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Featured Article

Nursing Students' Perceptions and Experiences of Using Virtual Simulation During the COVID-19 Pandemic

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Keywords

Content analysis;
experience;
nursing students;
virtual nursing care;
virtual simulation

Abstract

Background: This study aimed to understand prelicensure nursing students' perceptions and experiences of using virtual simulation as an alternative to clinical practice during the coronavirus 2019 (COVID-19) pandemic in South Korea.

Methods: A total of 20 students from a 4-year baccalaureate nursing program participated in this descriptive qualitative study. Six focus group interviews using Zoom video communications were conducted with three to four participants to understand their experiences. Data were analyzed using an inductive content analysis approach.

Results: The following three major themes emerged: (a) difficulties encountered in using virtual simulation, (b) benefits to student confidence and competence to provide patient-centered care, and (c) gaps in satisfaction due to needed improvements.

Conclusions: Virtual simulation could be beneficial for improving prelicensure nursing students' confidence and competence; however, improvements to virtual simulation realism and engagement are needed to maximize user satisfaction and performance.

Cite this article:

Kim, M.J., Kang, H.S. & De Gagne, J.C. (2021, Month). Nursing Students' Perceptions and Experiences of Using Virtual Simulation During the COVID-19 Pandemic. *Clinical Simulation in Nursing*, 60, 11-17. <https://doi.org/10.1016/j.ecns.2021.06.010>.

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Virtual simulation (VS) applications currently used in nursing education are diverse and known only as platform types; these include Developed platform, Second Life,

Unity 3D, vSim®, and CliniSpace (Rim & Shin, 2020; Shin et al., 2019). An evaluation of vSim use by the National League for Nursing in the US reported that clinical faculty members perceived it positively and of "more value and utility than other teaching methods" (Forneris & Scroggs, 2014, p. 348). The coronavirus 2019 (COVID-

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19) pandemic has made it difficult for nursing students to practice in hospitals, so many nursing colleges are using remote learning; for example, VS programs have been widely introduced as a substitute for or supplement to clinical practice. Nursing colleges globally are implementing VS. Its popularity has rapidly increased as it has the potential to substitute clinical practice hours with

simulation, improve the safety of health care, offer access at all times and in all spaces, and ensure that a safe student-centered learning is available (Foronda et al., 2020; Shea & Rovera, 2021; Verkuyl & Mastrill, 2017). Its use is expected to expand as the COVID-19 pandemic continues to create clinical site shortages. As virtual reality technology continues to improve, VS with greater realism and dynamic interaction may continue to serve as an essential tool by providing opportunities to enhance experiential learning (Kolb, 2015) and foster person-centered care in nursing education (Liaw et al., 2020; Mendez et al., 2020).

Key Points

- Nursing students viewed virtual simulations as beneficial for improving their confidence and competence to provide nursing care.
- Positive student learning outcomes can be promoted by encouraging students to utilize a feedback log, complete guided reflection questions, and participate in debriefing sessions.
- Additional support is required for nursing students who are not fluent in the English language.

Before the pandemic, Foronda et al. (2018) surveyed the preferences and perceptions of nursing students in the US and found that they preferred using VS to supplement clinical practice or to strengthen understanding of case-based lectures; students recognized that important learning points in VS included patient assessment skills, prioritization of patient care, and emergency patient care. In a study conducted in China, participants who were trained with VS scored significantly higher in knowledge of fundamental nursing than those in control groups exposed to traditional formal education only (Gu, Zou, & Chen, 2017). Similarly, an evaluation of the VS program from the perspective of non-English speaking Norwegian nursing students (Tjøflåt, Brandeggen, Strandberg, Dyrstad, & Husebø, 2018) found that 63%-80% of the students felt motivated after using VS and expressed that it reinforced their levels of new and existing knowledge; however, some students reported difficulty understanding the program in English, finding it to be monotonous and time-consuming.

The COVID-19 pandemic has been a milestone in the application of VS in nursing education as it has obstructed nursing students' ability to train safely in hospitals, consequently increasing the demand for remote learning. As

such, strategies and guidelines for its effective application in nursing education need to be developed. It is also necessary to explore nursing students' perceptions and experiences of the benefits of VS in education, practical challenges to its implementation, and areas for further improvement. This study explored nursing students' perceptions and experiences with VS as an alternative to clinical practice during the COVID-19 pandemic.

Material and Methods

Research Design and Participants

This study used a descriptive qualitative design. The main research questions were "What were the benefits of and obstacles to using VS?" and "What do you want to improve on VS?" The inclusion criterion was that the participant be a senior student who had experienced at least one nursing practice training session with VS.

Virtual Simulation for Nursing

The VS (vSim® for nursing) used in this study is a web-based simulation program specific to nursing training co-developed by Wolters Kluwer Health Lippincott and Laerdal Medical in cooperation with the National League for Nursing (NLN) in the USA (Foronda et al., 2016). This program consists of six steps: (a) suggested reading, (b) presimulation quizzes that provide students with an overview of the contents, (c) interactive clinical nursing scenarios authorized by the NLN, (d) post-simulation quizzes, (e) documentation assignments, and (f) guided reflection questions. Students' nursing care actions are recorded automatically during the VS experience, which generates a performance score and personal feedback log. This log informs students about what areas are strong and which may need improvement. Available in English, this program allows students to interact with patients and receive direct performance feedback from the program (Forneris & Scroggs, 2014; Foronda et al., 2018).

In this study, VS was adopted into the curriculum during the spring semester of 2020 and replaced clinical practicum hours. Students were oriented to VS by reviewing the tutorial during class (online or offline) or as homework. Each student completed the VS individually. Not all students received passing scores; the passing scores that were assigned varied, ranging from 70 to 90%. Students completed VSs followed by a self-debriefing or a facilitator-led debriefing.

Data Collection

Before data collection, the study's purpose was explained to the department head verbally and in writing at a university in South Korea. The department head permitted re-

searchers to collect data through interviews with nursing students. The recruitment notice for research participants was shared via KakaoTalk, a free instant messaging application. The study's purpose and content were explained. Subsequently, those who volunteered and met inclusion criteria to participate were included in the study. We conducted and recorded six focus group interviews with three to four participants using Zoom video communications (ZOOM). Focus group interviews were conducted in Korean. Data were collected from October to December 2020 until data were saturated.

Ethics

This study was conducted with approval from the Institutional Review Board (IRB: 1041078-202008-HRSB-219-01). The researchers fully explained the study purpose and content to the students, and obtained written informed consent from those who volunteered to participate in the study.

Data Analysis

An inductive qualitative content analysis of the data was performed (Krueger & Casey, 2009). The ZOOM interviews were transcribed verbatim in Korean and read by the researchers several times to identify meaningful information (i.e., words, sentences, and paragraphs) which were then coded. The codes were categorized based on similarities. Any discrepancies were resolved by the researchers through discussion. Final analysis was translated into English by bilingual experts. To enhance the reliability of the study (Lincoln & Guba, 1985), the credibility of the research findings was established through member checking. Transferability was ensured via detailed descriptions of the research process. Dependability and conformability were achieved by ensuring an audit trail and checking the consistency of the findings.

Results

A total of 20 senior students from a 4-year baccalaureate nursing program participated in the interviews. Their mean age was 22.3 (± 1.17) years. Sixteen (80%) participants were female and four (20%) were male. Most (75%) participants' Test of English for International Communication (TOEIC) scores ranged between 600 and 800. Three major themes emerged from the interviews: (a) difficulties encountered in using VS, (b) benefits to student confidence and competence to provide patient-centered care, and (c) gaps in satisfaction due to a need for improvements.

Difficulties Encountered in Using virtual simulation

VS provided in English. Participants stated that one of the biggest challenges they encountered while using VS was

the need to use English, which was not their native language; its use was seen as "burdensome and not easy." The extent of difficulty experienced varied among participants with some having no major difficulty and others perceiving the language barrier as "enormous and stressful." Some participants disliked that English was spoken "fast" without "subtitles or captions" and were uncertain that they had understood the meaning of the content correctly. Some participants reported that they had used a translation service such as Google Translate or Papago (translation app) but felt that the automatic translation seemed inaccurate sometimes. The participants, particularly the students with low English proficiency, were concerned about achievement gaps and desired a Korean version of VS. One student stated, "It was hard to accept [the VS program] because it was in English. It took a long time . . . because I am not that good at English. At first, [one scenario] took more than eight hours."

Unfamiliarity with VS. Participants reported that VS was initially "unfamiliar and worrisome," but that they grew familiar with it quickly. Participants stated that there were "too many buttons" (i.e., items), making it difficult to find the one they needed for nursing care. They expressed that it would be more efficient and helpful if an educator were to provide students with a prepractice orientation to teach VS use, review VS cases (scenarios) briefly, and offer advice about areas of study.

Participants noted some culture-specific issues in the VS program that affected their comprehension. For instance, a nursing care question involving a carpet was hard to understand because carpets are not common in Asian households. Similarly, the program referred to discharging older adults to their homes to be visited by a rehabilitation team, whereas in South Korea it would be more common for older patients to be discharged to the homes of their adult children. As an instance of cultural diversity, one participant shared that seeing waist beads while caring for a pregnant woman had led to their realization of the necessity of respecting different religious traditions and cultural perspectives:

It was odd seeing beads on the pregnant woman's belly while doing a vaginal examination. I looked [waist beads] up later and learned that [they] were a symbol of fertility and are used in other cultures. At that time, I realized that I should consider those things.

Benefits to Student Confidence and Competence to Provide Patient-Centered Care

Opportunity to care for patients alone. Participants responded that the greatest advantage of VS was that it allowed the user to care for patients from admission to discharge by themselves. Regarding the maternity simulation for example, participants reported that they could make various assessments, including asking pregnant women

about their pain and checking the patterns of fetal heartbeats, and could provide interventions such as giving oxygen. Participants described that when they heard a “sound of pain,” they felt pressured to provide care quickly and pressed the appropriate buttons in a hurry. Moreover, participants stated that they learned “which treatment has to be provided first” and “how to respond to an emergency situation” when a patient’s severity level increased. Participants appreciated that VS offered a more comfortable space for making and learning from mistakes than a real clinical setting: “Prior to the VS experience, my clinical practice has been mainly observation only. For the first time, I was providing care to patients (all) by myself, so I felt very responsible and had more fun.”

Male participants noted that VS allowed them to provide direct contact with patients, unlike rotation situations in which pregnant women might be sensitive and reluctant to be touched by them. They reported that being afforded experiences regardless of gender was an advantage: “Maternity care on VS was really good for me as a male student. During maternity care [in] clinical settings, nurses asked me to step out of the care several times . . . I became very passive during the clinical practice.” Participants stated several other advantages of using VS, including the possibility of providing immediate care for patients, observing patients more closely than in clinical settings, and caring for high-risk or rare cases: “It was possible to see [situations in] VS, [that] I had never seen before.”

Opportunity to enhance my abilities. Participants responded that they could self-evaluate and strengthen their abilities repeatedly via VS by using quizzes, a feedback log, and reflection. Participants stated that the pre- and post quizzes and feedback log provided helpful (a) information before the case scenario began regarding what students would learn, (b) explanations of correct and incorrect quiz answers, and (c) guidance regarding areas in which further study or practice was needed. Students could check an evaluation feedback score (expressed as a percentage) to understand the seriousness of any gap in learning and the importance of studying harder when they had a low score. As one participant explained,

A pregnant woman was screaming [moaning], and on top of it, the alarm [monitor] was continuously beeping. [I] was at a loss . . . about what I had to do first, but providing care was not as easy as I thought. Although I knew it was virtual, I was anxious and impatient because she complained constantly of pain.

Participants reported “it was good to be able to practice repeatedly.” They described that they had developed their own protocols for practicing and seemed to remember nursing activities they performed continuously: “I have my own routine. If it is morphine, (I) inject it slowly and check the respiration rate. By practicing repeatedly, such situations that need to be checked are registered in my head.”

Participants responded that writing in the reflection section was helpful. The exercise allowed them to think deeply about the overall scenario, reflect on particulars by answering step-by-step questions, and consider whether their practice choices had been accurate and their competencies adequate. Some participants reported that completing the reflection section was stressful because they were unsure about how to write their thoughts. On the other hand, one participant described a helpful response to her query about how to write her reflection: “[I was told that] ‘There is no right answer, and everything you did was right,’ so I wrote a reflective note with confidence.”

Participants stated that they would like to receive feedback to improve their understanding and to address questions about using VS. They expressed that feedback would help them to envision new ways of caring, and they suggested that small group discussions in which they could share thoughts and experiences with peers would be constructive:

Reflection was somewhat stressful for me because there were many thoughts in my mind while answering questions, such as “Can I apply it well? Is this a correct answer?” Sometimes I only wrote two lines and wondered, “Is this long enough? Should I write more?”

Gaps in Satisfaction Due to Needed Improvements

Lack of reality and limited function. Participants reported that they enjoyed using VS because they liked the animation and being able to perform nursing care with a click. Some students expressed surprise at how realistically patients’ conditions changed as the scenarios progressed, although others stated that adding photos or videos of real situations and incorporating real “breathing sounds” would make the simulation more realistic. In addition, students noted that the lack of direct contact with patients affected realism in that there was no building of rapport with patients. Students mentioned the inconvenience caused by VS shutting down every 30 minutes and forcing them to remember what was happening in the scenario.

Some students stated that VS fundamentally differs from reality in that care is given by pressing buttons rather than by directly communicating with and providing nursing care to patients, thus allowing certain essential activities to be ignored. For example, in VS, they could inject medication without withdrawing solution from a vial into a syringe after opening an ampule. Similarly, they were able to perform an electrocardiogram (EKG) by pressing a button without knowing how to properly place EKG electrodes onto a patient’s body. One student stated,

Once I auscultated lung sounds because the patient’s breath [sounds] were not good, but it was reported only in writing: “absent sounds on this side.” It would be better if sounds could be heard when auscultating the lungs. I wonder what [about the actual experience of

hearing sounds] is different from textbooks because it is shown only in writing.

Confirming the level of achievement and evaluation. Participants had varying opinions about the method of evaluating students after VS practice. Some participants thought that students would perform better if a certain minimal score were set (e.g., 90%) that students could strive to achieve after careful consideration of how to accomplish their goal. Others were concerned that setting the score too high (e.g., 90%) could compromise learning as some students are score-oriented. It was suggested that such students might capture an image of their feedback and use it unfairly to achieve 100% on a future attempt. Some participants suggested that it would be better to set the minimum score at 70% or to evaluate students on a pass or fail basis to prevent such behavior.

Discussion

The findings of this study show that students can encounter difficulties due to language barriers and unfamiliarity with VS although it facilitates learning. Participants faced problems while using VS in the English language similar to those observed among student users in Norway (Tjofflåt et al., 2018). Participants in our study who had difficulties with English used online translator services such as Google Translate or the online dictionary to overcome language barriers. This study recommends providing a system to support students who have insufficient English proficiency to maximize their learning.

Additionally, participants in this study were unfamiliar with VS when they first used it, as was the case for some Norwegian nursing students in the study by Tjofflåt et al., (2018). In contrast, a study with US students reported that most students found VS easy to use (Foronda et al., 2016). There are several possible explanations for this dissimilarity. First, participants in this study were using VS for the first time during the global COVID-19 pandemic, a significant cause of stress. Second, although learning about cultural diversity while using VS could be beneficial for nursing students, some participants stated that they felt distracted by scenarios that seemed unrealistic to their cultural context. Culture-related stress among students must be acknowledged as a significant factor affecting VS use. This factor could be addressed by explaining any cultural differences in the scenario to students during orientation and by debriefing them following their practice. Third, simulation itself can cause stress. An integrated review study regarding the use of high-fidelity simulation found that students experienced simulation-related stress (Cantrell et al., 2017). Another study with Canadian nursing students reported that their anxiety scores were higher in the virtual clinical simulation than in the face-to-face high-fidelity simulation (Cobbett & Snelgrove-Clarke, 2016). These findings indi-

cate that instructors need to guide students towards achieving their goals with psychological safety.

Participants reported that VS was beneficial in helping them practice and gain competence and confidence to provide nursing care. Other studies have reported that VS offered students a positive experience (Gu et al., 2017; Wright, Tinnon, & Newton, 2018) and positively affected student knowledge, performance, and clinical judgment skills (Chen et al., 2020; Fogg et al., 2020; Sapiano et al., 2018). Taken together, our findings indicate that VS learning is a potentially valuable method of providing nursing education for students, even those with limited English proficiency, especially during a pandemic when safe clinical placement is not attainable.

Further, participants reported that the detailed personalized feedback log and guided reflection questions in VS helped them to evaluate their knowledge level and to reflect on their strengths and areas in which they needed improvement. This finding supports the assertion by Coyne Calleja, Forster, and Lin, (2020) that virtual simulation should incorporate reflection, and it underscores the importance of providing opportunities for nursing students to self-evaluate. Participants preferred to receive feedback from the instructor as well as a debriefing session with the instructor and their peers, supporting the finding by Verkuyl et al. (2017) that debriefing is an essential component of simulation-based learning. Our findings are potentially useful for informing nursing educators who plan to include debriefing sessions in their designs for VS education to maximize student learning. During the Covid-19 pandemic, such debriefing sessions can be delivered utilizing methods such as ZOOM or social networking services.

Participants agreed that there was room for improving VS. Some considered VS very realistic while others expressed concerns about its lack of realism. A systematic review on the use of virtual worlds as teaching tools described lack of realism as a disadvantage (Shorey & Ng, 2020). In a study that conducted two maternal-child scenarios with VS for students, participants preferred face-to-face simulation to VS owing to its similarity with real situations (Cobbett & Snelgrove-Clarke, 2016). Our participants reported that despite not knowing the details of nursing activities, such as how to place EKG electrodes on patients, they could perform those activities using VS simply by clicking buttons. These findings suggest that providing tailored guidance and references or website links might be helpful for self-learning.

VS offers learners an interactive learning experience; however, some participants in this study described having a hard time feeling empathy for the patients during the simulations. This may be due to the fact that VS for nursing is provided in English, which is not the participants' primary language. An empathic approach to patient-centered care is the core of nursing practice, so educators should consider assessing and building empathy among students. Regarding methods of evaluating student achievement us-

ing VS, most participants felt that setting a high minimum score would present a barrier to self-learning. It was felt that although pressure to achieve a high score could motivate students, it could also create stress and dissatisfaction that would undermine the positive effects of VS on student competence and confidence to provide quality care. This study recommends that assessment and grading of students be relatively flexible.

Participants in this study highly valued the VS experience, which is consistent with previous research findings (Gu et al., 2017; Wright et al., 2018); however, there is room for improvement. Given the growing use of VS and its potential to affect student competence and confidence to provide patient-centered care, nurse educators must be aware of challenges that students may face and support students based on their needs, some of which have been outlined above.

Studies reported that VS was useful in improving assessment skills, prioritization of nursing care, emergency management based on critical thinking, and understanding different interprofessional roles for patient-centered care (Foronda et al., 2018; Liaw et al., 2020). One of the main strengths of this platform is that it allows students to practice specific skills until they are mastered, which can facilitate a higher level of psychomotor ability and affective domains of learning that are essential to building confidence. These strengths, in turn, can be used by faculty to identify common errors in applying skills while assessing students' clinical reasoning process as well as their attitudes concerning this format of teaching.

Limitations

This study has certain limitations. It included participants from a single university; however, the findings offer student perspectives about the acceptability and feasibility of VS in an Asian, non-English speaking context, and these findings could be generalized to other such settings. Further studies need to be conducted to provide knowledge about educators' experiences of guiding students in using VS.

Conclusion

This study demonstrated that VS could improve clinical practice confidence in nursing students who speak English as their second language; however, instructors should remember that first-time users might require guided orientation and time to familiarize themselves with VS. In particular, more support is required for nursing students with low proficiency in English. It may be possible to reduce user difficulties by providing detailed instruction related to language and cultural differences before the VS session as well as during the debriefing session. In order to maximize

students' learning outcomes, instructors should encourage students to utilize a feedback log and complete guided reflection questions, and they should provide debriefing sessions. Furthermore, improvements to VS in terms of realism and engagement are needed to maximize user satisfaction and performance. Our findings are potentially useful for nursing educators who are designing VS education strategies to maximize student learning both during and after the COVID-19 pandemic.

Declaration of Competing Interest

There are no conflicts of interest to declare.

Funding

The authors received no specific funding for this work.

Acknowledgments

We would like to thank all participants for sharing their experiences.

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