Meeting Undergraduate Nursing Students' Clinical Needs

A Comparison of Traditional Clinical, Face-to-Face Simulation, and Screen-Based Simulation Learning Environments

Kim Leighton, PhD, RN, CHSE, CHSOS, ANEF, FSSH, FAAN;
Suzan Kardong-Edgren, PhD, RN, CHSE, ANEF, FSSH, FAAN;
Tonya Schneidereith, PhD, CRNP, PPCNP-BC, CPNP-AC, CNE, CHSE-A, ANEF, FAAN;
Colette Foisy-Doll, MSN, RN, CHSE, ANEF; and Katherine A. Wuestney, BSN, RN

ABSTRACT

Background: Nurse educators expanded replacement of traditional clinical practice and face-to-face simulation experiences with screen-based simulation (SBS) during the COVID-19 (coronavirus disease 2019) pandemic.

Purpose: The purpose of this research was to understand the student experience when learning in 3 types of clinical education environments.

Methods: This quantitative descriptive survey study used the Clinical Learning Environment Comparison Survey 2.0 (CLECS 2.0) to compare prelicensure nursing students' perceptions of learning in 3 clinical learning environments.

Results: The CLECS 2.0 was completed by 113 participants from 3 countries. Most scores were highest for the traditional clinical practice environment, and all were lowest for the SBS environment.

Conclusions: The findings are concerning as discussions about whether SBS can replace traditional clinical practice hours unfolds. The findings support the need for concentrated efforts to improve specific areas of the SBS experience.

Keywords: clinical learning environment, computer simulation, nursing students, prelicensure students, screen-based simulation

Cite this article as: Leighton K, Kardong-Edgren S, Schneidereith T, Foisy-Doll C, Wuestney KA. Meeting undergraduate nursing students' clinical needs: a comparison of traditional clinical, face-to-face simulation, and screen-based simulation learning environments. *Nurse Educ*. 2021;46(6):349-354. doi: 10.1097/NNE.0000000000001064

The COVID-19 (coronavirus disease 2019) pandemic resulted in the sudden unplanned need for nurse educators worldwide to replace their usual ways of clinical teaching. Although 65% of nurse educators were already using virtual simulation,[1] most were forced to replace traditional clinical practice experiences with virtual simulation so that nursing students could meet regulatory requirements for progression and graduation.[2] Many nursing students no longer had opportunities to learn in traditional clinical practice environments (TCEs) with their clinical instructor or preceptor, or in skills laboratory and face-to-face simulation environments (F2FS) with a facilitator. Screen-based simulation (SBS)[3] became one method for providing clinical education as this allowed safe, clinically based learning opportunities for students. With SBS, students could provide care for graphical representations of human patients on a computer screen through a keyboard, mouse, or other input device. Screen-based simulation allows for feedback and assessment, when an instructor may or may not be present.[3]

An understanding of how well learning needs are met in each of these environments is critical. The purpose of this research was to understand the student experience when learning in 3 types of clinical education environments.

Author Affiliations: Executive Director (Dr Leighton), Itqan Clinical Simulation & Innovation Center, Hamad Medical Corporation, Doha, Qatar; Associate Professor (Dr Kardong-Edgren), Health Professions Education, MGH Institute of Health Professions, Boston, Massachusetts; Associate Professor (Dr Schneidereith), Debra L. Spunt Clinical Simulation Labs, University of Maryland School of Nursing, Baltimore, Maryland; Director (Mrs Foisy-Doll), Clinical Simulation Centre, MacEwan University Faculty of Nursing, Edmonton, Alberta, Canada; Graduate Student (Ms Wuestney), College of Nursing, Washington State University, Spokane.

There was no funding received for this work.

The authors declare no conflicts of interest.

Correspondence: Dr Leighton, Itqan Clinical Simulation & Innovation Center, Medical Education Department, Hamad Medical Corporation, PO Box 3050, Doha, Qatar 00000 (KLeighton@hamad.qa).

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (www.nurseeducatoronline.com).

Accepted for publication: May 19, 2021

Early Access: July 15, 2021

DOI: 10.1097/NNE.0000000000001064

Background

Clinical nursing education in the TCE continues to be the cornerstone of nursing education, despite limited evidence

of its effectiveness.[4,5] Roberts et al[6] suggest that there are no differences in clinical skills, knowledge, and student confidence when simulation is substituted for a percentage of traditional clinical practice hours. In addition, this study added to the knowledge gained from the NCSBN multisite longitudinal study, which showed no statistically significant differences in clinical competency, comprehensive nursing knowledge, NCLEX pass rates, or readiness to practice when simulation replaced 50% of traditional clinical practice experiences under specific conditions.[7] The rigorous inquiry by Roberts et al[6] further elucidated a historical lack of evidence-based approaches to most clinical teaching.

Numerous comparison studies between the TCE and F2FS experiences have been undertaken to learn about the impact of discrete aspects of simulation (eg, design, debriefing, fidelity) on specific outcomes (eg, critical thinking, clinical reasoning, prioritization, communication).[8-12] One instrument, the Clinical Learning Environment Comparison Survey (CLECS), compares how well students' learning needs are met in the traditional and simulation clinical environments[13] and was used in the NCSBN study.[7] However, the authors found no similar studies that compared outcomes of virtual or SBS to those of the TCE or F2FS.

Methods

This quantitative descriptive survey study was designed to compare prelicensure nursing students' perceptions of learning in 3 clinical learning environments using the CLECS 2.0. Virtual reality (VR) was not addressed in this study as the researchers assumed that most students did not have access to quality VR equipment in the home. The research question was: How well do the students believe their learning needs were met in the TCE, F2FS, and SBS environments?

Instrument: CLECS 2.0

The CLECS includes 29 items determined to be important learning needs in the prelicensure nursing clinical practice environment. The CLECS has established reliability and validity as a tool for use with prelicensure nursing students.[13] For use in this study, all 29 items were evaluated for face validity, and it was determined by the research team that they were congruent with expectations of clinical education regardless of the environment, as the clinical education model is essentially unchanged over the years.[4,14] Many nursing education regulatory bodies now agree to allow SBS to replace TCE and F2FS[15]; therefore, it was reasonable to extend the CLECS 2.0 learning environments to include SBS. Permission was received to modify the CLECS by adding SBS as the third environment for comparison and renaming it the CLECS 2.0. The response structure of the CLECS 2.0 remains a 4-point Likert scale (4 = well met, 3 = met, 2 = partially met, 1 = not met) with a not applicable (NA) option. The CLECS 2.0 is located on the Evaluating Healthcare Simulation website (sim-eval.org) and freely available for future use and further psychometric analysis. The research team consisted of a statistician and 4 nurse educators and researchers with extensive clinical, simulation, and classroom nursing education experience.

Recruitment and Sampling

Research ethics board approval was obtained (#101793), and subject recruitment was conducted via snowball sampling strategy using social media sites. This nonprobability convenience sampling method was used as many nursing schools worldwide moved to online learning in the wake of the COVID-19 pandemic, making potential participants difficult to identify or recruit. The sampling strategy is further described by Leighton et al.[16] Inclusion criteria were prelicensure nursing students at any level of their program of study, including those who recently graduated, who had cared for at least 1 patient in each of the 3 clinical environments between January 1, 2020, and June 30, 2020. Exclusion criteria were nursing students who graduated prior to January 2020 or had previous licensure as an RN.

Thirteen social media sites catering to the nursing student audience were identified in an online search. Each site owner was contacted for permission to post study-related information; only one gave permission but did not post the recruitment message. Fifteen sites for nurse educators were then identified in an online search; 7 sites posted the recruitment information. The intent was for educators to share the information with students through social media accounts. The research team also posted to their personal social media accounts. All recruitment information led potential participants to a website where full study information and link to the informed consent and survey housed in QualtricsXM (2020, Provo, Utah) were posted.

Following informed consent, participants responded to demographic questions about their program of study and marked how well they thought their learning needs were met in each of the 3 learning environments. In addition, participants were asked how many hours they spent each week playing screen-based games to see if there was a correlation between these games and how well learning needs were met with SBS.

Statistical Analysis

Data were summarized as means (SDs), medians (first quartile, third quartile) and minimums and maximums. To ensure a more valid comparison of the difference in how well each respondent perceived each setting to meet their learning needs, only those cases that did not respond NA on any items (n = 113) were included in item score analysis. The item scores had a heavily skewed, asymmetric ordinal distribution with only 4 response categories, so a Friedman test was chosen to test for differences in item scores across the 3 settings with post hoc multiple comparisons.[17] Friedman test is a nonparametric alternative to repeated-measures analysis of variance and is well suited to the ordinal data captured from the same respondents in multiple environments. Associations between item scores and demographic variables were assessed using Spearman ρ and Kruskal-Wallis tests. To reduce the

chance of type I error and maintain a family-wise error rate of $\alpha = .05$, a Bonferroni correction was used to adjust the significance threshold to $\alpha = .0001$ for all hypothesis tests involving CLECS 2.0 item scores. Differences in subscale scores were not tested because of the number of NA responses and to limit family-wise error rate.

Results

Of the 174 total respondents, 61 marked at least 1 CLECS 2.0 item as NA and were omitted from analysis. Of the 113 respondents retained for item score analysis, 93 (82.3%) attended school in the United States, 12 (10.6%) attended school in Japan, and 8 (7.1%) attended school in Canada. A summary of all demographic variables measured is represented in the Supplemental Digital Content, Table, http://links.lww.com/NE/A969. Approximately half of the respondents were in baccalaureate nursing programs (n = 61). On average, respondents had been in their respective nursing programs for 20 (SD, 13.7) months. Respondents attended traditional clinical practice the greatest number of times (mean, 10.4 [SD, 8.1]) and on average spent 4.2 (SD, 3.0) hours preparing for traditional clinical practice. Respondents also reported spending an average of 3.8 (SD, 5.8) hours per week playing video games.

Results of Friedman tests show scores of each CLECS 2.0 item are significantly different across the 3 clinical settings with post hoc comparisons revealing that for most items the difference was between the TCE and SBS (Table, category B). Item scores were typically greatest for TCE (range, 2.86-3.74) and lowest for SBS (range, 1.84-2.91) (Table). Students perceived all their learning needs were better met in the TCE than either F2FS or SBS. For the items *interacting with patient* (item 3) and *thoroughly documenting patient care* (item 20), students reported their learning needs were better met in the TCE than in FTFS (see Friedman test, A). In addition, items in the communication (1, 2, 4), nursing process (9), critical thinking (19, 22), and teaching-learning dyad (24, 25, 28, 29) subscales indicated that students believed their learning needs were better met by FTFS than by SBS (see Friedman test, C). Two of the items, *understanding patient's pathophysiology* and *receiving immediate feedback on performance*, did not have any significant post hoc tests despite having a significant Friedman test. This is most likely due to the small α level set to control the family-wise error rate.

Spearman ρ between each quantitative variable (number of times attended clinical, hours preparing for clinical, and hours spent gaming per week) in each setting was all of magnitude less than or equal to 0.30, and none were significant at the $\alpha = .0001$ level, indicating no correlation between item scores and clinical preparation hours, clinical attendance count, or video game hours.

Discussion

The CLECS 2.0 measured student perceptions of how well they believed their learning needs were met in 3 clinical learning environments (TCE, F2FS, and SBS) during the spring of 2020. VR was not addressed in this study as the researchers assumed that most students did not have access to quality VR equipment in the home. For all items, the SBS environment had the lowest mean scores (Table).

Comparison of CLECS 2.0 Items Between Environments

Communication

As seen in the Table, students reported their need for opportunities for c*ommunicating with an interdisciplinary team* (item 2) were more consistently met in TCE and F2FS than in SBS. Providing information and support to families in the TCE and F2FS met students' needs better than an SBS opportunity. Current SBS programs rarely have high-level artificial intelligence for robust real-time student patient/interprofessional team conversations and interactions; communication is often typed or in preplanned phrases and sentences using a mouse and keyboard, which creates an artificial rather than spontaneously realistic means of interaction. Students also indicated TCE met their need for *interacting with the patient* (item 3) better than F2FS. This may be due to students' awareness of the artificial and predictable environment provided in the simulation laboratory compared with the more uncontrolled nature of an actual patient encounter.

Nursing Process

Students' learning needs related to the nursing process were met significantly less in the SBS than the TCE. Furthermore, students' needs were met less well in the SBS than F2FS for *prioritizing patient care* (item 9). The nursing process is a dynamic and creative problem-solving process that may be hard to effectively replicate in SBS software. Students who gave lower scores on items related to the nursing process in SBS may not have had the opportunity to exercise all 5 phases of the nursing process (assessment, nursing diagnosis, plan, implementation, and evaluation) in a way that felt natural to them. These findings suggest the SBS scenarios would benefit from incorporating care planning and prioritization tasks that better mimic the chaotic and unpredictable nature of the real clinical setting.

Holism

The subscale of holism (items 12-17) arguably encompasses the heart of nursing. Students' scores for *discussing a patient's psychosocial, developmental, spiritual, and cultural needs*, as well as *assessing outcomes of care and identifying nursing goals*, ranked significantly lower in the SBS than the TCE and F2FS. The TCE is ultimately where nurses practice their craft, with real patients, peers, and outcomes resulting from those interactions. The holistic aspects of a person can be replicated in the F2FS environment through use of simple, inexpensive props designed to trigger the student to explore psychosocial, developmental, spiritual, and cultural needs of the patient and correlate them with physical care and treatment goals. These same features of scenario design should be replicated by SBS developers.

Table. CLECS 2.0 Items Across 3 Clinical Settings With Post Hoc Comparisons

		Mean (SD)			Friedman Test[a]	
Subscale	Item	TCE	F2FS	SBS	χ^2 (df = 2)	Significant Post Hoc Comparisons
Communication	1. Preparing to care for patient	3.58 (0.68)	3.22 (0.80)	2.46 (1.01)	79.61[b]	B, C
	2. Communicating with interdisciplinary team	3.36 (0.82)	2.86 (1.04)	2.04 (1.03)	82.66[b]	B, C
	3. Interacting with patient	3.74 (0.56)	2.92 (0.93)	2.19 (1.05)	108.13[b]	A, B
	4. Providing information and support to patient's family	3.18 (0.85)	2.63 (1.08)	1.84 (0.98)	86.93[b]	B, C
Nursing process	5. Understanding rationale for patient's treatment plan	3.46 (0.67)	3.13 (0.84)	2.66 (0.95)	57.66[b]	B
	6. Understanding patient's pathophysiology	3.46 (0.69)	3.19 (0.85)	2.91 (0.92)	30.90[b]	–
	7. Identifying patient's problems	3.53 (0.66)	3.31 (0.78)	2.86 (0.93)	42.30[b]	B
	8. Implementing care plan	3.33 (0.83)	3.03 (0.96)	2.55 (0.99)	37.14[b]	B
	9. Prioritizing care	3.40 (0.79)	3.20 (0.86)	2.74 (0.99)	38.41[b]	B, C
	10. Performing appropriate assessment	3.63 (0.66)	3.26 (0.84)	2.50 (1.05)	78.07[b]	B
Holism	12. Assessing outcomes of care provided	3.27 (0.83)	2.96 (1.02)	2.33 (1.05)	49.27[b]	B
	13. Identifying short- and long-term nursing goals	3.27 (0.82)	2.78 (0.99)	2.29 (0.99)	63.82[b]	B
	14. Discussing patient's psychosocial needs	3.22 (0.86)	2.70 (1.08)	2.23 (1.09)	59.07[b]	B
	15. Discussing patient's developmental needs	3.18 (0.88)	2.62 (1.05)	2.19 (1.04)	55.97[b]	B
	16. Discussing patient's spiritual needs	2.86 (1.05)	2.44 (1.08)	1.94 (0.98)	52.52[b]	B
	17. Discussing patient's cultural needs	2.93 (0.95)	2.48 (1.02)	1.96 (1.00)	63.97[b]	B
Critical thinking	18. Anticipating and recognizing changes in patient's condition	3.42 (0.79)	3.05 (0.89)	2.42 (1.02)	59.28[b]	B
	19. Taking appropriate action when patient's condition changes	3.40 (0.75)	3.17 (0.89)	2.43 (1.05)	60.70[b]	B, C
Self-efficacy	21. Reacting calmly to changes in my patient's condition	3.34 (0.75)	3.03 (0.85)	2.50 (1.06)	37.27[b]	B
	22. Knowing what to do if I make an error in my care	3.11 (0.88)	2.92 (0.9)	2.27 (0.96)	49.78[b]	B, C
	23. Being confident in my decisions	3.04 (0.78)	2.81 (0.93)	2.27 (0.98)	44.65[b]	B
	27. Feeling confident in abilities	3.17 (0.85)	2.84 (0.91)	2.25 (0.94)	57.25[b]	B
Teaching-learning dyad	24. Having instructor available to me	3.50 (0.76)	3.29 (0.89)	2.50 (1.13)	59.58[b]	B, C
	25. Feeling challenged and stimulated	3.54 (0.73)	3.20 (0.87)	2.35 (1.06)	84.33[b]	B, C
	26. Receiving immediate feedback on performance	3.37 (0.88)	3.35 (0.85)	2.74 (1.03)	29.96[b]	–
	28. Feeling supported by instructor and peers when making care-related decisions	3.50 (0.75)	3.25 (0.9)	2.44 (1.14)	60.52[b]	B, C
	29. Improving my critical thinking skills with experiences	3.52 (0.66)	3.22 (0.92)	2.45 (1.04)	64.77[b]	B, C
Unassigned to subscale	11. Evaluating the effects of medications administered	3.30 (0.82)	2.81 (1.05)	2.35 (1.06)	45.46[b]	B
	20. Thoroughly documenting patient care	3.50 (0.78)	2.58 (1.05)	2.12 (1.07)	97.07[b]	A, B

Abbreviations: CLECS, Clinical Learning Environment Comparison Survey; F2FS, face-to-face simulation; SBS, screen-based simulation; TCE, traditional clinical environment.
A = statistically significant difference between traditional clinical and face-to-face simulation. B = statistically significant difference between traditional clinical and screen-based simulation. C = statistically significant difference between face-to-face simulation and screen-based simulation.
[a]Each Friedman test had 2 degrees of freedom (df), and the critical difference in each post hoc test was 62.4 (α = 0.0001).
[b]P < .0001.

Critical Thinking

There was a difference ($P < .0001$) in how well students' needs for *anticipating and recognizing changes in a patient condition* and *taking action* (critical thinking subscale) were met between the TCE, F2FS, and SBS. These 2 items are the basis of clinical reasoning and judgment and are skills that are practiced iteratively and nonlinearly during the course of patient care.[18] Effective clinical judgment involves determining whether action is required and, if so, whether to use or modify standard approaches or improvise a new approach that best meets the patients' needs.[18] This type of nonlinear, creative ingenuity is a hallmark of good nursing practice but may be challenging to integrate into SBS software. Instructors should be aware of this shortfall and provide opportunities during debriefing to discuss students' decision-making processes and alternative actions that could have been chosen during clinical scenarios.

Self-efficacy

Students indicated that TCE and F2FS met their needs for evaluating their own *self-efficacy* (items 21-23, 27) better than SBS. The opportunity to self-reflect with faculty and peers present in post–clinical conferences or simulation debriefing is not unusual. Indeed, experiencing a first bed bath with pericare[19] or dementia patient or patient death[20] with a faculty member close at hand would allow for validation of self-efficacy. Many SBS programs are designed as asynchronous activities where the learner, peers, and instructor are involved at different times. Further study is warranted to ascertain the effect of more immediate feedback in the form of synchronous interaction or debriefing that occurs individually or within a group or immediately following the SBS versus debriefing that follows later.

Teaching-Learning Dyad

Students indicated that their need for having an instructor available to them (items 24-26, 28-29) was better met in the TCE and F2FS learning environments, compared with SBS. The INACSL Standards of Best Practice: Simulation[21] and NCSBN faculty guidelines[22] apply to all clinical environments and should be used to prepare students for their learning in the SBS environment. Whether students were prepared by faculty for their SBS is unknown but should be explored in future studies. The researchers did not ask study participants about their SBS prebriefing; however, as more is understood about the use of SBS, the importance of prebriefing SBS will become clearer.[23]

Faculty should complete the SBS themselves before assigning it to students.[23,24] This allows faculty to speak knowledgeably about the scenarios during a prebriefing and debriefing and note any regional or customary variations encountered, any variations in drugs or protocols that might be identified in the program, or technical glitches in the scenario itself. Prior to assigning the SBS, faculty should also verify that learning objectives are at the correct level for the student, instructions are clear, and how to best help the student to prepare is identified. In addition, the faculty should explore and understand the analytic capabilities of the SBS program for necessary data collection and evaluation.

Medication Administration and Care Documentation

Two items (11, 20) not associated with the 6 CLECS 2.0 subscales[13] were also measured. Students identified a difference on *evaluating the effects of medications administered to the patient* between TCE and SBS. The physical task of preparing and administering medications in TCE and F2FS is completed with a mouse click in SBS, and methods for assessment of medication effects are limited to those preprogrammed into the simulation. *Documenting patient care* is not often an expectation of SBS or F2FS but is often expected in the TCE. Only slightly more than half of simulation programs use electronic health records.[25] This lack of consistent practice is worthy of further study.

Under normal conditions, faculty have the time and experience to ensure their F2FS and clinical practice experiences are well thought out. Faculty may not have had any experience with SBS, but adopted it for any number of reasons during the pandemic; indeed, some companies offered SBS resources at no cost. Faculty were asked to pivot quickly to online learning; many had no experience or training in either online teaching and/or SBS. Rapid changes during an emergency are almost never the ideal. While this small study offers a glimpse of students' opinions, it might be interesting to further study how SBS has evolved over the last year and how vendors and faculty have responded to the increased usage of this modality.

What may have been lost in the widespread adoption of SBS as clinical replacement is the understanding that, as a form of simulation, SBS should be used with the same pedagogical rigor as TCE and F2FS. SBS scenarios should be tested (dry run) ahead of time by the clinical faculty member to note any practice variations that may be present.[23] Faculty should prebrief and debrief students using theory-based models. Current research suggests that students using SBS preferred an independent self-debrief, followed by a larger group debrief, to allow an opportunity to address any questions or misconceptions.[24] Faculty development about simulation in all forms, including SBS, should include the concepts of prebriefing, facilitation, and debriefing.[21,22]

Limitations

The sample of this study was reached through snowball sampling; however, an indirect approach was required as the nursing student social media sites did not agree to post recruitment information. The use of faculty and simulationist websites creates a risk of bias in that the faculty may have expertise in one or another type of teaching environment, which may result in their recruited students rating that environment higher. In snowball sampling, the composition of the final sample is unknown, and it is possible that responses were submitted by people other than the intended participants.

The resulting sample was very small, resulting in the inability to generalize any of the findings.

Future studies should ascertain the types of SBS programs in use, the faculty or facilitators' training for implementation, support received, understanding of best practices for online learning, and their competency in using the program and technology.

The research team chose to keep the original definitions of the subscale concepts from the CLECS for this study. While student learning needs have not changed in the clinical environment, current definitions of the concepts should be explored during future study of the CLECS 2.0 and in conjunction with a factor analysis. The sample size in this study was not large enough to perform psychometric evaluation and confirm the subscale structure identified in the original CLECS; however, item-by-item analysis of an instrument is acceptable under its own merit. Future research is needed with larger samples. The researchers support updating definitions of subscales to align with current practice, such as changing critical thinking to clinical reasoning.

Conclusion

This study compared prelicensure nursing students' perceptions of learning using the CLECS 2.0 in 3 learning environments: TCE, F2FS, and SBS. SBS scored the lowest for every CLECS 2.0 item when compared with F2FS and TCE. This is concerning as the discussion about whether SBS can replace traditional clinical practice hours unfolds. While SBS is being used as a form of self-guided simulation, it does not abrogate faculty responsibility for the pedagogical expectations associated with simulation. While this study did not differentiate between SBS products and the conversion of F2FS to online, the findings support the need for a concentrated effort to improve specific areas of the SBS experience.

References

1. Lea M. How virtual simulation is set to change nursing education. *HealthTech*. https://healthtechmagazine.net/article/2020/05/how-virtual-training-set-change-nursing-education. Accessed May 20, 2020.
2. Rabe A, Sy M, Cheung WYW, Lucero-Prisno DE. COVID-19 and health professions education: a 360 view of the impact of a global health emergency. *MedEdPublish*. 2020;9. doi:https://doi.org/10.15694/mep.2020.000148.1
3. Lioce L, Lopreiato J, Downing D, et al. *Healthcare Simulation Dictionary*. AHRQ Publication No. 20-0019. 2nd ed. Agency for Healthcare Research and Quality; 2020. https://doi.org/10.23970/simulationv2
4. Leighton K, McNelis AM, Kardong-Edgren S, Foisy-Doll C, Sullo E. Traditional clinical outcomes in prelicensure nursing education: an empty systematic review. *J Nurs Educ*. 2021;60(3):136-142. doi:https://doi.org/10.3928/01484834-20210222-03
5. Wu XV, Enskär K, Lee CCS, Want W. A systematic review of clinical assessment for undergraduate nursing students. *Nurse Educ Today*. 2015;35(2):347-359. doi:https://doi.org/10.1016/j.nedt.2014.11.016
6. Roberts E, Kaak V, Rolley J. Simulation to replace clinical hours in nursing: a meta-narrative review. *Clin Simul Nurs*. 2019;37:5-13. doi:doi.org/10.1016/j.ecns.2019.07.003
7. Hayden JK, Smiley RA, Alexander M, Kardong-Edgren S, Jeffries PR. The NCSBN national simulation study: a longitudinal, randomized, controlled study replacing clinical hours with simulation in prelicensure nursing education. *J Nurs Regul*. 2014;5(2):C1-S64. https://www.ncsbn.org/JNR_Simulation_Supplement.pdf.
8. Cant RP, Cooper SJ. Simulation-based learning in nurse education: systematic review. *J Adv Nurs*. 2010;66:3-15. doi:https://doi.org/10.1111/j.1365-2648.2009.05240.x
9. Dunn SV, Hansford B. Undergraduate nursing students' perceptions of their clinical learning environment. *J Adv Nurs*. 1997;25:1299-1306. doi:https://doi.org/10.1046/j.13652648.1997.19970251299.x
10. Jeffries PR, Rizzolo MA. *Designing and Implementing Models for the Innovative Use of Using Simulation to Teach Nursing Care of Ill Adults and Children: A National, Multi-site, Multi-method Study*. National League for Nursing; 2006.
11. Padilha JM, Machado PP, Ribeiro AL, Ramos JL. Clinical virtual simulation in nursing education. *Clin Simul Nurs*. 2017;15:13-18. doi:https://doiorg/10.1016/j.ecns.2017.09.005
12. Phillips KF, Mathew L, Aktan N, Catano B. Clinical education and student satisfaction: an integrative literature review. *Int J Nurs Sci*. 2017;4(2):205-213 https://dx.doi.org/10.1016/j.ijnss.2017.03.004
13. Leighton K. (2015). Development of the Clinical Learning Environment Comparison Survey. *Clin Simul Nurs*. 2015 Jan; 11(1): 44–51. http://dx.doi.org/10.1016/j.ecns.2014.11.002
14. Billings DM, Halstead JA. *Teaching in Nursing: A Guide for Faculty*. Elsevier, Inc; 2016.
15. Waxman KT, Fowler Durham C. Use simulation to replace much needed, lost clinical experiences due to COVID19: Strategies and recommendations [video]. YouTube. March 31, 2020. https://youtu.be/W9S3_NbqB18.
16. Leighton K, Kardong-Edgren S, Schneidereith T, Foisy-Doll C. Using social media and snowball sampling as an alternative recruitment strategy for research. *Clin Simul Nurs*. 2021;55:37-42. doi:https://doi.org/10.1016/j.ecns.2021.03.006
17. Siegel S, Castellan NJ. *Non Parametric Statistics for the Behavioural Sciences*. McGraw-Hill; 1988.
18. Wong SHV, Kowitlawakul Y. Exploring perceptions and barriers in developing critical thinking and clinical reasoning of nursing students: a qualitative study. *Nurs Educ Today*. 2020;95:104600. doi:https://doi.org/10.1016/j.nedt.2020.104600
19. Reid-Searl K, O'Neill B. Mask-Ed: breaking the barrier of fear of intimate care for nursing students. *J Nurs Educ*. 2017;56(9):572-574. doi:doi.org/10.3928/01484834-20170817-12
20. McKenzie EL, Brown PM. Nursing students' death anxiety and fear towards dementia patients. *Australas J Ageing*. 2017;36(3):e32-e35. doi:https://doi.org/10.1111/ajag.12414
21. INACSL Standards Committee. Standards of best practice: Simulation[SM]. *Clin Simul Nurs*. 2016;12:S1-S50. https://www.inacsl.org/INACSL/assets/File/public/standards/SOBPEnglishCombo.pdf.
22. Alexander M, Durham CF, Hooper JI, et al. NCSBN simulation guidelines for prelicensure nursing programs. *J Nurs Regul*. 2015;6(3):39-42. doi:https://doi.org/10.1016/S21558256(15)30783-3
23. Verkuyl M, Atack L, Kamstra-Cooper K, Mastrilli P. Virtual gaming simulation: an interview study of nurse educators. *Simul Gaming*. 2020;51(4):537-549. doi:https://doi.org/10.1177/1046878120904399
24. Verkuyl M, Lapum JL, St-Amant O, et al. Exploring debriefing combinations after a virtual simulation. *Clin Simul Nurs*. 2020;40:36-42. doi:https://doi.org/10.1016/j.ecns.2019.12.002
25. Badowski D, Horsley TL, Rossler KL, Mariani B, Gonzalez L. Electronic charting during simulation: a descriptive study. *Comput Inform Nurs*. 2018;36(9):430-437. doi:https://doi.org/10.1097/CIN.0000000000000457