Virtual Patient Simulation and the Effect on Clinical Reasoning

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Abstract

Purpose:

Schools of nursing are using innovative solutions like supplemental virtual simulation to enhance their curriculum and offer students more exposure to life like-situations to better prepare students for real-world practice. The purpose of this paper is to evaluate the effectiveness of virtual simulation on baccalaureate nursing students' clinical reasoning through a systematic review of the literature.

Method:

This literature review contains seven research articles with publication dates ranging from 2013 to 2022. The studies included web-based virtual simulations in the United States, Korea, and Portugal, that used online surveys or zoom interviews to evaluate the students' perceived learning. Some of the content in the virtual simulations was child health, communicating using ISBAR format, and STD education.

Results:

All the studies in this research, regardless of the country, language, or content used, suggest a positive relationship between virtual simulation and students' learning. This literature review supports using supplemental virtual simulation in nursing curricula to enhance students' learning.

Conclusion:

Adding virtual simulation to nursing school curricula could improve students' self-confidence and clinical reasoning. More rigorous studies are needed to better understand the effects of virtual simulation on nursing students' clinical reasoning.

Keywords: virtual simulation, clinical reasoning, nursing curriculum, nursing students

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It's known that there are different learning style preferences; therefore, there is a need for a better understanding of how different teaching styles in nursing education can help to better-prepare baccalaureate degree nursing graduates to enhance their ease of transition into their new role as registered nurses. Schools of nursing are using innovative solutions like supplemental virtual simulation in addition to on-campus patient simulation labs and traditional clinical teaching to prepare nursing students for real-world practice. Supplemental virtual simulation may increase students' self-confidence by enhancing their clinical decision-making skills with various scenarios in a more relaxed, safe, and comfortable environment (Woda et al., 2019). Allowing students time to contemplate the scenarios makes them more likely to retain the information, gain knowledge, and develop clinical reasoning from the virtual experience. This systematic review aims to review the literature on the effect of virtual simulation on students' clinical reasoning skills.

Research Problem

There remains a documented gap between nursing education and newly graduated nurses' readiness for practice as licensed nurses. This gap was first identified in the 1970s by Marlene Kramer in her book titled "Reality Shock: Why Nurses Leave Nursing." She believed that something could be done to retain nurses (1975). Fifty years later, this problem continues to persist. Nursing schools continue to improve their curriculum to better prepare nursing students for clinical practice. Kenny et al. (2016) explained how young, newly graduated nurses are more likely to leave the profession than more experienced nurses due to stress and dissatisfaction in their new role as registered nurses. Lack of support, understaffing, responsibility, and quality of care were also contributing factors (Kenny et al., 2016). There is a documented association

between students' perceived readiness to transition after graduation from nursing programs and the retention of new nurses (Kenny et al., 2016). With more experienced nurses aging and retiring, it is essential to retain younger, newer nurses to stabilize the workforce and secure the future of nursing. The smooth transition from student to registered nurse depends significantly on their previous clinical experiences and educational preparation in nursing schools (Çiriş & Ergün, 2021).

Today, hospitals and other nursing institutions are experiencing a rapid turnover rate and an acute shortage of nursing staff, placing a financial burden on facilities and forcing new nurses to have a shortened orientation time (Çiriş & Ergün, 2021). Retaining nurses in the profession has been an ongoing challenge (Çiriş & Ergün, 2021). New nurses are expected to transition into practice enthusiastically and quickly with their newly acquired skills. This overwhelming urgency makes new nurses question whether they made the right career choice, sometimes resulting in new nurses leaving the profession altogether (Çiriş & Ergün, 2021).

Due to mounting pressure on nursing faculty to better prepare students for practical application of skills, many nursing schools are using virtual interactive simulation to enhance their curriculum and offer students more exposure to life like-situations. Virtual simulation can be defined as a "computer-generated, three-dimensional image or environment that can be interacted with in a seemingly real or physical way" (Tolarba, 2021). There is a need to evaluate the possible benefits virtual simulation may have on improving students' clinical reasoning and self-perceived competence. Virtual simulation can be very costly for nursing colleges (Hockenberry & Clark, 2019); therefore, it is essential to understand these benefits before purchasing the programs. There is a lack of knowledge on how supplemental virtual simulation

affects nursing students' clinical reasoning, competence, and ease of transitioning into practice as newly licensed nurses (Woda et al., 2019).

Research Question

Among undergraduate nursing students enrolled in a baccalaureate program (P), does virtual patient simulation (I) increase students' clinical reasoning (O) as compared to no virtual patient simulation (C) during the nursing program (T)?

Purpose of Review

The purpose of this paper is to evaluate the effectiveness of virtual simulation on baccalaureate nursing students' clinical reasoning through a systematic review of the literature. Nurse educators are using creative ways to teach the next generation of nurses. Virtual simulation programs are being used by nurse educators as an adjunct to traditional curricula to achieve the required clinical time students need to graduate; however, the effectiveness of remote clinical has been in question. Furthermore, many nursing student graduates feel unprepared to enter the world of nursing with traditional curricula and clinical (Çiriş & Ergün, 2021). Students who feel unprepared after graduation have higher perceived anxiety and stress, which has been associated with newly graduated nurses leaving the profession (Çiriş & Ergün, 2021). Virtual simulation may be a needed addition to nursing school curricula to help enhance students' clinical reasoning (Kim et al., 2021). Nursing students who graduate feeling confident with their clinical reasoning skills and safe in their new role and field of practice as newly licensed registered nurses are more likely to remain in the workforce and stabilize the future of nursing (Çiriş & Ergün, 2021).

Theoretical Framework

Applying theory to practice advances clinical integrity and therefore is necessary for nursing education (McEwen, 2019). In this paper, I have applied the Thorndike Learning Method to learning through virtual simulations since the method is best known for learning through trial and error. To summarize the theory, Thorndike stated that in a learning or problem-solving situation, the learner answers questions repeatedly until they get the correct answer or solve the problem (Aliakbari et al., 2015). Many virtual simulation programs require students to keep repeating the scenario until they obtain a passing grade. Through repeated trial and error, the student is provided with access to skills in a relaxed, safe, controlled, and harmless environment. They are less stressed and anxious since there is no risk of causing physical harm to a patient. The student gains knowledge and satisfying results once they answer the questions correctly, strengthening their education. Answering incorrectly will cause the students to find alternative answers until they eventually reach the correct response (Aliakbari et al., 2015). When a student is learning using the Thorndike Learning Method with virtual simulations, the repetitious scenarios use trial and error, giving them time to think and ponder the given scenarios until they achieve the desired answers. This learning style would increase students' retained knowledge, potentially increasing their clinical reasoning.

Review of Literature

Virtual simulation has gained popularity in teaching nursing students to help apply theory to the clinical setting (Kim et al., 2021). Finding in-person clinical placements can be challenging, therefore, virtual simulations have become a valued tool in supplementing clinical to meet the needs of the nursing curriculum and the student (Kim et al., 2021). The increased use

of virtual simulation prompted many researchers to study the effectiveness of virtual simulation programs.

This literature review contains seven research articles obtained using the research engine CINAHL Plus with full text. The phrase "virtual simulation" was searched in the main field, and "clinical reasoning or critical thinking" in the second field. The search was narrowed further using "baccalaureate or bachelor's degree" in the third field. Publication dates ranged from 2013 to 2022. Articles were then selected according to relevance. The studies included web-based virtual simulations and used online surveys or zoom interviews to evaluate the students' perceived learning.

Synthesis of Literature

Over the past few years, virtual simulation has been more commonly utilized in nursing schools (Kim et al., 2021). Recent and past studies support the use of virtual simulations to facilitate students' learning in various nursing curricula. For example, Fogg et al. (2020) studied a convenient sample of 234 senior nursing students in the Southwestern United States who had commercial pediatric virtual simulation integrated into their curriculum. This study had two separate research questions. The first looked at students' post-test scores compared to their pre-test scores for self-evaluation. The second question focused on how many attempts it took the student to obtain a passing score of 90% on the virtual simulation. The study found that overall, students perceived an increase in knowledge and clinical judgment, while the first question concluded that students could obtain a passing grade in fewer attempts from the first to the last scenario (Fogg et al., 2020). Similarly, Jung and Roh (2022) studied a convenient sample of 276 students in Korea, divided into two groups with 148 students from two separate nursing colleges, with pediatric nursing simulations as the most common nursing focus. This study aimed to

determine whether the cognitive load had a mediating effect on the relationship between learning flow and clinical reasoning skills of nursing students in virtual simulation learning (Jung & Roh, 2022). Like Fogg et al., this study provided evidence that nursing students' perceived learning flow and cognitive load contributed to students' clinical reasoning skills (Jung & Roh, 2022). Padilha et al. (2019) also had similar findings. They used a randomized controlled trial that consisted of 42 Portuguese nursing students who used virtual simulation in their second year of nursing school. Knowledge and clinical reasoning were assessed before and after the simulation and two months later (Padilha et al., 2019). The findings of this study, like the previous two studies, suggest that virtual simulation may help improve students' self-confidence and improve their clinical reasoning (Padilha et al., 2019). The above three studies all suggest a positive relationship between the use of virtual simulation and students' clinical reasoning.

The following two studies in the review suggest that virtual simulation is beneficial in nursing curricula by helping students practice and gain confidence in providing care (Kang et al., 2020; Kim et al., 2021). By gaining confidence through practice and repetition with virtual simulation programs, students gain knowledge in a fun, non-stressful way, improving their overall clinical reasoning skills (Hoffman & Argeros, 2021). Kim et al. (2021) did a descriptive qualitative study using twenty students from a four-year baccalaureate degree program. The virtual simulation content consisted of cultural diversity scenarios and was evaluated via zoom video conferences with three to four students per group. Kang et al. (2020) did a quasi-experimental design study comparing two groups of newly licensed registered baccalaureate-prepared nurses from a university in the Midwest. The first group had virtual simulation substituted for traditional clinical while the other had virtual simulation added to traditional clinical; the virtual simulation content was not specified. Both groups were evaluated between

four to six months of practice, with the supplemental group rating higher job satisfaction (Kang et al., 2020).

While the following two studies did not evaluate the direct effects on students' clinical reasoning, they showed a correlated positive benefit to nursing students learning (Foronda et al., 2014; Hoffman & Argeros, 2021). One could assume that if the students learn from virtual simulation, their clinical reasoning would also be enhanced (Hoffman & Argeros, 2021; Jung & Roh, 2022). Foronda et al. (2014) evaluated the use of virtual simulation to improve the communication skills of 8 students in Baltimore and Miami before the pandemic began. The aim was to communicate significant data using ISBAR format, and it concluded that virtual simulation could be an effective way of teaching communication skills to nursing students (Foronda et al., 2014). Hoffman and Argeros (2021) used a mixed-methods design with purposive sampling of 121 baccalaureate undergraduate nursing students from a Midwestern, urban, public university. The content was on sexually transmitted disease (STD) counseling. Students in this study stated they learned how to talk to patients about STDs and how a knowledgeable nurse can calm a patient's anxiety (Hoffman & Argeros, 2021).

Strengths and Weaknesses

The first weakness identified is that three studies consisted of small sample sizes. One sample consisted of only nine students, with a student who expressed great difficulty signing into the simulation dropping the sample down to only eight (Foronda et al., 2014). The other two studies consist of less than forty-two students in each group (Kim et al., 2021; Padilha et al., 2019). Significant language barriers were noted in three studies; two of the simulations were translated into Korean and one into Portuguese. Students in all three of these studies felt the English language was challenging, difficult to understand, burdensome to translate, and hindered

their learning (Jung & Roh, 2022; Kim et al., 2021; Padilha et al., 2019). The studies used different design techniques and content in their virtual simulations and evaluated the results differently, lacking consistency.

The last four studies are large convenient samples ranging from one hundred twenty-one to two hundred seventy-six students. Jung and Roh (2022) and Kang et al. (2020) split their sample into two cohorts for comparison reasons; this gives the study more validity and, therefore, can be considered a strength in the research. For instance, Kang et al. (2020) divided the group into two parts to compare findings between supplemental virtual simulation and substituting clinical with virtual simulation, with the results supportive of supplemental virtual simulation being the most beneficial (Kang et al., 2020). Another strength of the research is the consistent findings in different countries and languages. The majority of students had no difficulty using the online virtual simulation programs and overall reported satisfaction.

Compare and Contrast

This research study was conducted in various countries at baccalaureate level undergraduate nursing schools based out of universities. Of the seven studies, three were conducted outside the United States, two took place in Korea, and one in Portugal. The remaining four were in the United States, two in the Midwest, one in the southwest, and the last study was in Baltimore and Miami. The content in the virtual simulations also varied significantly, with two focusing on child health, one on communicating using ISBAR format, one on STD education, and three studies not clearly defining the content used in the article.

The studies all used different methods for evaluation and different design styles. Two of the studies used convenient samples, and one used purposive sampling. One study was a quasi-experimental design, while another was a mixed-methods design. One study used both

qualitative and quantitative, and another was descriptive qualitative. Padilha et al. (2019) was the only randomized control trial. The majority of the studies, five out of seven, all used pre and post-testing to evaluate the effectiveness of virtual simulation on students' learning and clinical reasoning. For example, Padilha et al. (2019) study assessed knowledge using true or false and multiple-choice questions, and students' self-efficacy was assessed using a Likert scale. Hoffman and Argeros (2021) evaluated students' learning using Qualtrics survey software with qualitative and quantitative content questions. Kim et al. (2021) and Foronda et al. (2014) interviewed students in small groups in a debriefing style to analyze the students' perceptions of using virtual simulations.

Gaps in the Literature

Nursing schools have used virtual simulation worldwide to enhance nursing education (Kim et al., 2021). It is known that substituting 50% of clinical with simulation labs results in no change in student outcomes (Woda et al., 2019). It remains unknown what the effects may be on nursing students' learning from substituting in-person clinical with virtual simulations. This literature review supports using supplemental virtual simulation in nursing curricula to enhance students' learning. Still, more rigorous studies are needed to better understand the role of supplementing virtual simulation with traditional clinical and on-site simulation labs to help nursing students develop more critical thinking skills and feel better prepared for real-world experience.

Conclusion

Nursing schools are using innovative ways of teaching, like virtual simulation, to meet the needs of the nursing students' education and to create a more robust curriculum. Retention of new nurses is pertinent for the future of nursing; students' that feel better prepared at graduation

are more likely to remain in nursing and can help stabilize the nursing profession (Kim et al., 2021). The studies in this review showed a positive relationship between virtual simulation and nursing students' learning, suggesting that adding virtual simulation to nursing school curricula could improve students' self-confidence and clinical reasoning. More rigorous studies are needed to better understand the effects of virtual simulation on nursing students' clinical reasoning.

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