offered free of charge through partnership with the local simulation center. These simulation entities offer prompt responses and assistance with student inquiries.

Video Simulation

Video simulations were created through a collaboration between faculty and the simulation center staff. According to Cardoso et al. (2012), “a video-recorded simulation is a teaching technology that allows one to represent reality under controlled conditions, both of the environment and the individuals involved, which in turn favors learning” (p. 709). Vital to the video simulation is the use of actors for the standardized patient and the spouse. Use of standardized patients (actors) can “provide rich clinical experiences for undergraduate nursing students” (Sideras et al., 2013, p. 425). In addition, an exemplary registered nurse is used in the video to depict precision and fluidity of patient care as “observation of an expert role model and simulation can impact student development of clinical judgment” (Lasater, Johnson, Ravert, & Rink, 2014, p. 263).

Faculty time is required for the conceptualization and creation of video content, which was chosen based on the perceived needs of the students. Alignment to course content and objectives was also checked by faculty. But, once this initial development process is completed, the video has an extensive shelf life. The video and aligned patient chart materials can be used repeatedly with limited faculty time. A final item, assessment, is performed through the completion of an extensive clinical assignment and participation in a postsimulation discussion board debriefing, for which all require grading by the faculty.

Telepresence Simulation

As is known, “simulation replicates key aspects of a clinical situation to facilitate student learning—to promote critical thinking and self-efficacy” (Richardson, Goldsamt, Simmons, Gilmartin, & Jeffries, 2014, p. 309). Therefore, the means to allow the actual “presence” of a distance student among campus-based students required a mobile robotic telepresence. To suit our needs, we selected the Double Robot for its unequivocal ease of use, size, and cost (Double Robotics, 2018). The mobile robotic telepresence brings distance students to the point of learning, the actual brick and mortar simulation laboratory.

With a current fleet of 16 Double Robots, an entire class of senior-level distance students participate in scheduled simulation sessions and debriefings with their on-campus peers. This simulation is by far the most consuming of faculty time, beginning with the collaborative effort to develop scenarios and objectives that align with course outcomes and address student learning needs. Although a telepresence simulation technician is present for the scheduled simulations, the organization, planning, student driving lessons (how to pilot the Double Robot), and student evaluation require additional faculty attention and resources.

The telepresence simulation is also the one simulation modality that must be completed synchronously. With proper planning, this can and has been executed without a hitch. This simulation modality also allows actual faculty observation which provides a unique vantage point for assessment of an otherwise invisible virtual student. Although this virtual simulation modality requires continual faculty presence and participation, it is no more than that of a typical on-campus, face-to-face simulation.
Embrace the Opportunity

Technological innovations in simulation are here to stay and may become an integral part of the online nursing education process. As new and innovative technology is continually being developed, the options may become overwhelming. Therefore, it is with great care that faculty selects and determines the usefulness and viability of a “technology” within their course design.

This review has offered a means to evaluate technological entities for use (accentuate the positive) and presented a framework to align the technology with course objectives (Quality Matters Rubric) for meaningful learning. Beyond this, we are only as good as our chosen tools and the extent of our imagination to provide experiential learning through a virtual environment.

As we proceed on this educational landscape, we have an ethical obligation and responsibility to continually assess and evaluate the impact of these simulation modalities and seek continued improvement. Such assessments can be and are in the form of research initiatives. But, faculty must embrace the challenge and opportunity to prime future nurses with an ability to assimilate into and navigate within multifaceted, technology-based health care systems. May intrigue, innovation, and implementation continue to drive the commitment of educating nurses in a virtual sphere.

Acknowledgment

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References


