

Effect of High-Fidelity Simulation on Clinical Judgment Among Nursing Students

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Abstract

Introduction: Nursing education needs to be improved in order to bridge the gap between education and clinical practice. However, clinical placements for nursing students are limited and student nurses often take merely an observer role, especially in critical situations. High-fidelity simulation (HFS) is a teaching method that can bridge the gap between education and clinical practice. The purpose of this study was to evaluate the influence of using HFS as a teaching method on clinical judgment among pediatric nursing students at the Arab American University utilizing a bacterial meningitis case scenario.

Methods: A quasi-experimental study with a convenience sample of one hundred and fifty baccalaureate nursing students enrolled in a pediatric health nursing course. Nursing students were randomly assigned to high-fidelity simulation experience or traditional methods. The clinical judgment was assessed using Lasater Clinical Judgment Rubric Tool.

Results: Results revealed that the high-fidelity simulation experience has improved pediatric nursing students' clinical judgment. The mean clinical judgment differed significantly at post-test in the intervention group after the simulation ($t(148) = 7.20, P < .001$).

Conclusion: The HFS can be an effective tool to provide a safe and effective learning environment for pediatric nursing students, consequently improving their clinical judgment

Keywords

clinical judgment, high-fidelity simulation, nursing, students

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Open Access pages (<https://us.sagepub.com/en-us/nam/open-access-at-sage>).

Highlights

What do we already know about this topic?

- High-fidelity simulation has the potential to enhance pediatric nursing education and improve confidence among nurses and other healthcare professionals

How does your research contribute to the field?

- High-fidelity simulation can be an effective tool to improve clinical judgment among pediatric nursing students

What are your research's implications toward theory, practice, or policy?

- The study supports using high-fidelity simulation in conjunction with the clinical site experience in preparing pediatric nursing students, where the integration intended to bridge the gap between knowledge and nursing practice

Introduction

Owing to the shortage of clinical placement locations, pediatric nursing students have limited opportunities to practice.¹ Unfortunately, because of limitations on what students are permitted to do and not permitted to do, students often end up in an observer position in the practical clinical encounters that they do have the opportunity to participate in, especially in obstetrics and pediatrics.² Additionally, nursing educators are facing a deficiency inadequate clinical space, a shortage of clinical nursing faculties, and students in hospital settings often do not have the opportunities to care for and treat life-threatening cases.³⁻⁵ Patient safety protocols can also limit the involvement of students in the provision of care and treatment.⁶ These challenges make it difficult for nursing students to have clinical experiences that strengthen their clinical judgment.⁶ It is vital for new nurses to have high levels of confidence in their ability to make the correct clinical decisions.⁷ To that end, the high-fidelity simulation (HFS) could be replaced 50% of the clinical training hours in a nursing course.⁸ Simulation offers a safe practice environment for learners where they can make errors in a structured, controlled environment.^{9,10} Moreover, HFS has the potential to enhance pediatric nursing education and improve confidence among nurses and other healthcare professionals.¹¹ Further, previous studies concluded that high fidelity has the capability to improve decision making,⁷ clinical judgment,^{12,13} and self-awareness and empathy.¹⁴ These high-fidelity simulation laboratories demonstrate an efficient outlet for nurses to practice the competencies required to take care of complicated, highly critical cases; drill for emergency preparedness; or function collaboratively amongst a team of healthcare providers.²

However, there is little evidence to support that HFS may be a form of teaching and learning that supports students in the development of clinical judgment and the use of simulation requires further study.⁸ Therefore, the purpose of this quasi-experimental, two-group, post-test study was to evaluate the influence of using HFS as a teaching method on clinical judgment among pediatric

nursing students at the Arab American University utilizing a bacterial meningitis case scenario.

Method

Design: A quasi-experimental two-group pre-post-test study. The study was conducted between February and March 2019.

Sample and Setting

The G*power version 3.0.10 was used to estimate a necessary sample size for this study. Using a calculated medium effect size of .5 based on nursing research for an independent t-test to determine the differences between means of the groups, an alpha of .05, and power of .8, which is recommended based on the assumption that an expected difference would result, a sample size of 128 participants was calculated. To overcome the attrition rate, a convenience sample (N = 150) of baccalaureate nursing students enrolled in the pediatric nursing course were recruited from the Faculty of Nursing at a larger university program in Palestine. Random allocation was used to assign students either to control (n = 75) or intervention group (n = 75).

The researcher listed the students and randomly assigned the first number in the list to the intervention group and then the second one to the control group. The same process was repeated until the desired sample size was achieved (Figure 1).

Inclusion criteria included nursing students enrolled in the pediatric health nursing course. Students with special needs such as physical or sensory impairment (hearing or vision) that would have interfered with their ability to communicate and work in a simulated environment were excluded from the study.

The Intervention

One simulation scenario of a clinical case of bacterial meningitis was adopted for this study. The scenario was

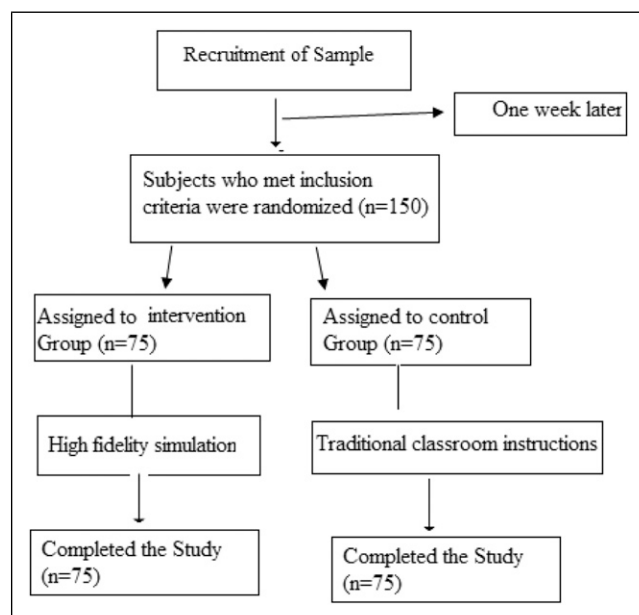


Figure 1. Sampling and flow of subjects through the study.

adopted from the Simulation Scenarios for Nurse Educators developed by Campbell and Daley.¹⁵ This scenario included a four-year-old child complaining of a high fever, nuchal rigidity, photophobia, and positive Krings and Budenski signs. The researchers divided the students in the simulation training into 5 groups of fifteen students in each group. The simulation training was two hours for each group. From each group, five students were chosen randomly as a team to demonstrate the scenario, and the remaining members of the group were in the debriefing room, observing the team demonstration. The team role was a primary nurse, secondary nurse, family, physician, and leader. The interventions required for the simulation group included activities such as measuring the vital signs, breath sounds assessment, connecting heart monitor leads, providing oxygen supplement if needed, monitoring oxygen saturation and arterial blood gases (ABGs), tracking laboratory results, diagnostic tests, and medication administration. Determining which of the skills was appropriate for the care and management of the simulated patient required the participants to exercise clinical judgment. The researcher stopped the simulation and led the debriefing session for the participants when the scenario was completed. The debriefing session lasted up to 10 minutes where a discussion of the positive aspects of the simulation performance, as well as the opportunities for improvement, was undertaken. The students of the group then repeated the scenario for expert role modeling and deliberate practice with feedback until the students were proficient. Each team in the group needed 40 minutes (scenario and debriefing) to accomplish their demonstration.

The control group received a three-hour lecture about bacterial meningitis and clinical training in the hospital. The

control group was divided into seven groups randomly, and each group trained for two days. At the end of clinical practice, the control group was evaluated by the researcher using LCJR. The intervention group received a three-hour lecture about bacterial meningitis, simulation training, and clinical training in the hospital. In the clinical practice, the intervention group was divided into seven groups randomly, and each group trained for two days. At the end of clinical practice, the intervention group was evaluated by the researcher using LCJR.

The clinical training in the hospital offered the opportunity for nurses' students to demonstrate their knowledge and skills with a real child suffering bacterial meningitis.

The same theoretical content and clinical training were given by the same instructor to eliminate bias in instructional delivery methods.

Instruments/Tools

The instruments used in this study composed of the following:

Demographic data question set: was designed by the researcher. It covered participants' demographical data such as age and gender

Lasater Clinical Judgment Rubric: The original tool was developed by Lasater¹⁶ to evaluate students' clinical judgment. The rubric has four subscales: noticing, interpreting, reflecting, and responding. Each domain is rated using a Likert-type scale from 1 to 4, with 1 being beginning, 2 is developing, 3 is accomplished, and 4 being exemplary. Total scores identify the level of development of overall clinical nursing judgment and range from 11 to 44. Scores in the 34-44 range indicate exemplary; those in the 23-33 range are accomplished, the 12-22 range indicates developing, and 11 or below is beginning. The psychometric analysis supports the use of this rubric in HFS research. The LCJR inter-rater reliability is ($\alpha = .87$), and the internal consistency of the subscales is (Cronbach's alphas, ranging from .87 to .93). Permission to use the LCJR was obtained from the author.

Data Collection Procedure

After obtaining ethical approval and permission from the university, the researchers first met the course coordinator at the nursing faculty and asked the coordinator to serve as a liaison to approach students in the pediatric health nursing course. The role of the coordinator was limited to approaching and informing the learners about the study and its purpose and inviting them to take part in the study. Additionally, the study announcement was put on the student board and on electronic contact links in conjunction with the administrator of the Faculty of Nursing. The coordinator then invited the researchers to provide students who displayed the desire to take part in the study with the

information related to the study. Information regarding the purpose, content, and duration of the research and what was expected from participants was given by the researcher. Students who met the inclusion criteria and agreed to participate were asked to sign the informed consent. The researcher randomly assigned the students to the intervention group or to the control group according to identity number. All students in both groups filled the demographic part of the questionnaire.

Ethical Consideration

Ethical approval was obtained from the Arab American University, and data were collected anonymously. The researchers presented the purpose of the study to the students. The students were informed that they had the freedom to withdraw from the study at any time. Students who agreed to participate in the study were asked to sign informed consent.

Table 1. Demographic distribution of the sample (N = 150).

| Variable | Frequency (%) | M (SD) |
|----------|---------------|-------------|
| Age | | 21.6 (1.16) |
| | < 20 years | 18 (12.0) |
| | 20-25 years | 130 (86.7) |
| | > 25 years | 2 (1.3) |
| Gender | | |
| | Male | 63 (42.0) |
| | Female | 87 (58.0) |

Table 2. Comparison of the sample characteristics between the two groups according to background characteristics (N = 150).

| Variable | | Chi Square | | | |
|----------|-----------|--------------|---------------------------|----------------------|---------|
| | | Total, n (%) | Intervention Group, n (%) | Control Group, n (%) | p-value |
| Gender | Male | 63 (42.0) | 33 (44.0) | 30 (40.0) | .246 |
| | Female | 87 (58.0) | 42 (56.0) | 45 (60.0) | |
| Age | < 20 yrs | 18 (12.0) | 10 (13.3) | 8 (10.7) | 2.345 |
| | 20-25 yrs | 130 (86.7) | 63 (84.0) | 67 (89.3) | |
| | > 25 yrs | 2 (1.3) | 2 (2.7) | 0 (.0) | |

*P value significant at the .05 level.

Table 3. Comparison between the experimental and control groups regarding clinical judgment (N = 150).

| Variable | Intervention M (SD) | Control M (SD) | Statistical Test | |
|--------------------------------|------------------------|-------------------|------------------|---------|
| | | | t test | P Value |
| Clinical judgment at post test | 31.37 (11.18) | 18.03 (11.51) | 7.20 | < .001* |
| Noticing | 8.77 (3.06) | 5.33 (3.02) | 6.92 | < .001* |
| Interpreting | 5.96 (2.29) | 3.28 (2.39) | 7.00 | < .001* |
| Responding | 10.77 (3.90) | 6.20 (4.15) | 6.95 | < .001* |
| Reflecting | 5.87 (2.21) | 3.21 (2.13) | 7.49 | < .001* |

*P value significant at the .05 level.

Data Analysis

Data were analyzed using version 23 of the Social Science Statistical Package (SPSS). Independent *t* and paired *t* tests were used to compare between and within the groups.

To check the feasibility of the study, a pilot study was performed on 15 pediatric nursing students and they were excluded from the current study.

Results

One hundred and fifty participants agreed to participate in the study. The mean age of participants was 21.6 ± 1.16 , and the majority of them, 130 (86.7%), were aged between 21 and 24 years old. More than half of the sample was female, 87 (58.0%), as seen in Table 1.

At pre-test, the analysis revealed that the chi-square test indicated that all demographic variables between groups were similar, as seen in Table 2.

At post-test, an independent *t* test was performed to compare means of clinical judgment of the intervention group and the control group. There was a significant difference between the means of the clinical judgment of both groups ($t(148) = 7.20$, $P < .001$). Mean clinical judgment for the intervention group ($M = 31.37$, $SD = 11.18$) was higher than the mean score for clinical judgment among the control group ($M = 18.03$, $SD = 11.51$). Additionally, the findings of the subscales of the clinical judgment for the control group showed that the mean score ranged from 3.21 ($SD = 2.13$) for the subscale *reflecting* to 6.20 ($SD = 4.15$) for the subscale *responding*, while the subscales of clinical judgment for the intervention

group showed that the mean score ranged from 5.87 (SD = 2.21) for the subscale *reflecting* to 10.77 (SD = 3.90) for the subscale *responding*. The mean score of the subscales of the clinical judgment for the intervention group was higher than that for the control group at post-test (see Table 3).

Discussion

The results revealed that there is a significant difference between students in the intervention and control groups on the clinical judgment after HFS, and the higher mean score of clinical judgment was regarding the intervention group who received clinical training using HFS. This study supports that HFS increases clinical judgment among nursing students. Furthermore, the results showed that using HFS enabled achieving clinical judgment in subscales as noticing, interpreting, responding, and reflecting.

The findings in this study were consistent with findings from previous studies such as Kaddoura et al and Fawaz and Hamdan-Mansour^{17,18} who found that HFS as an educational tool is a potent teaching/learning method, as the students who participated in HFS were able to use clinical judgment. The findings of both studies indicated that students in the treatment groups scored significantly higher in clinical judgment. Similarly, Lindsey and Jenkins⁸ found the same results. Also, the finding of a higher student clinical judgment level after a simulation was also found in a quasi-experimental study conducted by Salameh et al¹³ who compared clinical judgment of Palestinian nursing students in emergency nursing including the aspects of noticing, interpreting, responding, and reflecting based on treatment and control groups. Moreover, the findings of the current study are supported by Konieczny¹² who compares the effect of low-fidelity and high-fidelity simulation experience on clinical judgment. The outcomes of the study indicated that the use of high-fidelity simulation is useful in skills performance and clinical judgment. On the other hand, the findings in this study were inconsistent with findings from Blum et al¹⁹ who assessed the impact of HFS on student self-confidence and clinical judgment in their first clinical semester. Findings showed that there was no statistically significant difference between the simulation group and the control group.

One issue to highlight is the role of using HFS to bridge the gap between theory and practice.¹⁷ The debriefing process is a critical component of the simulation, and it is very important for the clinical judgment development of the participant.²⁰

Due to the opportunity to build or replicate a learning experience, high-fidelity simulations can be an efficient alternative to the clinical site experience. Pediatric nursing students can practice as much as needed until they become proficient and it gives them the chance to participate in real-life situations that may not be encountered during their clinical practice period.

Interestingly, findings from the current study confirmed the positive effects of HFS centering on patient care because

there is no chance of harm to patients and the high demand on clinical site availability could be decreased. Using HFS was helpful in improving pediatric nursing students' clinical judgment and solidification of their capabilities to make correct clinical decisions. Experiencing HFS can help pediatric nursing students to progress from the beginner level to exemplary level of clinical judgment to manage clinical situations in real-life situations.

There were several limitations acknowledged in the current study. The first limitation was a convenience sample; this study was limited to sample of bachelor-degree nursing students from one private university. The second limitation was the short study duration period and study also may have been affected due to the fact that only one simulated scenario was used.

Conclusion

The current study confirmed that HFS can be an effective tool to provide a safe and effective learning environment for pediatric nursing students, consequently improving their clinical judgment.

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Declaration of Conflicting Interests

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