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A Prospective Study of the Benefits of Simulators in Improving Beginners' Obstetric Vaginal Examination Skills

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ABSTRACT

Background: Vaginal examination is a procedure used frequently during the management of labor, especially to assess its beginning and to evaluate its progress.

Objective: The aim of the current work was to assess the benefits of the use of simulators in improving obstetric vaginal examination to house officers.

Subjects and methods: A single-center, prospective study was performed at the Department of Obstetrics and Gynecology, Cairo University Hospitals, between June 2020 and March 2021. It enrolled 39 house officers spending their internship program and 70 women admitted for an uncomplicated delivery. All house officers attended orientation lectures and each student performed vaginal examinations for different conditions of the simulator followed by examination of different patients within emergency department. The overall accuracy score for simulators examination was calculated out of 90 for each participant and compared with the score of patient's examination.

Results: There was no statistically significant difference between simulator and patient's examination accuracy score concerning cervical dilatation, presenting part, fetal station, and moulding. Participants were more accurate in assessing effacement after simulator examination compared to their accuracy after real patient's examination. On the other hand, cervical position assessment accuracy was significantly higher after real patient's examination compared to that shown after simulator examination. Overall, students' examination accuracy was not significantly different when comparing both simulators versus real patients.

Conclusion: Simulation training has achieved great results using one that is anatomically typical to human female pelvic structure. However, it did not show similarity with real patients when assessing the cervical effacement and position.

Keywords: Simulator, Vaginal examination, Labor.

INTRODUCTION

Teaching technical skills during medical training can present many ethical and medico-legal issues [(1)]. Vaginal examination is a procedure used frequently during the management of labor, especially to assess its beginning and to evaluate its progress [(2)].

However, being able to perform vaginal examination correctly is considered as an essential skill in the labor management [(3)].

It is the most accepted way to assess progress during childbirth [(4)].

Many studies have reported low levels of accuracy in vaginal examinations performed by residents in gynecology and obstetrics departments [(5)].

This is due to these technical skills in examination cannot be learnt by observation only, but house officers need to perform multiple vaginal examinations on real different pregnant women [(1)].

Vaginal examination Simulators play an important role in the education of house officers and have important effects on learner outcomes such as confidence, knowledge, skills, workplace behaviors, and translation to patient care [(6)].

The idea of the present study was that initial training by simulators could be beneficial for non-experienced house officers, allowing them to improve their vaginal examination skills.

SUBJECTS AND METHODS

This prospective study enrolled a total of 39 house officers spending their internship program and 70 women admitted for an uncomplicated delivery, and performed at VESELKA Unit, Department of Obstetrics and Gynecology, Kasr Al_Ainy Hospital, Cairo university, during the period from June 2020 to March 2021. Clinical trial registration: NCT05190692.

Study population:

For the 39 house officers, clinical demonstration sessions were performed first for three successive sessions: 1 hour duration for each.

They were oriented about the six parameters of examination in case of both simulators and real patients.

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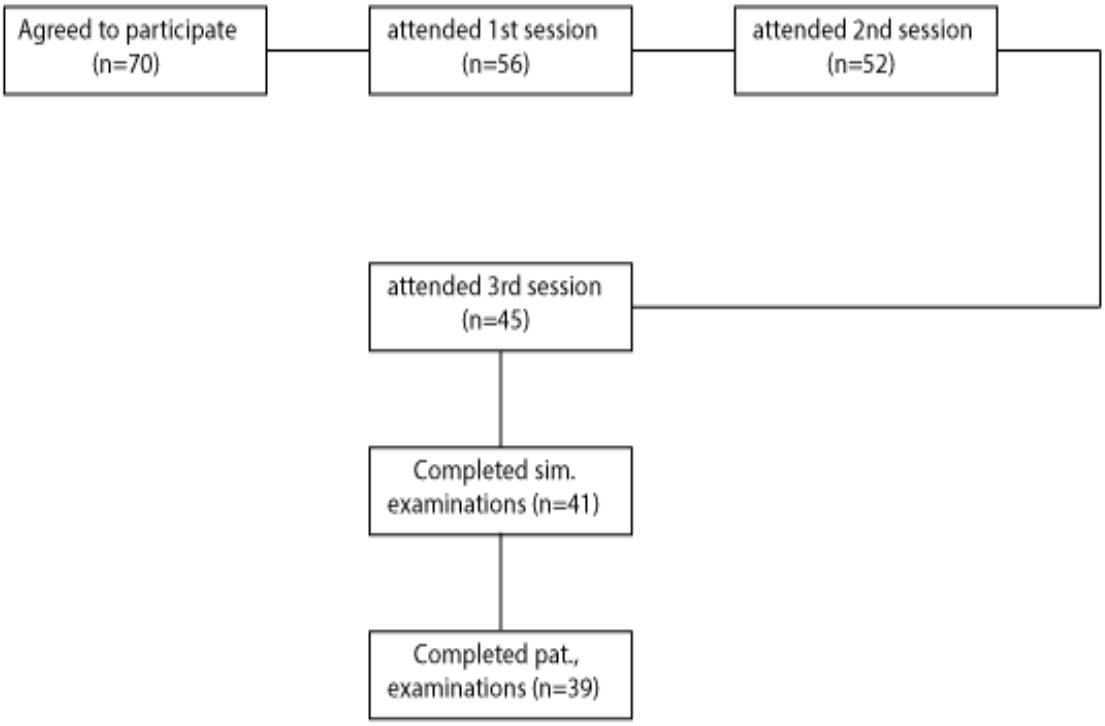

Figure (1) showing the flow chart for participants inclusion in the study.

Each house officer performed five vaginal examinations for five different conditions of the simulator followed by examination of 5 different patients within emergency department. The reference for real patient examination was the first principle investigator who was an experienced staff member to avoid interpersonal differences

The overall accuracy score for simulators examination was calculated out of 90 for each participant and compared with the overall accuracy score of patient's examination.

Two simulators were used in the study:

(1st) : PROMPT Flex Birthing Simulator Advanced – Light (PRODUCT NO. 80106).UK, 2020 .

Figure (2) showing PROMPT Flex Birthing Simulator Advanced – Light (PRODUCT NO. 80106).UK, 2020

(2nd): PROMPT Flex Cervical Dilatation & Effacement Module –Light (PRODUCT NO. 80102),Uk, 2020.

Figure (3) showing PROMPT Flex Cervical Dilatation & Effacement Module –Light (PRODUCT NO. 80102),Uk,2020.

Inclusion criteria:
House officers must be without any experience in vaginal examination at the start of study, Study group must attend at least (**15)** simulator training sessions before testing them.
Exclusion criteria:
House officers with any experience in vaginal examination.

Outcome measurement:

The primary outcome was learning curve and efficiency of vaginal examination interpretation. Benefit of simulation training on non-experienced house officers in vaginal examination skills before performing it on real pregnant women in labor.

Secondary outcomes included the role of vaginal examination simulator and if it should be included in the training curriculum for each house officers during their clinical rotation in gynecology and obstetrics department, satisfaction of patients, satisfaction of trained group.

***Ethical Consideration*:**

The study was carried out according to the World Health Organization's ethical standards for human studies and the Helsinki Declaration. This study was ethically approved by Research Ethics Committee of Cairo University's Faculty of Medicine (IRB: MS-190-2021). All potential participants signed informed written consents after a thorough description of the study's goal and potential advantages.

Statistical analysis

To the best of our knowledge, this was the first study of its type. So, we performed a pilot study on 10 house officers that completed their simulation training and performed vaginal examination on real patients admitted to kasr El-Ainy outpatient clinics for non-complicated delivery. Vaginal examination accuracy score was calculated after performing both examinations. We used G power version 3.0.10 for windows (1) for calculating the sample size and we found that with power of 80%, α error of 0.05 and effect size of 0.461 (76.7 ± 3.75 versus 75.2±2.07 for both simulator and patients respectively), the minimum sample size required was 39 house officers.

RESULTS

39 house officers were enrolled in the study. Each house officer performed five vaginal examinations for five different conditions of the simulator followed by examination of 5 different patients within emergency department.

Table (1): shows the difference between simulator and patients examination accuracy score concerning cervical dilatations for all participants (n=39):

Table (1): Cervical dilatation

Parameter	Simulator examination	Patients' examination	P value
Cervical dilatation	**13 (12 – 14)**	**13 (11 – 13)**	**0.12**

As regard vaginal examination accuracy, we found that there was no statistically significant difference concerning accuracy in assessing the cervical dilatation 13 (12 – 14) versus 13 (11 – 13), p=0.12 for accuracy scores after simulator examination versus after patients' examination) respectively.

Table (2) shows the difference between simulator and patients examination accuracy score concerning cervical effacement for all participants (n=39):

Table (2): Cervical effacement:

Parameter	Simulator examination	Patients' examination	P value
Cervical effacement	**14 (12 – 15)**	**12 (11 – 14)**	**0.001**

Concerning accuracy scores in assessing cervical effacement, we found that participants were more accurate in assessing effacement after simulator examination compared to their accuracy after real patients' examination (14 (12 – 15) vs 12 (11 – 14) respectively. However, this was significantly different (p=0.001) as shown in the table below.

Table (3) shows the difference between simulator and patients examination accuracy score concerning cervical position for all participants (n=39):

Table (3): Cervical position:

Parameter	Simulator examination	Patients' examination	P value
Cervical position	**11 (10 – 13)**	**13 (11 – 15)**	**0.028**

On the other hand, cervical position assessment accuracy was significantly higher after real patients examination compared to that shown after simulator examination (13 (11 – 15) vs 11 (10 – 13), p=0.028) respectively.

Table (4) shows the difference between simulator and patients examination accuracy score concerning presenting part for all participants (n=39):

Table (4): Presenting part:

Parameter	Simulator examination	Patients' examination	P value
Presenting part	**12 (11 – 13)**	**12 (9 – 13)**	**0.321**

Concerning assessment of the presenting part, there was no significant difference between students' accuracy after simulator examination and real patients examination (12 (11 – 13) vs 12 (9 – 13) respectively (p=0.321).

Table (5) shows the difference between simulator and patients examination accuracy score concerning fetal station for all participants (n=39):

Table (5): Fetal station:

Parameter	Simulator examination	Patients' examination	P value
Fetal station	**11 (10 – 12)**	**12 (11 – 13)**	**0.056**

For fetal station assessment, we found that participants' accuracy was not significantly different after simulator examination and after real patients' examination (11 (10 – 12) vs 12 (11- 12) respectively, p=0.056).

Table (6) shows **the difference between simulator and patients examination accuracy score concerning fetal moulding for all participants (n=39):**

Table (6): Moulding:

Parameter	Simulator examination	Patients' examination	P value
Moulding	**14 (12 – 15)**	**15 (13 – 15)**	**0.934**

For moulding assessment, we found that students' accuracy score was not significantly different when performing simulator examination vs real patients (14 (12 – 15) vs 15 (13 – 15), p=0.934) respectively.

Table (7) shows **the difference between simulator and patients examination overall accuracy score for all participants (n=39):**

Table (7): Overall score:

Parameter	Simulator examination	Patients' examination	P value
Overall score	**76 (71 – 79)**	**75 (71 – 77)**	**0.213**

Overall, we found that students' examination accuracy was not significantly different when comparing both simulators vs real patients (p=0.213), (76 (71 – 79) vs 75 (71 – 77)) respectively.

Satisfaction score:

When analyzing the satisfaction rate of students after completing the whole examination through a Likert scale out of 5, we found that their mean satisfaction rate was 4.01 ± 0.23 as shown in the figure below (figure 4).

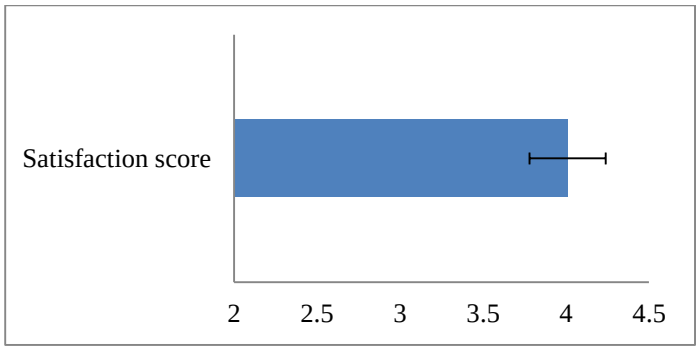

Figure (4) showing the satisfaction score of students after completing their training.

DISCUSSION

Simulation is one of the recent innovations that played an important role in medical education generally and obstetrics and gynecology field especially. It provides a clear safe area for both patients and students. It provides an environment nearly comparable to real patients which in turn improves students' performance and help them gain more skills [7].

So, in this study, we tried to investigate students (house officers) performance when examining a simulator having typically the same anatomical features as real females and compare it with their performance when examining real patients admitted for non-complicated delivery at emergency unit at Kasr El-Ainy gynecology and obstetrics clinics.

Overall, we found that there was an improvement when using the simulator as a method of teaching obstetric examination. This matches what was reported by prior 2 studies when they used simulation-based technique in teaching medical students but for different purposes either for illustrating ultrasound guided nerve block or for thoracocentesis [8,9].

In our study, we found no significant difference between house officers' accuracy score after simulator examinations or after examination of real patients (p=0.213): this proves the efficacy of simulator to simulate the real conditions of normal vaginal delivery. This matches what was reported by previous study which compared house officers' performance when performing obstetric examination without prior simulation training and after performing simulation-based training. They reported that house officers' performance has improved significantly after being illustrated through simulation-based training (p <0.001) [1].

In our study, we found that house officers' accuracy score when vaginal examination was 76 (71 – 79) for house officers using simulators and 75 (71 – 77) for others examining real patients. This was markedly higher than that reported by Arias et al. who found that house officers' accuracy score was 21.7 ± 2.3 for those who experienced combined methods for teaching. While it was 13.6 ± 2.1 for those who experienced a single method for teaching. This may be due to the

different methodology applied in both studies and the difference in scoring system used in both studies.

When dealing with each component separately, we found that no significant difference between their accuracy when assessing cervical dilatation, presenting part, fetal station and moulding (p=0.12, p=0.321, p=0.056, p=0.934 respectively)

On the other hand, house officers' accuracy in cervical effacement assessment was significantly higher after experiencing simulator training compared to real patients examination (p=0.001): While the accuracy score in assessing the cervical position was significantly higher after examination of real patients compared to its accuracy after simulators examination (p=0.028) and these results were similar as in Arias et al study **(1).**

However, in Arias *et al*. the accuracy score was significantly higher during assessment of vaginal dilatation among those experienced vaginal birth simulator compared to those who performed vaginal examination without prior simulator training. This may be explained by the difference in the simulator used for educational purposes **(1).**

Regarding the satisfaction rate of house officers after completing the whole examination, there was a study showing similar results as it compared the performance and satisfaction of 98 house officers who completed simulation training in obstetric examination with 80 other medical house officers who did not receive simulation training and measured their satisfaction using a Likert scale out of 5. They found that house officers experienced vaginal simulators gave significantly higher ratings compared to the control group (4.1 vs 2.7, p <0.001) **(10).**

CONCLUSION AND RECOMMENDATIONS

Simulation training has achieved great results using one that is anatomically typical to human female pelvic structure. For assessment of cervical dilatation, presenting part, fetal station and moulding, the results were similar between examination of real patients and prompt flex simulator.

However, the PROMPT FLEX simulator did not show similarity with real patients when assessing the cervical effacement and position. That is why, it is recommended performing the study using different commercially available simulators to compare their accuracy and finding the best tool for achieving better results.

DECLARATION OF CONFLICT INTEREST

The author(s) declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

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