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Obstetric simulation for undergraduate medical education: how to improve students' self-confidence and expectation according to gender

Roseli Mieko Yamamoto Nomura[1*], Fabiana Medeiros D. Reis[1], Amanda Menezes Gonçalves[1], Carolina Matos de Proença[1]

SUMMARY

OBJECTIVE: The aim of this study was to evaluate the effects of obstetric simulation training on undergraduate medical students to improve their self-confidence.

METHODS: Fifth-year undergraduate medical students were invited to a 2-week course of simulation in obstetrics during their clerkship. The sessions included were as follows: (1) care for the second and third periods of childbirth, (2) partograph analysis and pelvimetry, (3) premature rupture of membranes at term, and (4) diagnosis and management of third-trimester bleeding. Before the first session and at the end of the training period, a questionnaire about self-confidence in obstetric procedures and skills was applied.

RESULTS: A total of 115 medical students were included, of whom 60 (52.2%) were male and 55 (47.8%) were female. Comparing initial and final scores, the median results of the subscales "comprehension and preparation" (18 vs. 22, p<0.001), "knowledge of procedures" (14 vs. 20, p<0.001), and "expectation" (22 vs. 23, p<0.01) were significantly higher at the end of the training period in all items of the questionnaire than in the beginning. Differences were found based on the students' gender, i.e., female students had a significantly higher sum of scores than the male students in the initial subscale for "expectation" (median, 24 vs. 22, p<0.001) and "interest" (median, 23 vs. 21, p=0.032), and a higher sum of scores in the subscale for "expectation" (median, 23 vs. 21, p=0.010) in the final questionnaire.

CONCLUSION: Obstetric simulation enhances the improvement of students' self-confidence in understanding both the physiology of childbirth and the obstetric care procedures. Further studies are needed to understand the influence of gender on obstetric care.

KEYWORDS: Simulation training. Education, medical. Clinical clerkship. Students, medical. Obstetrics.

INTRODUCTION

Simulation-based medical education is always a challenge for educators. In obstetrics, teaching undergraduate students about childbirth care and management of complications is hampered by the impossibility of inserting them straightaway into real-life clinical practice.

Wang et al.[1] found that students' engagement in a simulation-based learning environment is different from their engagement in a traditional setting. Furthermore, educators need to incorporate new technologies into their teaching methods in order to suit the needs of new generations, who prefer to work in groups and have practical and dynamic experiences. Scholz et al.[2] found that the students felt well prepared for obstetric practice and performed with better skills in a high-fidelity than in a low-fidelity simulation. The simulation training is able to increase students' satisfaction by providing a safe environment for them to practice their skills[3].

In the literature, we found a variety of studies of simulation training in operative vaginal delivery, obstetric emergencies, and surgical skills for obstetrics and gynecology residents[4]. Specific obstetric scenarios for undergraduate medical students are less developed and do not present a variety of learning contents. This study was conducted to evaluate the effects obstetric simulation training in different scenarios had on undergraduate medical students, aiming at improving their self-confidence and motivation and encouraging their engagement and interest in the study of obstetrics.

METHODS

This research was developed at the University Simulation Center. The study protocol was approved by the local research ethics committee (CAAE nº: 71373317.2.0000.5505), and all participants signed an informed consent form.

Between August 2018 and April 2019, a total of 115 fifth-year undergraduate medical students were recruited to participate. They were classified into groups of 5–6 students and assigned to a 2-week course of simulation in

[1]Universidade Federal de São Paulo, Escola Paulista de Medicina, Department of Obstetrics – São Paulo (SP), Brazil.
*Corresponding author: roseli.nomura@hotmail.com

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obstetrics during the 4-week clerkship rotation in their fifth undergraduate year. Simulation training took place in 3–4 sessions of approximately 3 h each. Every session included three steps as follows: (1) orientation, which encompassed an introduction to the learning objectives; (2) simulation, when students managed the cases; and (3) debriefing. Before the beginning of the first simulation session, a questionnaire about self-confidence in obstetric procedures, skills, and expectations was applied to each student. The same questionnaire was applied at the end of rotation. The student had predetermined tasks to carry out.

In the simulation-training sessions, a NoelleS575, a full-sized female anthropomorphic birth simulator, and models of cervical dilation and pelvis were used. For the scenarios that simulate a woman's admission, standardized speeches were prepared with specific topics, challenging the student caring for the simulated patient. The students were trained in the following scenarios.

Scenery 1: care for the second and third stages of childbirth

A 25-year-old primiparous at term with 39+4 weeks' gestation went through maternity triage in spontaneous labor. She was known to have a baby of normal weight, and maternal and fetal signs were also normal. The contractions are strong, and she is fully dilated. She was transferred to a labor and delivery room, and a student was given the task to assist the parturient with only one nursing technician in training to help in this scenario. The supervising professor plays the role of the nursing technician, pushing the fetus through the birth canal in the mannequin until the baby is out. A third person (usually a postgraduate student) performs the woman's dialogues, voicing complaints and doubts and letting out screams and sounds to make the scenario more realistic. The fetal head station initially is at +3 of De Lee in occiput anterior position, and it gradually progresses to delivery. To simulate the third stage, the placenta is manually pushed when appropriate. Each student performed the scenario individually. The scenario lasted for an average of 20 min. In this scenario, the student was expected to do the following: to perform a vaginal exam and correctly identify the head station and position; to guide pushes, "hands-on" perineal protection maneuver; to promote delayed umbilical cord clamping; to check the baby's conditions for keeping the skin-to-skin contact; to perform active management of the third stage; to perform a placental rotation maneuver, and a placental and perineal revision; and to demonstrate effective communication with the mother.

Scenery 2: partograph analysis and pelvimetry

A 29-year-old primiparous woman at 40+2 weeks' gestation was in labor for 9 h in the delivery room. Cervical dilation was progressing slowly, and a student was called to evaluate the mother. The progress of labor is shown on the partograph, which reveals a secondary arrest of dilation suggestive of cephalopelvic disproportion. The student is asked to outline the clinical pelvimetry. The scenario lasts for an average of 15 min and the following skills are evaluated: guided anamnesis, effective communication to perform the examination with the woman's consent, evaluation of cervical dilation, demonstration of how to perform a clinical evaluation of the pelvis, filling out of the partograph detection of cephalopelvic disproportion, and management planning.

Scenery 3: premature rupture of membranes at term

This scenario is developed with the participation of an actress (usually a postgraduate student) representing a woman at 39 weeks' gestation who tests positive for group B streptococcus. She complains of fluid loss from her vagina which started 8 h before and is now experiencing contractions every 30 min. The student is tasked with conducting an anamnesis to establish the full extent of the situation, including the woman's expectations. A physical examination should be performed on the simulator to verify maternal and fetal status and to reach a clinical diagnosis by conducting a specular examination and using diagnostic tests. In addition, calculation of the Bishop's index to determine obstetric management, organize the treatment, and prepare a medical prescription is also a required task. In this scenario, a cervical dilation effacement simulator and a medical prescription form are used.

Scenery 4: diagnosis and management of third-trimester bleeding

In this scenario, the student is asked to assist a pregnant woman who has just been admitted presenting third-trimester bleeding. An actress representing the woman gives a history of 32 weeks' gestation and reports two previous episodes of painless vaginal bleeding at 26 and 28 weeks. The student has to decide between a diagnosis of placenta previa and placental abruption and manage the case accordingly. The student should be able to interact with the patient, obtain medical history, perform an accurate examination (uterine height, obstetric palpation, FHR auscultation, and evaluation of contractions), and carry out a pelvic examination, while simultaneously gaining the patient's confidence and cooperation. The student should also be able to communicate

the results of the examination to the patient and describe the initial management plan for the case. In this scenario, the cervical dilation effacement simulator and a medical prescription form are also used.

Instruments

A self-assessment questionnaire based on the instrument proposed by Scholz et al.[2] was used to evaluate the students. This questionnaire was translated into Brazilian Portuguese and adapted to medical students in the clerkship. The self-assessment questionnaire contains 26 items divided into five subscales: comprehension and preparation (5 items), knowledge of procedures (5 items), motivation (6 items), expectation (4 items), and interest (6 items). The participants' scores on each item indicate their level of agreement with the item as expressed by their responses on the following 5-point Likert scale. Reliability analyses were performed to determine the internal consistency of the scale. The following variables were reversed prior to the analysis of Cronbach's alpha: 15, 18, 19, 20, 23, and 26. Cronbach's alpha for questionnaire results was 0.823 (95% lower confidence limit: 0.781).

Statistical analysis

Data were analyzed using the MedCalc® Statistical Software version 19.5.3 (MedCalc Software Ltd., Ostend, Belgium; 2020). The sample size was calculated based on the total number of fifth-year students. Descriptive statistics are presented as mean and standard deviation (SD), median (95% confidence interval [CI]), or frequency and percentage (%). The comparison between the moments before and after the simulation sessions was performed using the Wilcoxon test of paired samples. The comparison between proportions was drawn using the chi-square test or Fisher's exact test. The statistical significance was set at $p<0.05$.

RESULTS

A total of 115 medical students were included in this study, of whom 60 (52.2%) were male and 55 (47.8%) were female. The mean age was 24.6 years (SD=2.3 years), and the median age was 24.0 years (interquartile range [IQR]=2.0 years).

The results of the before and after self-confidence questionnaires are presented in Table 1. At the end of the clerkship rotation, the median scores of all items of the subscales "comprehension and preparation," "knowledge of procedures," and "expectation" were significantly higher. In the "motivation" subscale, the median of the final score was significantly higher in the items addressing overload, understanding of scenarios, and actual performance but significantly lower in the item involving curiosity about the next stage. In the subscale "interest," the median of the final score was significantly higher in items that addressed not having to deal with childbirth care and interest in childbirth care but significantly lower when the topic was knowing more about childbirth care and understanding that it is a challenge to learn about childbirth care.

The sum of the scores on the items of each subscale showed that in the final assessment (Table 2), the median score was significantly higher on the subscales "comprehension," "knowledge of procedures," and "motivation," but significantly lower on the subscale "expectation." No difference was observed in the subscale "interest."

Table 3 displays the scores of each subscale according to the students' gender. Scores differed by gender. On the questionnaire filled out by the female students prior to the clerkship, the subscales "expectation" and "interest" had a significantly higher score than those of the male students, and so did the subscale "expectation" on the final questionnaire.

DISCUSSION

The present study demonstrates that learning based on obstetric simulation increases the self-confidence of medical students in understanding, preparing, and learning obstetric procedures. We found gender-related differences; however, they need to be investigated by specifically designed studies. The practical activities in a simulation environment allow the students to experience possible situations in day-to-day obstetric practice with a view to improving self-confidence and knowledge about childbirth care, as was the case in the present study. The assessment and correction of the students' skills in the simulated scenarios allowed for greater understanding and knowledge retention.

We found that the sum of the scores increased on the subscales "comprehension," "knowledge," and "motivation," demonstrating an improvement in the learning process. Once the necessary tools for better acquisition of competencies are offered, the students' enthusiasm for new knowledge in obstetrics is expected to increase. One can think of different ways to further arouse students' interest, such as by extending the course or offering a greater diversity of practice scenarios, enabling them to have contact with different aspects of the specialty of obstetrics.

Obstetric simulation is of potential interest in medical education, as it allows students to practice new skills

Table 1. Scores on the self-confidence questionnaire items before and after the obstetric simulation training (n=115).

Comprehension and preparation	Initial		Final		p[a]
	Median	IQR	Median	IQR	
1. I understand the course of events of a physiological delivery.	4	0	5	1	<0.001
2. I understand fetal position and fetal rotation during labor.	4	0	5	1	<0.001
3. I feel confident assisting a doctor during labor.	4	2	5	1	<0.001
4. I feel well prepared for a internship in obstetrics.	3	2	4	1	<0.001
5. I am confident that I am going to have a significant role in intrapartum care.	3	2	4	1	<0.001
Knowledge of procedures					
6. I feel confident delivering the fetal head.	2	2	4	1	<0.001
7. I feel confident delivering the fetal shoulders and body.	2	2	4	1	<0.001
8. I am able to palpate the fetal presentation.	3	2	4	1	<0.001
9. I am able to palpate the fetal position.	3	2	4	1	<0.001
10. I am able to palpate the fetal station.	2	2	4	1	<0.001
Motivation					
11. I feel overcharged.	3	2	3	2	0.014
12. I am able to understand the clinical case scenarios.	4	1	4	1	<0.001
13. I think that my actual performances are very good.	3	2	4	1	<0.001
14. Learning gives pleasure.	4	1	5	1	0.170
15. I am curious what comes in the next internship stage[b]	5	1	4	1	0.001
16. I am quite bored.	2	2	2	2	0.168
Expectation					
17. I think that I am able to understand childbirth care.	4	1	5	1	<0.001
18. I will never be able to fully understand childbirth care.[b]	1	1	1	1	0.013
19. Childbirth care is too complicated for me.[b]	2	1.5	2	1	0.001
20. The correct interpretation of obstetric findings is too difficult for me.[b]	2	1	2	1.5	<0.001
Interest					
21. I am interested in the topic childbirth care.	5	1	5	1	0.794
22. I enjoy dealing with the topic childbirth care.	4	1	4	1	0.117
23. I am glad, if I do not have to deal with the topic childbirth care.[b]	2	2	2	2	0.048
24. I am fascinated by the topic medical care during childbirth.	3	2	3	1	0.015
25. I would like to learn more about childbirth care.	4	1	4	1	0.002
26. It poses a challenge for me to learn more about childbirth care.[b]	4	1	3	2	0.001

[a]Wilcoxon test (paired samples); [b]variables detected as reversed by Cronbach's alpha analysis.

Table 2. Total scores on the self-confidence questionnaire subscales before and after the obstetric simulation training (n=115).

Category	Initial		Final		p[a]
	Median	95%CI	Median	95%CI	
Comprehension and preparation	18	17.0–8.0	22	22.0–23.0	<0.001
Knowledge of procedures	14	13.0–15.0	20	20.0–21.0	<0.001
Motivation	22	21.0–23.0	23	22.0–23.0	<0.001
Expectation	9	8.0–10.0	8	8.0–9.0	0.046
Interest	23	22.0–23.0	22	21.0–23.0	0.234

[a]Wilcoxon test (paired sample).

Table 3. Total scores on the self-confidence questionnaire before and after the obstetric simulation training according to the students' gender.

	Male (n=55)		Female (n=60)		p[a]
	Median	IQR	Median	IQR	
Initial					
Comprehension and preparation	18	3.8	18	3.0	0.953
Knowledge of procedures	14	6.0	14	7.0	0.690
Motivation	9	2.0	8.5	4.5	1.000
Expectation	22	3.8	24	5.0	<0.001
Interest	21	4.0	23	4.5	0.032
Final					
Comprehension and preparation	22	4.0	23	3.0	0.078
Knowledge of procedures	20	3.8	20	4.5	0.632
Motivation	8	3.0	8	4.0	0.194
Expectation	21	3.0	23	4.0	0.010
Interest	22	4.0	23	4.0	0.053

[a]Mann-Whitney test. IQR: interquartile range.

in a safe environment. The simulation can be interrupted at any time to point out errors or correct them[5]. In addition, training teams with different health professionals in scenarios where simulations are performed repeatedly has demonstrably succeeded in terms of cost-effectiveness in managing emergencies[6].

Learning projects using obstetric simulation scenarios that can be integrated into the medical curriculum for the development of skills will also promote students' self-confidence[7]. In addition, the importance of spreading knowledge by training programs for health professionals must be recognized[8]. Simulation can help standardize education and ensure quality and comparability in an ever-expanding educational environment[9].

Communication skills can be practiced in a simulated environment using standardized patients[10]. In our obstetric simulation sessions, we observed that medical students immerse themselves in clinical reasoning when they see a standardized patient interpreted by a member of the teaching team with whom they have no connection. Issues of ethical and professional conduct are easily addressed, as in real-life obstetric practice when, for example, there is a demand for a cesarean section or a refusal to allow a pelvic examination[11]. Academic achievement was found to be the main learning stimulus for medical students.

A limitation of this study is the before-and-after design; also, there was no control group and no randomization. A further limitation is that the study design did not allow for an evaluation of the students' learning achievements and performance. This research focused on the students' experiences and subjective feelings in the simulation sessions. However, we cannot foretell their reactions in the real world, nor are we able to know whether the learning experience in the simulation center will affect their performance in real life.

CONCLUSION

Obstetric simulation supports the improvement of students' self-confidence in terms of understanding the physiology of childbirth and the obstetric care procedures. Further studies are needed to understand the influence of gender on obstetric care. The available technologies in simulation training support the acquirement of the required competencies. Activities in obstetric simulation have a positive impact on learning and on the development of students' self-confidence in basic obstetric care. Simulation-trained students felt better prepared for obstetric work and obstetric skills assessments.

AUTHORS' CONTRIBUTIONS

RMYN: Conceptualization, Data curation, Formal Analysis, Methodology, Supervision, Writing – original draft, Writing – review & editing. **CMP**: Conceptualization, Data curation, Writing – review & editing. **FMDR**: Formal Analysis, Writing – original draft, Writing – review & editing. **AMG**: Formal Analysis, Writing – original draft, Writing – review & editing.

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