Using Virtual Patient Simulation in Substitution for Traditional Clinical Hours in Undergraduate Nursing

Research Report

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1. Introduction

In recent years, undergraduate nursing education has been facing numerous challenges as the demand for nurses continues to increase. The shortage of nursing faculty in addition to increased student enrollment has put a greater burden on the limited resources available in most programs (Cobbett & Snelgrove-Clarke, 2016; Foronda, Godsall, & Trybulski, 2013; Foronda & Bauman, 2014; Laure, Pepin, & Allard, 2015). There is also a shortage of the clinical placements necessary to provide students with the education and experience necessary to become a competent and autonomous professional nurse (Cobbett & Snelgrove-Clarke, 2016; Foronda et al., 2013, 2014; Khalaila, 2014, Laure et al., 2015). Given these persistent challenges, many nursing programs have started to substitute students' traditional hours with some form of simulation. In fall of 2014, the National Council for State Boards of Nursing Simulation Study provided evidence that substituting high-quality simulation experiences for traditional clinical hours results in comparable educational outcomes in undergraduate nursing clinical courses (Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries, 2014).

As the field of nursing education continues to improve this educational strategy, several studies have examined the effects of simulation on student outcomes when used in substitution for traditional clinical hours. The purpose of this research report is to examine evidence on the effectiveness of this strategy, identify best practices for its implementation across the undergraduate nursing curriculum, and discuss the role that the Shadow Health Digital Clinical Experiences™ could potentially play in improving the preparation of students as faculty adopt our virtual patient simulation into their course.

2. The Value of Virtual Patient Simulations

In nursing education, simulation is usually defined as the most accurate possible representation of a care situation and can be categorized relative to its degree of clinical fidelity: high, intermediate, or low (Laure et al., 2015). Virtual patient simulations are considered to be high-fidelity simulations because they are "extremely realistic and provide a high level of

interactivity and realism for the learner" (Meakim et al., 2013, p.6). Virtual patient simulations have been found to be comparable or superior to other high-fidelity traditional simulation methods due to a variety of reasons. In an integrative review of 12 studies published between 2008 and 2015, Duff, Miller, and Bruce (2016) found that virtual patients and simulated scenarios were comparable or superior to traditional simulation methods for teaching diagnostic reasoning and assessment skills in terms of increased student learning, satisfaction, and engagement. Among other benefits, Duff et al. (2016) concluded that these patient scenarios were more realistic and challenging than manikins or standardized patient actors due to the ability to create virtual scenarios including physical findings (e.g., abnormal heart rhythms or breath sounds) that were impossible for standardized patient actors to simulate (Gesundheit et al., 2009; Lin, Wu, Liaw, & Liu, 2012; Pucher et al., 2014; Tan, Ross, & Duerksen et al., 2013).

In the same way, other studies have found that students get more engaged with virtual patient scenarios and value having a safe environment to practice reasoning skills before seeing real patients in a clinical setting (De Gagne, Oh, Kang, Vorderstrasse, & Johnson, 2013; Gesundheit et al., 2009; Lin et al., 2012; Poulton, Conradi, Kavia, Round, & Hilton, 2009). By using asynchronous, computer-based simulations students can receive immediate and timely feedback that can be more directly linked to the skills being practiced (Gesundheit et al., 2009). Virtual patient scenarios can also provide transformative learning experiences for students by challenging their prior knowledge and assumptions in light of a deeper and more meaningful patient interaction (Kleinheksel, 2014).

The ease of access, flexibility, and cost-effectiveness of virtual patient simulations also stand out as being benefits in comparison to other high-fidelity simulations methods (Duff et al., 2016, Kleinheksel & Ritzhaupt, 2017). Because simulation laboratories usually require multiple high-fidelity manikins as well as specialized faculty and technicians, setup and maintenance costs can be very high. Moreover, for face-to-face nursing programs that have 100 or more students, scheduling can also be complicated as working groups are normally made up with no

more than eight students in simulation laboratories (Verkuyl, Romaniuk, Atack, & Mastrilli, 2017). And for online or blended programs, high-fidelity manikins may not be the most effective alternative to account for hours of clinical instruction. The use of virtual patient simulations could free faculty from having to go to multiple clinical sites in order to meet up with students and preceptors since student performance evaluation, and even debriefing, can occur asynchronously (Foronta & Bauman, 2014).

3. Replacing Traditional Clinical Hours with Virtual Patient Simulations

Research has shown that relevant learning outcomes with simulation are at least equal to those achieved in traditional clinical settings in pre-licensure nursing programs. Meyer, Connors, Hou, and Gajewski (2011) evaluated the clinical performance of 116 undergraduate nursing students who attended a pediatric simulation instead of traditional clinical hours. During two weeks over the course of an 8-week semester, students had 24 hours of simulation and 72 hours of clinical, resulting in a 25% substitution of simulation for traditional clinical hours. Clinicals were composed of five groups of eight students across three different course sections, and every two weeks, two students were selected from each clinical group to attend simulation in place of traditional clinical. Each simulation activity had follow-up sessions of 30 minutes, and every two weeks students were assessed by supervisor faculty on a series of outcomes including communication skills, therapeutic nursing skills, clinical judgment, interprofessional communication, and documentation. Results showed that, on average, students who attended simulation had overall higher clinical performance than students who had yet to attend, specifically when they were assigned to simulation within the first two weeks of the section. Regarding each outcome specifically, students exposed to simulation tended to score higher in documentation and interprofessional communication.

The National Council for State Boards of Nursing (NCSBN) conducted a large-scale, nationwide, randomized study comparing educational outcomes between students groups where simulation was substituted for up to 50% of traditional clinical experiences (Hayden et al.,

2014). Results showed that there were no significant differences in nursing knowledge, clinical competency, NCLEX pass rates, and overall readiness for professional practice when simulation was substituted for up to 50% of traditional clinical experiences. The NCSBN study also showed that the benefits of using simulation in lieu of traditional clinical hours in pre-licensure nursing programs expanded to their students' first clinical position as there were no significant differences in clinical competency and readiness for practice at six weeks, three months, and six months after graduation.

Other research studies have showed that undergraduate students perceived simulation as a valuable clinical teaching model, and they reported higher confidence when compared to their peers who only experienced traditional clinical hours (McCabe, Gilmartin, & Goldsamt, 2015; Rodriguez, Nelson, Gilmartin, Goldsamt, & Richardson, 2017). McCabe et al. (2015) evaluated undergraduate students' self-confidence in clinical practice under a model replacing 50% of traditional clinical hours by high-fidelity simulation in a large, urban, research intensive university in the United States. Between the midpoint (second semester) and end of the program (fourth semester), changes in students' perceived self-confidence were assessed relative to the eight clinical practice competences established by the Student Self-Assessment of Breadth of Nursing Education (ANE): Clinical Prevention and Population Health (CPPH), Evidence-Based Practice (EBP), 3) Generalist Nursing Practice (GNP), 4) Healthcare Policy, Finance, Regulation (HCPFR), 5) Information Management and Application of Patient Technology (IMAPCT), 6) Inter-professional Communication and Collaboration, 7) Organization and Systems Leadership, and Professionalism and Professional Values (PPV). Results showed that program time had a significant effect on students' self-confidence on each of the eight clinical practice competences, with students showing increases in their confidence levels from the midpoint to the end of the program.

Rodriguez et al. (2017) examined undergraduate nursing students' assessment of learning in a clinical teaching model that replaced 50% of traditional clinical hours with high-

fidelity simulation in four core medical-surgical courses at the NYU Meyers College of Nursing. In their teaching model, simulation sessions were guided by Jeffries' educational practices model (Jeffries, 2005), which focuses on the principles of active learning, collaboration, diverse ways of learning, and high expectations. In their innovative clinical teaching model, NYU Meyers College of Nursing faculty were able to gain greater control over the range of patient scenarios and exposure to specific clinical skills that students practice, shifting the focus to key outcomes such as therapeutic communication, care planning and goal setting, interprofessional collaboration, and reflective practice (Richardson, Goldsamt, Simmons, Gilmartin, & Jeffries, 2014). In their study, Rodriguez et al. evaluated students at two time points within their two-year undergraduate program (i.e., midpoint and end of program) using a validated measure that assessed aspects of simulation-based learning which included the four domains of Jeffries' educational practice model. Results showed that, from midpoint to end of the program, students indicated increases in exposure to simulation activities focused on active learning and high expectations domains, as well as the importance of the collaboration domain.

4. Using Virtual Simulations as a Replacement for Clinical Hours

While studies have specified that the simulation used in place of traditional hours must be "high-quality" (Hayden et al., 2014), there are several modalities of simulation that can be used in lieu of clinical hours. Recent studies have concluded that online, virtual simulation experiences can lead to increases in students' knowledge and self-confidence in a similar fashion to face-to-face traditional simulations (Cobbett & Snelgrove-Clarke, 2016, Cummings & Connelly, 2015, Verkuyl et al., 2017). For instance, Cobbett and Snelgrove-Clarke (2016) compared the effectiveness between a virtual clinical simulation and a face-to-face high fidelity manikin scenario for two different maternal-newborn clinical simulations in third year undergraduate nursing students. Results showed no significant differences in student learning outcomes between the two simulation modalities. Given that the implementation of face-to-face simulations can be costly and their standard equipment resource intensive, Cobbett and

Snelgrove-Clarke suggested that online, virtual simulation experiences cannot only be less costly but also provide students with repeated practice opportunities in a safe, standardized, and easy-to-access environment.

Simulation activities have a positive impact on important student learning outcomes for undergraduate nursing students when virtual simulation is used in place of traditional clinical hours. Cummings and Connelly (2015) conducted a study where eight hours of observation were replaced with eight hours of online simulation time for junior and senior undergraduate nursing students. The simulation scenarios covered what students were being taught in class (i.e., adult health I and I for junior students and professional nursing integration for senior students), involved pre- and post-quizzes, detailed patient information, and a documentation system, and they were delivered in groups of three to four students at the time. After one year, students reported higher levels of self-confidence and active learning. As they went through simulations in place of traditional clinical hours over time, students were able to identify an improved belief in mastery of the content and confidence in their knowledge base for skills and critical content related to adult health nursing. Students also reported improvement of their debriefing, including their opportunities for making comments, understanding of content, and productivity.

Verkuyl et al. (2017) conducted an experimental study comparing a pediatric nursing virtual gaming simulation and a laboratory simulation among second-year BSN and RN-BSN students. Students in both groups were compared regarding pediatric knowledge, self-efficacy, and satisfaction. The pediatrics case study used was identical for both groups in terms of learning objectives, story script, and decision points; yet feedback on the students' progress was built into the virtual gaming simulation. Results showed comparable gains in pediatric knowledge and self-efficacy as well as high satisfaction scores across both groups, which suggests that similar outcomes may be achieved with virtual gaming simulations in comparison with traditional laboratory simulations.

Foronta and Bauman (2014) suggested that virtual simulation may be used to count for a portion of clinical hours, replicate high-risk clinical experiences, and act as clinical makeup. Clinical placements are increasingly scarce and difficult to arrange, and sometimes students are even required to pay extra fees to attend clinicals. In addition, using virtual simulations in lieu of traditional clinical hours may exempt faculty from the burden of driving out to multiple clinical sites to meet up with students and preceptors as evaluation of student performance and debriefing can occur asynchronously. On the other hand, situations involving high-risk training scenarios (premature newborn care in pediatrics, a patient presenting with PTSD in mental health, or end-of-life situation in gerontology) may require students to practice in a low-risk, low-anxiety environment due to safety, liability, and ethical reasons (Foronta & Bauman, 2014). Virtual simulations may complement the existing undergraduate nursing curriculum by incorporating these difficult and high-risk clinical experiences as well as provide an important curriculum standardization in nursing education so that all students can have access to high-quality, comparable educational opportunities (Baillie & Curzio, 2009, Foronta & Bauman, 2014, Laure et al., 2015).

5. What Is a Good Replacement Ratio?

Breymier, Rutherford-Hemming, Horsley, Smith, and Connor (2015) examined the ratios of simulation to supervised clinical hours per nursing course used, as well as the rationale for substituting simulation in place of traditional clinical hours in over 400 pre-licensure nursing programs in the United states. In their study, 77.5% of participants indicated that their nursing program uses simulation in place of supervised clinical instruction. Regarding the standardized versus unstandardized ratio of simulation substitution for clinical, 45% of participants indicated that their nursing program used the same ratio of simulation hours to supervised hours for each course (i.e., standardized ratio), while 55% indicated that their program did not (i.e., unstandardized ratio). The most common simulation to clinical time ratio among nursing programs using standardized replacement was 1:1, with over 60% of participants reporting it.

For nursing programs reporting unstandardized ratios, the 1:1 simulation to clinical time ratio was also most commonly reported for core courses throughout the curriculum (e.g., fundamentals, medical-surgical/adult health, women's health, mental health and pediatrics).

Curl, Smith, Chisholm, McGee, and Das (2016) also examined the effectiveness of using high-fidelity simulations in place of 50% of traditional clinical experiences in four clinical specialty areas: obstetrics, pediatrics, critical care, and mental health nursing. Students from three associate degree nursing programs were assigned to either an experimental intervention group combining simulation and clinical experiences or a control group using only traditional learning experiences. Student learning during four hours of high-fidelity simulations (including pre-lab and debriefing activities) was considered to be equivalent to or better than eight hours of traditional clinical experiences (i.e., 1:2 simulation to clinical time ratio). At the end of the research study, students in the high-fidelity simulation group performed as well as, if not better than, students who participated in the traditional hours group on a standardized measure of medical-surgical knowledge. Both groups also yielded comparable NCLEX-RN pass rates. Over 95% of the students in the high-fidelity simulation reported that the simulation experience improved their critical thinking and increased their confidence in technical skills. Faculty's evaluation of students' performance also reported that near 50% of the students showed above average critical thinking competency.

6. Conclusions and Recommendations for Practice

Nursing education and simulation experts who have further discussed the results and significance of the NCSBN Simulation Study agree on the fact that this study provided the needed evidence to support the claim that simulations work as a replacement of traditional clinical experiences in undergraduate nursing education (Rutherford-Hemming, Lioce, Kardong-Edgren, Jeffries, & Sittner, 2016). In the past three years, additional studies have contributed to an emerging body of research evidence regarding the value of simulation-based approaches in improving learner preparation and practice when used in place of traditional clinical hours.

Several conclusions can be drawn from this research report. First, virtual patient simulation can be defined as high-fidelity given their degree of realism and high level of interactivity for the learner. However, not every virtual patient simulation can be considered high-fidelity. The Shadow Health Digital Clinical Experience™ is an online, asynchronous virtual patient clinical simulation that allows undergraduate nursing students to demonstrate and practice their clinical reasoning skills through life-like interactions with Digital Standardized Patients™. Through an immersive experience powered by a conversation engine, students can practice taking a detailed health history, perform physical assessments in single-system exams, and conduct focused exams to rule out causes of a chief complaint. In addition, each assignment provides students with immediate feedback on several aspects of their performance using the Student Performance Index™, which measures students' clinical reasoning skills as they relate to subjective data collection, objective data collection, information processing, and the students' ability to identify opportunities to engage in therapeutic communication.

Second, virtual patient simulation is comparable, if not superior, to other forms of high-fidelity simulation. This research report shows that undergraduate nursing students have found virtual patient simulations to be more realistic and challenging than manikins and standardized patients. In addition, the use of simulation can lead to increases in student engagement, self-confidence, and satisfaction. Foronda et al. (2014) stated that virtual simulation can be used in a complementary way to support the existing undergraduate nursing curriculum. Besides providing students with a low-risk environment where students can practice new skills and apply new knowledge, virtual simulation like the Shadow Health Digital Clinical Experience™ allows educators to foster student outcomes through a uniform learning experience, and as a result, students can be more in control of their learning (Laure et al., 2015).

Third, the Shadow Health Digital Clinical Experience™ also addresses the challenges brought up by other forms of high-fidelity simulations, especially in these times when there is a deficiency in the clinical hours available to nursing students and quality clinical placements

brings are difficult to secure for traditional and nontraditional students. Compared to manikins or standardized patients, virtual patient simulations offer several benefits in terms of cost-effectiveness, flexibility, and ease of access (Duff et al., 2016). Virtual patient simulations do not require the financial investment or clinical lab space of high-fidelity patient simulators, which becomes an advantage for online and blended nursing programs (McKeon, Norris, Cardell, & Britt, 2009, Kleinheksel & Ritzhaupt, 2017). Virtual patient simulations do not require the time and costs associated to training a standardized patient actor, or the schedule and space restrictions posed by large sections of students having to work with a single standardized patient actor (Kleinheksel & Ritzhaupt, 2017).

Finally, national surveys show that the most common simulation to clinical time ratio among nursing programs using the simulation-based replacement approach is 1:1. Several research studies show that exposure to simulation up to 50% results in increases in clinical knowledge, critical thinking, debriefing skills, self-confidence, NCLEX pass rates, and overall readiness for professional practice. Unlike other forms of high-fidelity simulation, the Shadow Health Digital Clinical Experience™ provides an off-campus environment to allow students to engage in open-ended conversations to practice patient-centered communication. In addition, the Shadow Health Digital Clinical Experience™ offers a wide variety of clinical scenarios and patient cases for core courses in the nursing curriculum like health assessment, pharmacology, mental health, and gerontology, where students can gather subjective data, practice recording objective patient data, and synthesize their findings. For distance education students who do not have access to a simulation lab or clinical sites, faculty can use the Shadow Health Digital Clinical Experience™ as a summative assessment in order to count for hours of clinical and evaluate the competency of their students (Kleinheksel & Ritzhaupt, 2017).

This research reports lays out the multiple advantages for students when virtual patient simulation is used in place of traditional clinical hours. Student outcomes such as clinical competency, critical thinking, content knowledge and self-confidence can be successfully

achieved through the meaningful use of the Shadow Health Digital Clinical Experience™. As the field of nursing education moves forward with this trend, it becomes critical to promote the value of simulation by translating its importance in terms of providing better, quality care and patient outcomes (Rutherford-Hemming et al., 2016).

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