Nurse Educator

Comparison of Virtual Simulation to Clinical Practice for Prelicensure Nursing Students in Pediatrics

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ABSTRACT

Background: The COVID-19 (coronavirus disease) pandemic has required a transition from in-person clinical practice to virtual learning.

Purpose: This study compares the standardized assessment test scores of prelicensure nursing students who completed their pediatric clinical practicum in person for both the clinical and simulation practice settings versus virtually.

Methods: This study included 186 students in a pediatric clinical course. Half the students completed in-person pediatric clinical practice and simulation, and half the students used i-Human to complete their pediatric clinical practicum virtually. Scores on the Assessment Technologies Institute (ATI) Nursing Care of Children examination were compared using independent-samples *t* tests.

Results: There were no significant differences in ATI scores between students who completed their pediatric clinical practicum in the clinical setting compared with virtually ($P = .485$; 95% confidence interval, −2.24 to 4.71).

Conclusions: Using the i-Human platform, along with prebriefing and debriefing, is an effective pedagogical approach to simulating a pediatric clinical practicum.

Keywords: clinical practice, i-Human virtual platform, nursing education, pediatric nursing, virtual simulation

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In response to the COVID-19 (coronavirus disease) pandemic, schools of nursing have transitioned to distance learning. This transition has also necessitated a change in the structure in which nursing students complete their clinical practice requirements. In a position statement published in March 2020, the International Nursing Association of Clinical Simulation (INACSL) and the Society for Simulation in Healthcare indicated their support for the use of virtual simulation as a replacement for clinical practice usually completed in a health care setting for nursing students during the COVID-19 public health crisis.[1]

Virtual simulation platforms are increasingly being used as a modality for teaching and are an innovative and powerful medium for clinical education. Virtual simulation refers to screen-based scenarios that provide the opportunity for students to develop clinical skills using virtual patients in a variety of clinical practice settings and has been demonstrated to be an effective pedagogy within the nursing discipline.[2-4] Previous studies have shown virtual simulation to improve student knowledge and clinical decision making.[4] A recent systematic review on the effectiveness of virtual simulation found that 86% of the 80 articles included in the review reported improved learning outcomes in students who participated in virtual simulation experiences.[2] Most of these studies compared the effectiveness of virtual simulation to delivery of content through didactic courses or in-person simulation using high-fidelity manikins.[2]

Results from research comparing outcomes of nursing students who participated in high-fidelity manikin simulation versus virtual simulation are varied. Whereas some studies suggest no differences in knowledge based on learning modality,[4-6] others suggest differences in knowledge and clinical performance between groups.[7,8] One study found that clinical performance, as measured through timely recognition of a critical event, was better in students who were trained in person with high-fidelity manikins compared with virtual simulation.[8] However, as students gained more didactic and clinical practice experience, these differences became nonsignificant,[8] suggesting that effectiveness of virtual simulation may vary according to the learning needs of students.

Although several studies have evaluated learning outcomes for nursing students who participate in virtual simulations, it is unknown whether learning outcomes are comparable for students for whom virtual simulation has been substituted for clinical practicum. The objective of this evaluation was to compare the Assessment Technologies

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Institute (ATI) scores of prelicensure nursing students within our prelicensure program who completed their pediatric clinical practicum in person in the clinical and simulation practice setting versus virtually. It was important to evaluate the effect of virtual simulation on learning outcomes so that pedagogical approaches for subsequent semesters could be modified if necessary and establish objective institutional data to support our method.

Methods

Sample and Setting

Students who participated in the simulation evaluation include prelicensure baccalaureate nursing students in a university in the Southeastern United States. All students were in their second semester of their nursing program. The groups included both traditional and second-degree nursing students. The evaluation was conducted during the spring 2020 semester.

A cross-sectional descriptive evaluation approach was used to compare the ATI scores between students who completed their pediatric clinical practicum in a health care setting and students who completed their pediatric clinical practicum using a virtual simulation, i-Human. The evaluation protocol was submitted to the institutional review board and deemed to not be human subjects research.

Evaluation Process

All students were enrolled simultaneously in a 3-credit-hour didactic pediatric nursing course, as well as a pediatric clinical practicum. All traditional nursing students received the same didactic content from the same professor, and all second-degree nursing students received the same didactic content from the same professor. Half of the students completed their pediatric clinical practicum during the first half of the semester (session 1), whereas the other half completed their pediatric clinical practicum in the final half of the semester (session 2). Students were randomly assigned to a clinical group consisting of 7 to 8 students. There were a total of 17 clinical instructors, and each clinical instructor had a group of students for session 1 as well as for session 2. Prebrief content was delivered by the same professor for all students.

At the conclusion of the semester, all students took the proctored ATI Nursing Care of Children examination. This examination covers topics including foundations of nursing care of children, age-specific developmental expectations, and care for children with chronic conditions and acute illnesses. The ATI examination is given to help nursing students prepare for the NCLEX examination. ATI examinations in other content are administered at different points throughout the nursing program.

Session 1 (In-Person Clinical Practice/Simulation Laboratory)

Students in session 1 completed 60 hours of clinical practice in a pediatric hospital as well as in-person simulations over 5 weeks. Simulation each week included a 90-minute prebrief, a 1-hour simulation experience with high-fidelity manikins, and a 30-minute debrief. Debrief time is limited to 30 minutes weekly for 5 weeks as students were in the course on a weekly basis; debrief guidelines were followed using the recommended best practice standards from INACSL.[9]

Each week, students were presented with content about 3 unique clinical scenarios during prebrief. In groups of 4 students, students completed 1 of the 3 clinical scenarios. All 3 scenarios were run at the same time for a group of 12 students. Each week, students rotated through the roles of charge nurse, bedside nurse, parent, and debriefer/observer. The simulation scenarios for each simulated patient were based on actual clinical cases seen in the clinical practice setting and were chosen based on disease states that are identified nationally as problems that bring children into the acute care clinical setting. Students then immediately debriefed about all 3 scenarios together using the INACSL standards for debriefing. Weekly debriefs included identification of patient problems and interventions, as well as reflections about simulation performance.

Session 2 (Virtual Simulation)

Because of the COVID-19 pandemic, the session 2 students were unable to complete any of their clinical practicum hours in the simulation laboratory or clinical practice setting. As a result, students completed all of their clinical practicum hours virtually, using the i-Human simulation platform (www.ihuman.com). i-Human is a virtual simulation platform that presents students with interactive medical patient encounters.[10] Each case includes an animated avatar in which students take a patient history, perform a physical assessment, identify health problems, and prioritize interventions.[10] Cases allow for the integration of pathophysiology, pharmacology, and nursing foundation knowledge.[10] i-Human tracks each decision that students make and provides them with immediate feedback about their decision making.[10] Faculty can access performance reports for students to identify areas in which additional learning may be required and thus focus their debrief with students. i-Human can be accessed through phone, tablet, and computer. Both faculty and students completed an i-Human virtual tutorial as it was their first time using this product.

i-Human was selected as the virtual platform as it had 5 cases that aligned with content offered to the first session students in the in-person simulation laboratory. For example, i-Human offered pediatric cases in assessment, respiratory, neurology, and pediatric shock. Students in session 2 completed 35 hours of virtual simulation using the i-Human platform over 5 weeks. Using guidance set by our school leadership following the transition to virtual learning, each hour of virtual simulation was counted for 2 hours of clinical practice time, which allowed for 70 clinical practice hours. Each week, students in session 2 received the same prebrief content as session 1 students and then completed a case online in i-Human asynchronously. The case in i-Human was selected for its similarity

to the in-person simulation scenarios. Students completed 7 hours weekly including prebrief work and debrief. Each case in i-Human took students over 4 hours to complete. Following completion of the virtual simulation, students met online synchronously as a group of 7 to 8 students with their clinical faculty for a 1-hour debrief. Students in both sessions were accountable for mastery of content with weekly quizzes.

Statistical Analysis

Descriptive test statistics were used to analyze the distribution of ATI scores and the distributions were evaluated for normality. ATI scores for both traditional nursing students and second-degree students were normally distributed as assessed by Shapiro-Wilks test ($P > .05$). Independent-samples *t* tests were used to determine if there were any differences in ATI scores for students in sessions 1 and 2. All data were reviewed for data entry errors, outliers, and missing data. Statistical analysis was performed using IBM SPSS version 26 (IBM Corp, Chicago, Illinois) with α levels set at .05 and 2-tailed.

Results

The evaluation involved 186 students. Ninety-two students were traditional; 94 students were second-degree BSN students. The average ATI score for all students was 61.31% ± 12.05%. An independent-samples *t* test was run to determine if there was a mean difference in ATI scores for students who were in clinical practice/in-person simulation laboratory and virtual simulation. Results show that there were no statistically significant differences in ATI scores between students in clinical practice/in-person simulation laboratory (61.91% ± 10.76%) and virtual simulation (60.67% ± 12.99%), $t(184) = 0.700$, $P = .485$; 95% confidence interval (CI) for mean difference in ATI scores, –2.24 to 4.71. These scores are shown in the Table.

Table. Differences in ATI Scores of Prelicensure Nursing Students

Groups	n	ATI Score, %	Mean Difference in ATI Scores
Total sample			−2.24, 4.71
In person[a]	88	61.91 ± 10.76	
Virtual[b]	98	60.64 ± 12.99	
Traditional BSN students			−1.19, 9.32
In person[a]	47	60.13 ± 11.55	
Virtual[b]	45	56.06 ± 13.75	
Second-degree BSN students			−4.93, 3.65
In person[a]	41	63.95 ± 9.50	
Virtual[b]	53	64.59 ± 11.01	

[a]*In person clinical practice/simulation.*
[b]*Virtual simulation.*

Data were then stratified to evaluate if there were any differences in ATI scores between students in clinical practice/in-person simulation laboratory and virtual simulation within the cohort of traditional nursing students or the cohort of second-degree students. Among second-degree students, there were no statistically significant differences in ATI scores between students in clinical practice/in-person simulation laboratory (63.95% ± 9.50%) and virtual simulation (64.59% ± 11.01%), $t(92) = -0.30$, $P = .77$; 95% CI, –4.93 to 3.65. There was a larger difference in ATI scores between students in clinical practice/in-person simulation laboratory (60.13% ± 11.55%) and virtual simulation (56.06% ± 13.75%) for traditional nursing students; however, this difference was not statistically significant, $t(90) = 1.54$, $P = .13$, 95% CI mean difference in ATI scores, –1.19 to 9.32.

Specific areas of concentration for the simulations were reviewed in the ATI analytics. Areas of strength for both groups included topics that students received either through in-person simulation or an i-Human case scenario, including sickle cell disease, cystic fibrosis, infectious respiratory disease, head injury, cardiovascular disease, and physical assessment.

Discussion

The current COVID-19 pandemic has required a rapid response to the inability to have practice in clinical settings in nursing education. As a result, nursing programs have transitioned clinical and simulation-based courses to distance learning, which has required integrating virtual clinical simulations into course delivery. In our school of nursing, we evaluated the alternate virtual pediatric clinical practicum experience, using i-Human platform, and its impact on student learning outcomes.

There were no significant differences in ATI scores between students who had pediatric clinical practice in person and students who completed their pediatric clinical practicum hours using the virtual simulation, i-Human. Significant differences were not found in either cohort of students. As such, we are continuing to use the i-Human platform along with content prebriefing and debriefing for virtual pediatric clinical practice. Our evaluation was consistent with a previous study suggesting that i-Human helped develop diagnostic reasoning skills and clinical decision making in family nurse practitioner students.[11] The immediate student feedback along with the ability of faculty to access reports on content areas in which students perform poorly can facilitate a more robust simulation debrief and solidify content knowledge.

Although we found no difference in ATI scores, we will continue to evaluate whether virtual simulation can replace clinical practice or in-person simulation experiences in our program. ATI tests a student's content knowledge but does not test psychomotor skills or the ability to communicate therapeutically with patients, which are essential components of quality nursing care. Both clinical practice and in-person simulation may contribute more to the development of these critical nursing skills as compared with

the content knowledge necessary to succeed on an academic test.

Limitations

Limitations in the data analysis using ATI results include that faculty could not control student preparation time for the examination or anxiety during the examination; both groups of students used a virtual proctoring modality for ATI. Additionally, the results of this study cannot be generalized to other virtual clinical platforms.

Conclusion

This study compared in-person clinical experience and simulation to virtual simulation as a replacement for clinical hours. There were no statistically significant differences in ATI scores between students who completed their pediatric clinical rotations virtually compared with those who completed their practicum in person. Demonstrating comparable knowledge outcomes on a standardized nursing assessment for students who received in-person clinical practicum and those whose practicum was replaced by virtual simulation is reassuring with the current COVID-19 pandemic.

More research to evaluate the use of virtual simulation as a replacement for clinical practice is needed. Future studies should further investigate knowledge and clinical performance outcomes of nursing students for whom virtual simulation was used in lieu of an in-person clinical practicum to determine best practices for use of virtual simulation. The study suggests a potential successful way to teach pediatric material in the absence of in-person clinical practicum and simulation.

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