

A COMPREHENSIVE REFLECTION OF THE IMPACT IN UTILIZING SIMULATION IN
TEACHING OBSTETRICS TO UNDERGRADUATE NURSING STUDENTS

by

Anyla Hansley

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Anyla Hansley

Greenville, NC

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Approved by:

Dr. Andrea Sessoms

Abstract

The Bachelor of Nursing program at the East Carolina University College of Nursing currently provides obstetrical clinical at four hospitals throughout eastern North Carolina accommodating an average of 120 clinical students per semester. The hospitals range from small community hospitals to a tertiary care medical center. The diverse locations offer students varied opportunities to immerse themselves in obstetrics. While these clinical rotations offer invaluable learning opportunities for the students, many students lack clinical exposure to many of the more complex intrapartum concepts and complications. To ensure that students can apply these intrapartum concepts to real life patient care scenarios, a study is underway to assess the impact of a complex vaginal delivery simulation on the learning of the undergraduate nursing students in the obstetrics class. This initiative seeks to integrate critical thinking by utilizing feedback surveys from students to assess learning outcomes among undergraduate nursing students enrolled in obstetrics.

Introduction

The use of simulation in student learning has become more prevalent and continuously emerging as a teaching methodology to offer an interactive format of material within the classroom. In this study, we explore more specifically complex vaginal delivery simulation in an undergraduate obstetrics nursing course at the East Carolina University College of Nursing. The simulation, conducted and led by Dr. Andrea Sessoms, utilizes various facets of intrapartum content covered in classroom lectures, including several complications and their interventions. Simulation as an innovative teaching method is an effective form of pedagogical approach. A wealth of evidence shows that simulation in nursing education provides an opportunity for undergraduate students to improve learning outcomes (Akalin & Sahin, 2020). The implantation of this format of teaching serves to enhance the student's ability to critically think through complications and interventions introduced in lecture. Informal instructor-led verbal quizzing throughout the simulation is a teaching method that enables students to actively engage in a safe and potentially more effective learning environment compared to lecture-based instruction alone. To prepare nurses to provide safe and effective care in the current healthcare environment, it is essential to address the gap that exists between nursing education and nursing practice (Powers, 2020). This approach of education enhances student confidence to provide competent care in their own future practice. In this study, we explore the question of what implications obstetric simulations have on student learning.

Literature Review

In relevance to further investigate the use of simulation-based learning in developing critical thinking for nursing students, this literature review serves to interpret findings in similar studies across college campuses nationwide. Three scholarly articles are analyzed and interpreted to identify evidence of teaching strategies for nurse educators to utilize to promote student learning. Some limitations of these studies include bias of self-reporting, lack of participation from all students, and an increase in student knowledge and skills regardless of education strategies amongst the three studies. However, the studies also associate simulation-based learning with making independent and collaborative decisions during the simulation, improved confidence in skills through simulation repetition, and other benefits further explored throughout this literature review.

Kelly Powers (2020) uses a quasi-experimental approach of research to identify and utilize teaching strategies to promote experiential learning in the classroom with a sample of 54 nursing school students. The study conducted at a University in the southeast in the United States used an unfolding video patient scenario delivered in the classroom to promote student engagement. The study objectives were to: (1) Evaluate nursing students' satisfaction and self-confidence in learning and perceptions of the design of a simulated patient scenario delivered via video in the classroom and (2) Compare findings to students' satisfaction, self-confidence, and perceptions of the design of prior high-fidelity simulation experiences in the laboratory (Powers, 2020). The study results reported a higher student confidence following the video patient scenario simulation as well as student perceptions of the simulation design were more favorable for classroom intervention than for prior laboratory simulations (Powers, 2020). However, a

limitation to this education strategy is the number of resources readily available to nurse educators as simulation teaching methods require technology and equipment. Powers suggests that qualitative study of students' experiences with various types of simulation may provide valuable insight. Although satisfaction, self-confidence, and perceptions are important measures, it is vital for quantitative assessment of student learning outcomes such as knowledge, clinical reasoning, and patient care performance (Powers, 2020).

Similarly, Mary Elizabeth Guimond et. al (2019) of the Robert Morris University Department of Nursing designed a large-scale obstetric simulation that allowed student multiple opportunities for deliberate practice after micro-debriefing to better meet course objectives. A sample of fifty-three nursing students participated in a pre/post test design evaluation to measure achievement of communication skills based on student perception of obstetric self-efficacy and their ability to transfer those skills to similar scenario (Guimond et al., 2019). Guimond identifies the gap of the number of nursing students with the limited number of clinical sites to accommodate their hands-on learning. To address the problem, the lead faculty member, assisted by simulation and clinical faculty, designed a complex unfolding obstetric simulation to assure that all students participated in a high-risk patient scenario that met the course objectives (Guimond et al., 2019). Major learning objectives of the simulation include communication, effective prebrief and debrief amongst students as well as performance improvement. The purpose of this study was to evaluate the obstetric simulation in terms of students' ability to communicate important information from shift to shift during a simulated clinical experience after practicing communication skills during complex obstetric simulation and whether they can transfer those skills to similar scenarios (Guimond et al., 2019). Results identified the unfolding; obstetric simulation was effective in helping students demonstrate the achievement of course

objectives through improved obstetric self-efficacy scores and scores for shift-to-shift communication (Guimond et al., 2019). It is evident that there is sufficient evidence of improved confidence gained through repetition of simulation that develops further critical thinking skills useful to students in their goals of meeting course objectives as well as in practice upon graduation. This article outlines the development, implementation, and evaluation of our unfolding obstetric simulation which may be useful information for other educators interested in objective driven scenarios for specialty courses such as obstetrics (Guimond et al., 2019).

Simulation based learning is a promising instructional method, with long term benefits in improving students' skills evidenced through a study conducted by Torkshavand et. al (2020). A quasi-experimental design with repeated measure was used on a sample of undergraduate students enrolled in the nursing program at Hamadan University of Medical Sciences - School of Nursing & Midwifery, Iran (Torkshavand et al., 2020). The study begins with identification of academic and clinical preparation of health professionals is critical to equip them with the knowledge, attitudes and skills necessary for providing high quality care to a growing population of older adults, worldwide. Such preparation is best achieved through student-centered learning strategies, which can provide rich, interactive, and real learning experiences (Torkshavand et al., 2020). The methodology of the study includes eligible consenting students randomly assigned to the simulation-based learning group or lecture-based learning group. Outcome data was collected at three points in time: pre-test, post-test and one-month follow-up (Torkshavand et al., 2020). The study took place in the 2016–2017 academic years. Although this study serves to facilitate communication in educating older adult patients, the same foundation of clinical thinking skills are tested as well. Results shared all students demonstrated improvement in knowledge and skills in older patient education over time;

however, students in the simulation-based learning group had larger and more durable improvements in these outcomes than those in the lecture-based learning group (Torkshavand et al., 2020). Simulation based learning has been used successfully to develop health professionals' knowledge, attitudes and skills in caring for a range of patients with different health problems and in different contexts. This strategy can effectively help health professional students to achieve principles of care and objectives of education, and patient safety and autonomy (Torkshavand et al., 2020). The results shared in the study conducted provide more evidence proving simulation to be an effective teaching method to improve critical thinking skills.

Background

The simulation research study came about to introduce alternate methods of teaching didactic content that increase student engagement for traditional undergraduate nursing students attending East Carolina University. It has also allowed active participation in real-life clinical scenarios to increase confidence, critical thinking, and clinical judgment. It is impossible to ignore the emerging growth and rapid expansion of technology in the healthcare field and in the classroom environment (McCormick et al., 2013). Andrea Sessoms, the lead obstetric faculty of East Carolina University College of Nursing recognized a pattern of limited student clinical exposure to some of the more common intrapartum complications while still expecting the students to understand and the appropriate nursing management and interventions discussed in lecture. Given the competition for clinical sites and the wide variety of patient conditions likely to be encountered, it is impossible to predict the quality of obstetric clinical experience. Nurse educators must face the challenge of effectively integrating technology into what is essentially a hands-on, people-centered profession (Guimond et al., 2019). The use of effective simulation provides a mechanism to replace and/or augment traditional clinical practice for students so that the experience reinforces the objectives of the curriculum (Powers, 2020). The simulation provides a live demonstration of all the integrating parts that included the process of a vaginal birth, along with the interventions and clinical management. Students are active participants in discussion of the procedure in reference to analyzing electronic fetal monitoring, nurse role, stage of labor, identifying complications, interventions, and patient care management. This provides multiple opportunities for continuity of learning. Students who participate in the vaginal delivery simulation are given a distinctive chance to engage in the delivery process and reflect on their level of critical thinking in a safe and low-stress environment.

Purpose of Study

The implementation of simulation serves the primary purpose of offering real-time, collaborative student education that emphasizes critical thinking and communication. Simulation prominence in nursing education methodology stems from its focus on fostering student analytical reasoning within a controlled environment, ultimately enhancing confidence in learning and engagement with the material. There is evidence that improved confidence gained through repetition in simulation develops critical thinking skills; these skills are especially helpful for clinical areas like obstetrics, where hands-on clinical practice may be limited (Guimond et al., 2019). The academic and clinical preparation of health professionals is critical to equip students with the knowledge, attitudes and skills necessary for providing high quality care to a growing population of older adults worldwide. Such preparation is best achieved through student-centered learning strategies, which can provide rich, interactive, and real learning experiences (Torkshavand et al., 2020). To define the purpose of this study, the simulation learning objectives paint a concise picture of what knowledge students have prior to the simulation and the expansion of that knowledge through clinical practice. The specific objectives of the study are as follows:

- Identify potential side effects of epidural anesthesia, including hypotension and fetal heart rate abnormalities.
- Select appropriate nursing interventions to effectively address hypotension during epidural anesthesia.
- Distinguish between reassuring and non-reassuring electronic fetal heart rate monitoring tracings by analyzing key components.

- Identify potential causes of non-reassuring fetal heart rate monitoring, specifically the role of maternal hypotension in inadequate placental perfusion and fetal oxygenation.
- Choose appropriate interventions when faced with non-reassuring fetal heart rate monitoring, including repositioning, fluid bolus, cessation of Pitocin, and ephedrine administration.
- Recognize risk factors for shoulder dystocia, identify the 'turtle' sign as a warning sign, and prepare to provide appropriate interventions when necessary.
- Prioritize nursing interventions promptly upon identifying shoulder dystocia, including lowering the head of the bed, obtaining a step stool, and initiating the McRoberts maneuver.
- Apply intrapartum concepts learned in class to real-life clinical scenarios, including assisting with epidural placement, performing cervical examinations, recognizing different stages of labor, identifying signs of placental detachment, and delivering supportive nursing care to clients

Methodology

Simulation production involves a combination of creativity and functionality, along with the utilization of resources to develop an authentic learning opportunity for students. Dr. Andrea Sessoms coordinates and carries out the simulation in collaboration with the College of Nursing Information Technology and Concepts Integration Lab team to execute monitoring and audio-visual of the simulation for students. The presentation format allows students to observe and engage in the delivery process by participating in answering random informal questions by Dr. Sessoms throughout the unfolding patient-scenario simulation specifically addressing what is happening at numerous points throughout the simulation.

The simulation equipment involves birthing mannequin, two large television monitors, cameras, microphones, electronic fetal monitoring, and all necessary supplies typically utilized in a standard vaginal delivery. Essential items include a high-fidelity birthing simulation mannequin, delivery bed, intravenous pumps administering fluids and medication, a delivery cart stocked with needed instruments, patient records, epidural cart with supplies, epidural and lumbar puncture model and healthcare personnel to facilitate delivery. Cameras are used to see the delivery of the baby and then projected on two large screen televisions for student viewing as well as fetal heart monitoring and maternal vital signs to assess the patient's wellbeing during the simulation. To evaluate student knowledge and understanding, engagement throughout the simulation consists of answering questions from Dr. Sessoms in real time during the simulation. This encourages students to share their concept comprehension in a low-stress environment as well as allows faculty to identify gaps in student learning to be further reinforced. Each integral part of healthcare teamwork, intervention, and education is demonstrated to students by nurses

and anesthesia personnel. The layout of supplies and equipment is set up in a manner that would mimic an true hospital vaginal delivery.

A detailed and timed out guideline that dictates the order of events is adhered to by the staff to guide them in monitoring the completion of tasks at designated intervals. This encompasses the birthing simulator's communication as the patient communication, nurses engaging with the patient and delivering care, administering anesthesia for the epidural, and more. The protocol is segmented into categories based on the stages of labor. Key checkpoints consist of pre-procedure, initiation of scenario, epidural administration, post-medication delivery, and post-contractions. Following this detailed guideline facilitates completion of the simulation facilitates a smoother delivery process in which student engagement is maintained throughout the presentation.

After the completion of the simulation, a QR code provided the students with a link to an anonymous survey of eight Likert-scale questions and two short-ended totaling to ten questions. The students were asked to rank the questions below from a score of one to ten based on their experience. The questions completed by both the Fall 2023 and Spring 2024 semester students are as follows:

1. The simulation helped me identify epidural anesthesia's potential side effects, including hypotension and fetal heart rate abnormalities.
2. The simulation adequately allowed you to select appropriate nursing interventions to address hypotension during epidural anesthesia administration.
3. How confident are you in your ability to distinguish between reassuring and non-reassuring electronic fetal heart rate monitoring tracings after completing the simulation?

4. The simulation helped me understand the role of maternal hypotension in causing non-reassuring fetal heart rate monitoring.
5. How well do you believe the simulation prepared you to choose appropriate interventions when faced with non-reassuring fetal heart rate monitoring, including repositioning, fluid bolus, etc.?
6. To what extent did the simulation enhance your ability to recognize risk factors for shoulder dystocia, identify the 'turtle' sign as a warning sign, and prepare to provide appropriate intervention?
7. The simulation helped me prioritize nursing interventions promptly upon identifying shoulder dystocia, including lowering the head of the bed, obtaining a step stool, and initiating the McRoberts, etc.
8. The simulation effectively allowed me to apply intrapartum concepts learned in class to real-life clinical scenarios, including assisting with epidural placement, performing cervical examinations, etc.
9. What part(s) stood out in this simulation?
10. What do you think could be better for this simulation?

Results

Following the tentative 30-minute simulation, students were asked to complete a 10-item survey comprised of eight 10-point Likert-type items and two free text prompts related to students' perceived strengths and weaknesses of the simulation experience. Dr. Sessoms compiled two semesters of student feedback surveys to recognize and apply change to improve the outcome of student critical thinking using the simulation. The following data identifies the efficacy of simulation-based learning as well as areas in the simulation that have been improved between the fall 2023 and spring 2024 semesters. A further analyzation is identified in the discussion portion using the data to interpret changes made that increased positive student feedback. The fall 2023 semester had a total of 114 students with a sample size of 110 responses. The spring 2024 semester had a total of 120 students with a sample size of 86 responses. The areas with the highest and lowest scores are further analyzed as seen in figures 1 & 2.

Table 1

The table reflects data from both the fall 2023 and spring 2024 semesters average scores for each Likert question of the survey following the simulation. Results from fall 2023 and spring 2024 semester data of ten item survey answers with average scores from eight Likert-scale questions. The survey sample includes 110 student responses of the 114 students enrolled in the course for the fall 2023 semester. The survey sample from the spring 2024 semester reflects 86 student responses of the 120 students enrolled in the obstetrics course. The results of this table is further analyzed in the figures below identifying the lowest and highest average question scores as well as the improvement in scores between the two semesters. For both the table and figures, the fall 2023 semester is labeled in orange and the spring 2024 semester is labeled in blue.

Item	Mean score - fall 2023	Mean score – spring 2024
Survey question 1	9.53	9.71
Survey question 2	9.39	9.6
Survey question 3	7.82	9.05
Survey question 4	9.14	9.51
Survey question 5	8.94	9.41
Survey question 6	8.77	9.48
Survey question 7	9.47	9.65
Survey question 8	9.43	9.65

Figure 1

This figure reflects the average score of survey question three of the fall 2023 semester. The lowest average score in question three of the survey reads “How confident are you in your ability to distinguish between reassuring and non-reassuring electronic fetal heart rate monitoring?”

Response from fall 2023 semester data with an average of 7.82.

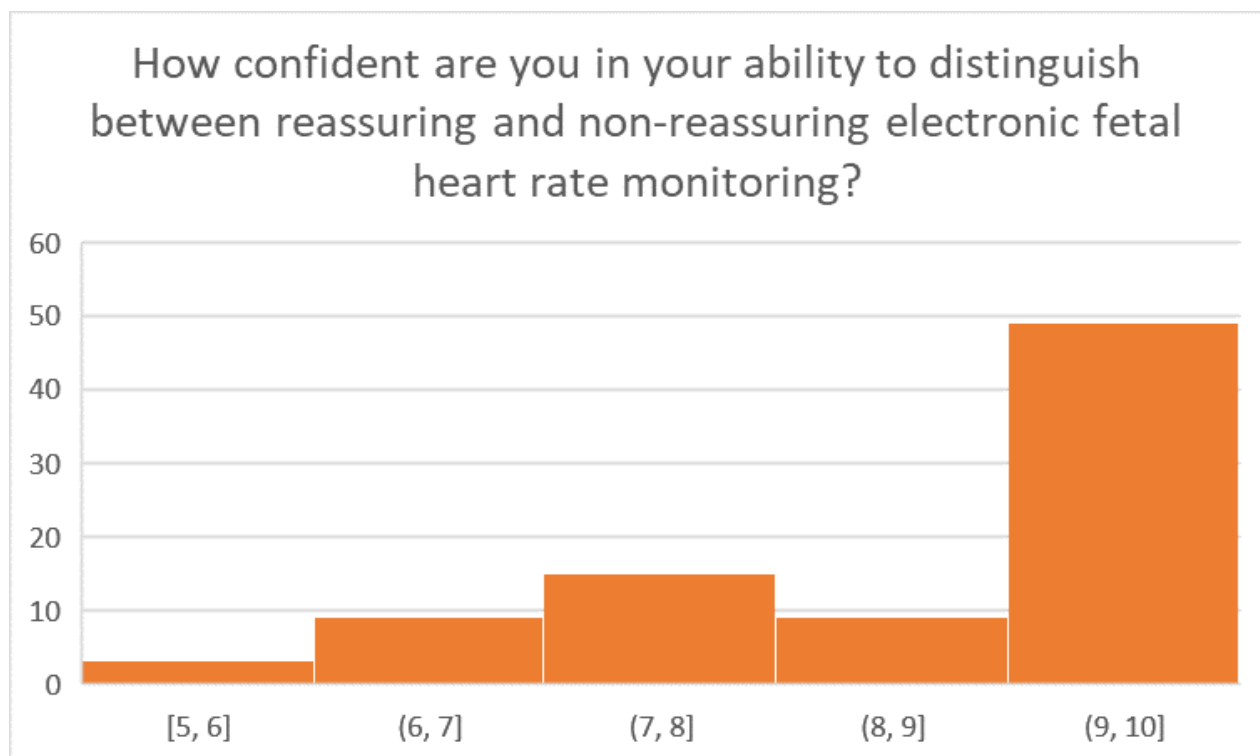


Figure 2

The highest average score of 9.53 in question one of the surveys reads “The simulation helped me identify epidural anesthesia’s potential side effects, including hypotension and fetal heart rate abnormalities.” Data interpreted from Fall 2023 semester showed that a lack of confidence in interpreting electronic fetal monitoring as well as improving visual access for students needed to be addressed.

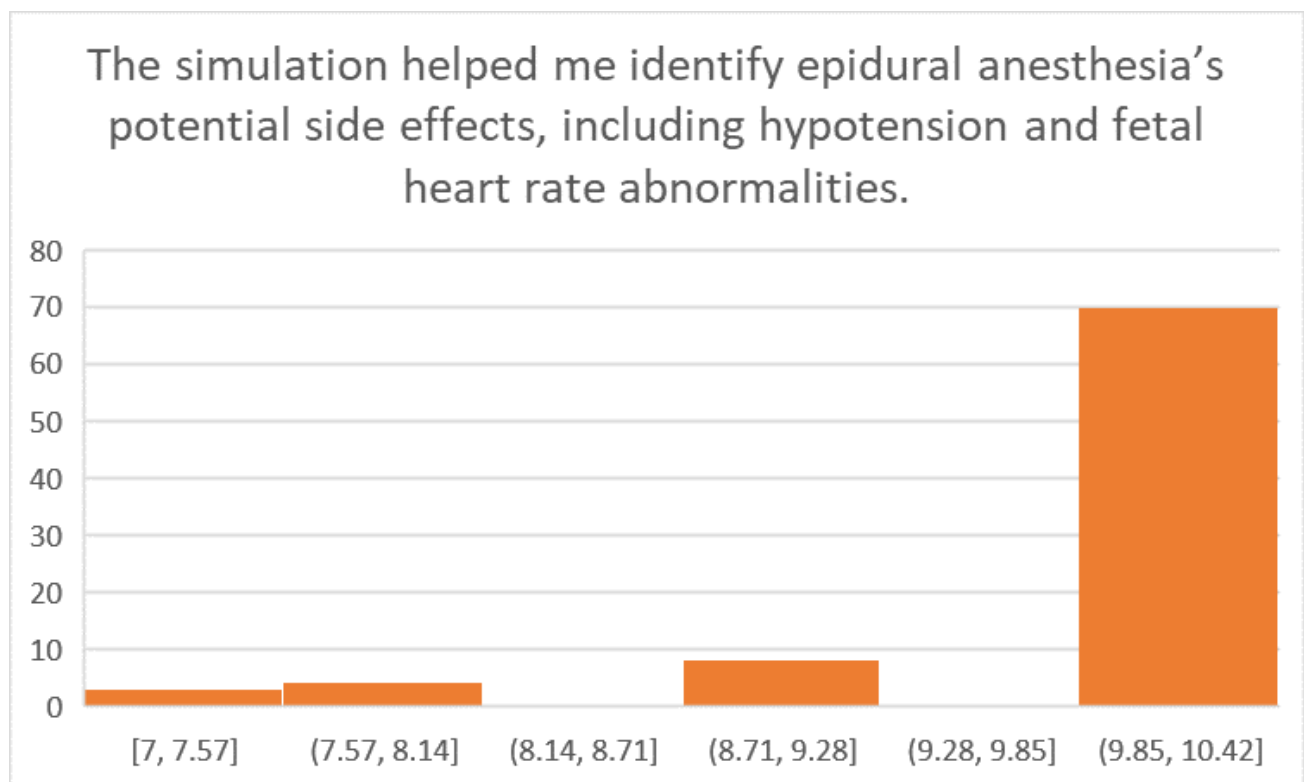


Figure 3

This figure reflects the average score of responses from survey question three of the spring 2024 semester. The lowest average score came to 9.05 of question three of the survey reads, “How confident are you in your ability to distinguish between reassuring and nonreassuring electronic fetal heart rate monitoring tracing after completing the simulation?” This change from the fall 2023 semester of the same question score average being 7.82 is significant. The change in providing two large television screens in the spring 2024 semester potentially impacted the significant score average between the semester responses. The fall 2023 semester students left feedback regarding ability to see the fetal monitoring during the simulation and suggested better access to the electronic fetal monitoring screen for students to analyze.

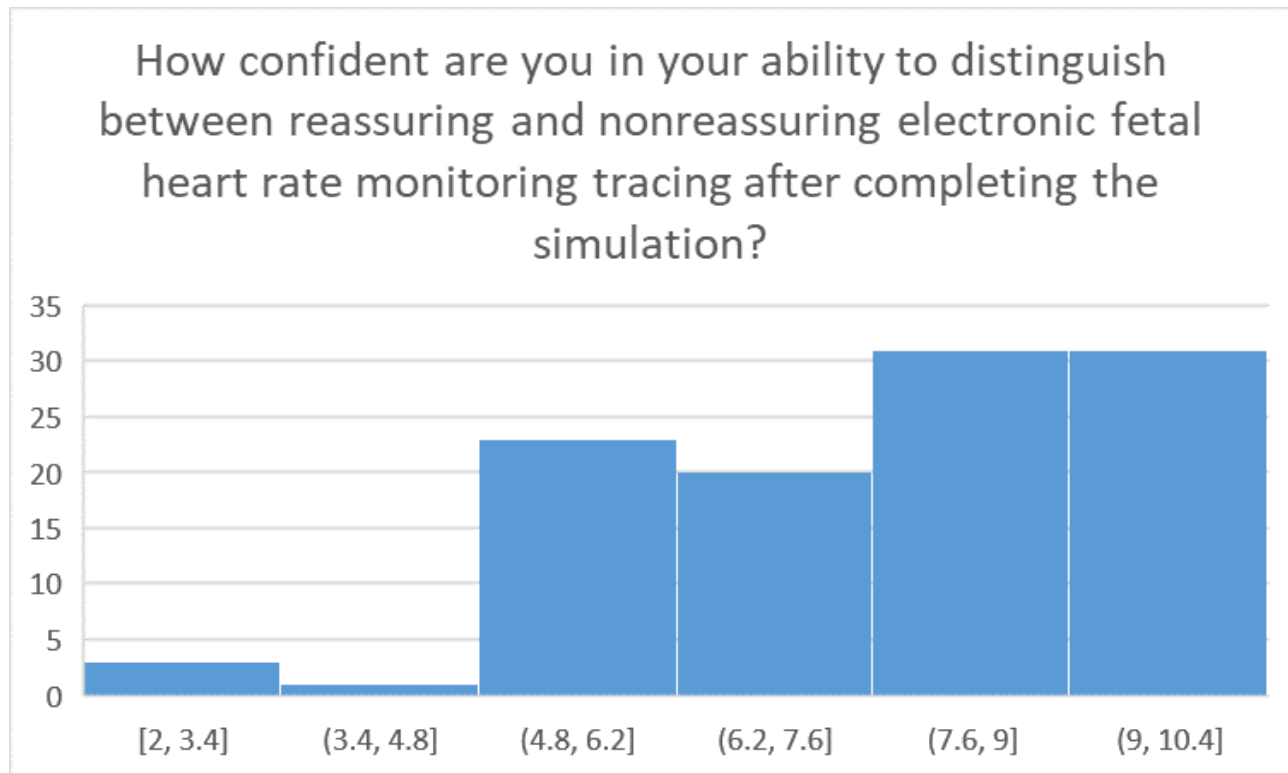
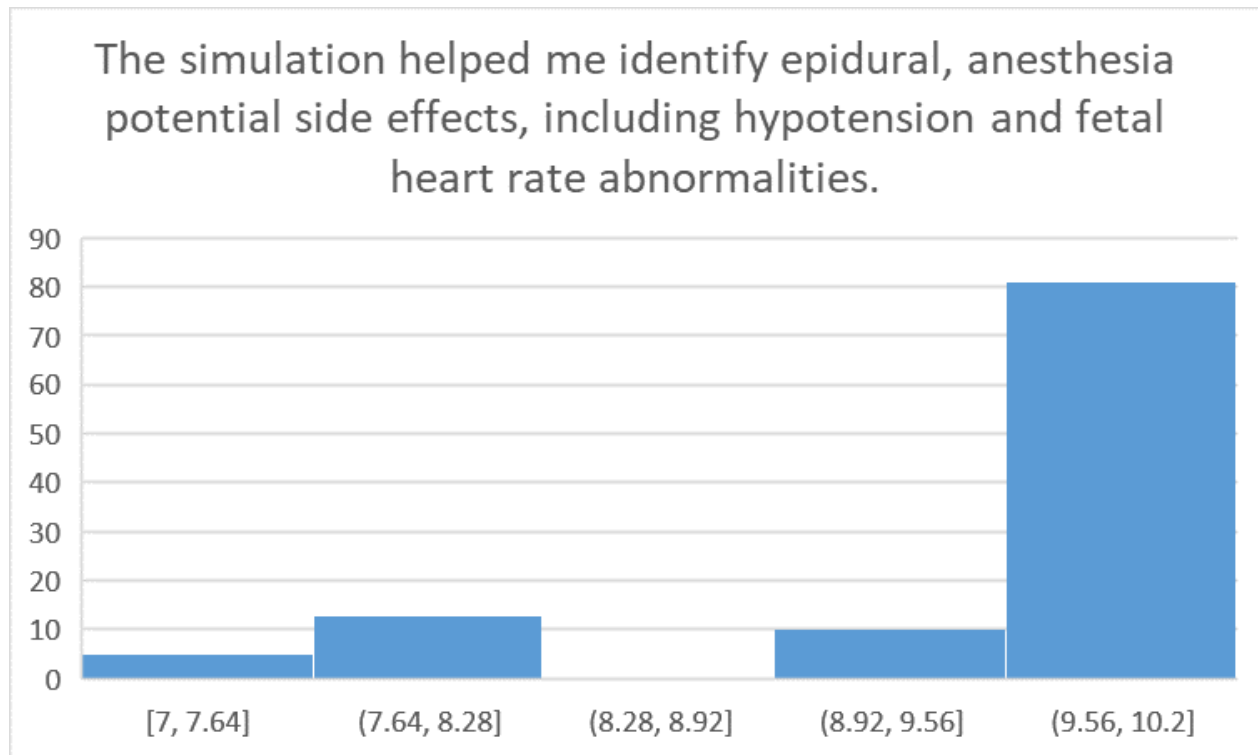


Figure 4

The highest scoring question reads, “The simulation helped me identify epidural, anesthesia potential side effects, including hypotension and fetal heart rate abnormalities.” The average score for this question was 9.71.



Discussion

All data together shows an overwhelming vast improvement made between the Fall 2023 and Spring 2024 data. Each survey response of the Likert-style questions had an improvement between the first and second set of data. The largest change in improvement is seen in question 3 of the survey that states, “How confident are you in your ability to distinguish between

reassuring and non-reassuring electronic fetal heart rate monitoring tracings after completing the simulation?” fall 2023 data shared an average of 7.82 and spring 2024 data shared an average of 9.05. A variable in this difference may stem from the timing of the simulation for both semesters in reference to when the information asked in the question was taught in lecture. The fall 2023 students were presented with the simulation on the same day the intrapartum lecture content was completed and 1 week prior to the exam on this same content. However, the spring 2024 students were presented the simulation a week following the lecture exam on the same content. This may have influenced student decision making in this survey question because the spring semester students had already been tested and potentially more prepared to answer questions on the material with more study time.

Student short answer feedback was obtained in the last two questions of the survey following the simulation. The first question asked for students to identify “What stood out in the simulation to them in comparison to a standard lecture style learning?” The following statements are answers to the first question from the fall 2023 semester students:

“What stood out to me is getting to see the healthcare team come to life as even anesthesia was involved in the simulation to help show the full picture from report to the epidural to inspection of the placenta. I thought the changing of the electronic fetal monitor throughout the story really brought what we learned into perspective.” Another student answered, “I liked being able to watch the simulation to know how to be prepared and think critically in these types of situations. I liked how the mannequin was able to say things that we may see in real patients and react similar in that regard.” To the same question a response from a student in the spring 2024 semester stated, “The simulation aided in bringing all concepts, interventions, and stages of labor together.”

The second question asked students to make any suggestions for future simulations. “I would suggest splitting the class in half for the simulation if possible because it was difficult to see everything. I would also suggest more monitors so more people can see the monitor information. But overall, it was a great interactive activity!” is a response from a student in the fall 2023 semester. A student in spring 2024 responded, “I think students would benefit from getting a video of the simulation as well to refer back to.” This data is important in getting different perspectives from all the participants firsthand. The responses from the first semester directly influence changes made for the second semester and staff will continue to use this data to adapt to student feedback in the following semesters.

Limitations

In semester one of the simulations, the open-ended comments most often stated a setback of the simulation was visualization access for the students. Feedback concerning the monitor showing the fetal heart rate monitor as well as the video. The fall 2023 semester simulation group consisted of all 110 students present at the same time divided by two floors of viewing in

an atrium style lobby at the College of Nursing using only one television monitor for the students to visualize both the patient's vital signs and the electronic fetal monitoring. The large number of students limited visibility for some students as well as the small monitor that students were expected to analyze during the simulation. To address this issue two large tv monitors were used in the spring 2024 simulation to improve visibility. The most notable difference made included separation of the class of students into two groups present at a time to improve visualization for students as opposed to the previous semester. the result of these important changes in a large difference in student response with few comments of the 86-student feedback concerning visualization.

Student feedback following the second semester of simulations, suggestion of having a better sound was the most frequently made. Spring 2024, the CRNA had a lapel microphone and the students reported that anesthesia personnel couldn't be heard as well in comparison to the lead nurse as well as the lobby of the building carrying an echo. Location of the simulation is limited as all aspects of the simulation need to be seen, heard and recorded for optimal benefit.

Conclusion

This study highlights the significance of simulation technology as an invaluable learning tool that bridges the gap between retaining classroom concepts and applying them to practice. By integrating concepts taught throughout the semester into a safe environment, simulation instills confidence in students and motivates them to apply their knowledge. Furthermore, given the

variability of patient censuses in each clinical location, there is no guarantee for students to have the opportunity to experience an observation of a vaginal delivery. Simulation addresses this variance by providing all participating students with the chance to engage in questioning, interaction, and involvement, regardless of their clinical experiences. Use of simulation patient scenario education in the classroom can promote student engagement in learning. Nursing educators should consider this teaching strategy that provides students with opportunities to connect and apply classroom content to patient care. Student feedback thus far has proved the importance and appreciation of simulation for student learning, suggesting the potential long-term integration of simulation-style education methodologies in the future.

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