

# Medical Trainees' Attitudes about the Value of Simulation in the Obstetrics and Gynecology Program of King Abdulaziz University, Jeddah, Saudi Arabia

Ettidal A. AlJahdali

*Obstetrics and Gynecology, King Abdulaziz University Hospital, Faculty of Medicine, King Abdulaziz University, Jeddah, KSA*

## ABSTRACT

**Objective:** Simulation was introduced as an educational method in the Obstetric and Gynecology (OB-GYN) to enhance the quality of trainees' medical education, knowledge, and skills acquisition. This questionnaire-based study aimed to assess types of simulation used and satisfaction with simulation-based education (SBE) among medical trainees in the OB-GYN program of King Abdulaziz University in Jeddah, Saudi Arabia before and during COVID-19.

**Method:** A total of 1131 undergraduate and postgraduate medical students were registered in the OB-GYN programs and participated in the SBE activities utilizing KAU-CSSC from 2018 through 2020. total, 581 requested to participated in questionnaire, only 300 students completed the questionnaire.

**Results:** Simulations were used most frequently for skills training (91.3%), followed by mannequin-based scenarios (63.0%), virtual reality (41.3%), standardized patients (34.0%), and tissue-based scenarios (32.1%). OB-GYN simulations can help trainees and instructors overcome problems in conducting intimate-area examinations and improve their gynecological history-taking skills. Trainees recommended mandatory establishment of simulation skills centers in every hospital and medical college and the use of online simulation tools after COVID-19. The mean of total score for simulation use was 49.63 out of 60 points. A total of 218 trainees (72.7%) had a positive attitude toward simulation use and 82 (27.3%) had a more neutral attitude.

**Conclusions:** The study results revealed the usefulness of low and high-fidelity SBE among OB-GYN medical trainees in concerning their teaching, training, and objective assessments. The cumulative mean score suggested that the trainees were satisfied with simulation-based modules and practical learning. SBE provided a valuable alternative opportunity for exposure to clinical cases during COVID-19, allowing interactive virtual demonstrations of simple clinical examinations and procedures while attending to infection control concerns relating to COVID-19.

**Corresponding Author e-mail:** ialjahdali@kau.edu.sa

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## INTRODUCTION

Obstetrics simulation is instrumental part of medical training and education for nearly 400 years since birthing mannequins were first developed in the 17th century the idea of using simulation as part of professional programs is relatively new. Since the 1990s, obstetrics has paid more attention to simulation and is incorporating it into specialty-specific training programs. The apprenticeship model based on the adage "See one, do one, teach one," has long been used to train physicians. Medical students and residents learn by observing and completing procedures under the supervision of attending physician. As learners store much information when they are actively engaged in a task rather than passively listening to a lecture, hands-on training has been an effective strategy in improving the medical and surgical competence of physicians trainees.<sup>1</sup>

Moreover, recent innovations in medical education and medicine have made patient-based instructions much more complex, to the point that it is no longer enough to meet the demands medical students.<sup>2</sup> It was mentioned in the Accreditation Council for Graduate Medical Education (ACGME) Bulletin 2005 that patient safety actions resulted in reduced hours of duty, thereby dramatically reducing patient contact time for students.<sup>3</sup>

Coronavirus disease 2019 (COVID-19) has been classified as pandemic affecting 199 countries and territories worldwide. The spread of the virus caused most countries to implement emergency

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lockdowns and used social distancing measures, which have resulted in interruptions to school and university attendance. Approximately 1.5 billion learners have been influenced by school and university closures during COVID-19. The responses of medical schools to the pandemic differed worldwide, ranging from the initiation of online distance learning to complete study cessation. The abrupt shift from on-campus to distance learning methodologies has been difficult for both staff and trainees, and it has necessitated extensive planning over a short time with no defined guidelines.<sup>4-9</sup>

Simulation-based education (SBE) is a rapidly developing discipline that provides effective and safe learning environments for students. Clinical situations for learning and teaching purposes are created using part-task trainers, mannequins, simulated patients, or computer-generated simulations.<sup>10</sup> Simulation training via anatomical models used to fill the procedural training gaps for young physicians,<sup>11</sup> and has been assessed for obstetric and gynecological (OB-GYN) manipulations.<sup>12-14</sup> However, the unique nature of OB-GYN diseases and complex anatomical structures combine to make education in this medical specialization particularly challenging. Residents are generally preoccupied with their assigned inpatients and teaching in a hospital room or outpatient setting as pregnant women in labor await to give birth, which can be very difficult for the latter. Simulation models play an important role in such scenarios. Medical simulation uses a variety of techniques to imitate clinical scenario such that students can learn in a risk-free environment. Students who have undergone simulations of performing vaginal deliveries reported having more confidence in their own abilities to perform or attempt vaginal delivery in real clinical situations as compared to third-year medical students who were taught in traditional education, without any simulated experiences.<sup>13</sup> In this respect, Birch and colleagues contrasted lecture-based methodology with a simulation-based approach and a combined lecture-and-simulation-based strategy for teaching teams to manage postpartum hemorrhage. When examined three months later, simulation-trained teams indicated sustained improvement in clinical management, interdisciplinary communication, and self-confidence. Teams taught using simulation also improved their multidisciplinary communication abilities compared to teams taught just through lecture. Although not powered for statistical significance, this study suggests that simulation-based training has advantages over standard lecture-only methods. It has to be observed whether such advantages are long-lasting, and how frequently simulation-based team-training coursework should be repeated to preserve clinical skill.<sup>15</sup>

This questionnaire-based study aimed to assess satisfaction of medical trainees in the OB-GYN program at King Abdulaziz University with SBE and the types of simulation used before and at the peak of COVID-19.

## MATERIALS AND METHODS

### Study design

Questionnaire based study. Permission was obtained from the Ethics Committee of King Abdulaziz University Hospital, Jeddah, Saudi Arabia before conducting the study, and the study was made in accordance with the Helsinki Declaration.

Written informed consent was acquired from all participants after researcher explained the study's purpose to them.

### Setting

OB-GYN Department of King Abdulaziz University, Jeddah, Saudi Arabi

KAU-CSSC (King Abdulaziz University -Clinical Skill Simulation Center)

### Participants

**Inclusion criteria:** All registered medical students in the OB-GYN program at King Abdulaziz University, Jeddah, Saudi Arabia who use SBE during the study periods (from 2018 through 2020).

**Exclusion criteria:** Students who did not complete the questionnaire or refused to participate in the study, not trained in OB-GYN department at King Abdulaziz University. Students before year 2018 or after year 2020 were also excluded.

### Sample size

A total of 1131 medical students (395 in 2018, 382 in 2019 and 354 in 2020) were registered in the OB-GYN programs and participated in the SBE activities over the three-year study period between 2018 and 2020.

Sample size was calculated utilizing a single proportion equation with the Raosoft software package. Based on assumption that attrition rate was 50% and the error margin of 5% at 95% confidence value, estimated sample size required for the study was 361 students. Sampling was conducted using systematic random selection.

### Data sources/measurement

Medical students in the OB-GYN department of King Abdul-Aziz University were invited to answer the questionnaire survey anonymously. The questionnaire was introduced to the students as a modified Google Form through social media during the three-month data-collection period. It was designed to measure the simulation use of students at all levels of medical education and their perception of the benefits of simulation and its enhancement of their teaching and learning experiences before and during the COVID-19. The questionnaire consisted of two parts: The first part consisted of three items pertaining to 1) Level at which students perceived having benefitted the most from simulation (ranging from medical student to specialist fellow), 2) Type of simulation used, and 3) Type of simulation students perceived as the most beneficial. The second part of the questionnaire consisted of 11 items pertaining to students' attitudes toward the value and importance of simulation use before and during COVID-19. These items assessed participants' attitudes by measuring their agreement level with positive statements related to simulation value. The examples of positive statements on simulation use before COVID-19 are "Simulations can accommodate large numbers of trainees, ensuring them a fair chance of exposure to learning opportunities"; "Simulation helps build trainees' confidence before real-life exposure to patients"; "The use of simulation tools during trainees' examinations helps evaluators conduct fair and objective assessments of large numbers of candidates." Examples of positive statements on simulation at

the peak of COVID-19 are “During the pandemic, the use of simulation tools helped teach precautions regarding infection control to small groups of trainees”; “Given the limited number of suitable clinical cases during COVID-19, the simulation provides a valuable alternative source of clinical cases”; “To what extent do you agree with the use of online simulation tools after COVID-19?”

Students rated their agreement level with the statements (items), on a 5-points Likert scale (5-strongly agree, 4-agree, 3-neutral, 2-disagree, and 1-strongly disagree). The ordinal scale for item 12, which assessed students' attitudes towards the helpfulness of simulation, used the following ratings: 5-extremely helpful, 4-very helpful, 3-somewhat helpful, 2-not so helpful, and 1-not at all helpful. The total possible score was 60 points, with a higher score indicating stronger agreement with the positive statements about simulation. Students' total scores ranged from 32 to 60. Ratings were categorized as a positive attitude (total score > 45), neutral attitude (total score 30-45), and negative attitude towards simulation (total score < 30).

### Statistical analysis

The results were analyzed using the Statistical Package for the Social Sciences, version 23 (IBM Corp., Armonk, New York, U.S.). Descriptive statistics were expressed as frequencies and percentages for categorical values and as means and standard deviations for continuous values.

## RESULTS

Skills training was the most frequently used type of simulation (91.3%), followed by mannequin-based simulations (63.0%),

virtual reality (41.3%), standardized patients (34.0%), and tissue-based simulations (32.1%) (Table 1).

The type of simulation that students identified as most beneficial was basic clinical exam skills and procedures (77.3%), followed by interactive simulation scenarios (46.7%), emergency cases or rare situations (37.3%), basic or advanced laparoscopic training (35.0%), and teamwork management or effective communication (33.0%) (Table 2)

**Table 1:** Simulation use and attitudes toward simulation by participants at King Abdulaziz University Hospital (n = 300).

Items	Total (N=300,100.0%)
<i>Level at which students perceived having benefitted the most from simulation</i>	
Student	226 (75.3%)
Resident	84 (28.0%)
Intern	73 (24.3%)
Specialist	51 (17.0%)
Fellow or higher level	48 (16.0%)
<i>Type of simulation used</i>	
Skills training	244 (91.3%)
Mannequin based	189 (63.0%)
Virtual reality	124 (41.3%)
Standardized patient	102 (34.0%)
Tissue based	96 (32.0%)
<i>Most beneficial type of simulation</i>	
Basic clinical exam skills & procedures	232 (77.3%)
Interactive simulation scenarios	140 (46.7%)
Emergency situations/rare cases	112 (37.3%)
Basic/advanced laparoscopic training	105 (35.0%)
Teamwork management/effective communication	99 (33.0%)

**Table 2:** Student's level of agreement about the value of using simulation in medical education before and during the peak of the COVID-19 and overall rating of the simulation tools in medical practice.

Items	Total (N = 300)
<i>Value of simulation use in medical education</i>	
1. Simulations can accommodate large numbers of trainees and ensuring them a fair chance of exposure to learning opportunities.	4.27±0.88
2. Simulations maintain competencies & reduce medical errors.	4.43±0.68
3. Gynecological simulations help learners overcome problems of performing intimate-area examinations and improve gynecological history-taking skills with real patients.	4.26±0.92
4. Simulation exposes trainees to rare cases and emergencies in interactive scenarios, and it improves their rapid response skills.	4.26±0.85
5. Simulation helps build trainees' confidence before exposure to patients.	4.34±0.83
6. The use of simulation tools during trainees' examinations helps evaluators conduct fair and objective assessments of large numbers of candidates.	4.16±0.92
7. To what extent do you agree with the mandatory establishment of simulation clinical-skills centers in every hospital and medical college?	4.32±0.91
8. During the pandemic, the use of simulation tools was helpful for teach precautions regarding infection control to small groups of trainees.	4.25±0.87
9. Given the limited number of suitable clinical cases during the COVID-19, simulation provided a valuable alternative source of clinical cases.	3.80±1.18
10. During the COVID-19, the use of simulation tools was helpful in interactive virtual demonstrations of simple clinical examinations and procedures.	4.11±0.79
11. To what extent do you agree with the use of online simulation tools after COVID-19?	3.36±1.22
12. The overall ratings of the benefits of simulation tools in medical practice.	4.06±0.86
Total Score (range: 32-60 pts.)	49.63±7.48
<i>Attitudes about simulation use</i>	
Positive attitude (> 45)	218 (72.7%)
Neutral attitude (30-45)	82 (27.3%)
Negative attitude (< 30)	-

Approximately 54.7% of student participants strongly agreed with recommending mandatory establishment of simulation clinical-skills training centers in every hospital and medical college; 53.3% strongly agreed that simulation use help maintain competencies and reduces medical errors; 52.0% strongly agreed that OB-GYN simulations can help students overcome problems performing intimate-area examinations and gynecological history-taking skills; 50.3% strongly agreed that simulation increased students' confidence before exposure to patients in real practice; and 47.2% agreed that simulation can accommodate large numbers of trainees, ensuring them a fair chance for exposure to learning opportunities. Approximately 44.3% strongly agreed that simulation can expose trainees to rare cases and emergency situations in interactive scenarios and improve their rapid response skills; 40.7% strongly agreed that the use of simulation tools in examinations of trainees helps evaluators conduct fair and objective assessments of large number of candidates, and 36.3% rated the benefits of simulation tools

in medical practice as 'extremely helpful'. Approximately 46.7% of students strongly agreed that simulation use in medical education in COVID-19 helped teach precautions about infection control to small groups of students; 34.0% agreed that simulation provided a valuable alternative source of clinical cases given the limited number of suitable clinical teaching cases during the pandemic; 32.3% agreed that the use of simulation tools helped in interactive virtual demonstrations of simple clinical exams and procedures; and 21.0% agreed with the recommendation for the use of online simulation tools post COVID-19. The mean total attitude rating was 49.63. Approximately 72.7% of the students had a positive attitude ratings and 27.3% had a neutral attitude towards simulation use (Table 3).

The Likert scale ratings for items 1-11 were 5 - strongly agree, 4 - agree, 3 - neutral, 2 - disagree, 1- strongly disagree and ratings for Items 12 were 5 - extremely helpful, 4 - very helpful, 3 - somewhat helpful, 2 - not so helpful, 1 - not at all helpful.

**Table 3:** Students' mean ratings of the value of simulation in medical education before and during COVID-19 and overall ratings of the benefits of simulation tools in medical education

Items (statements)	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
<i>Value of simulation use in medical education</i>					
1. Simulations can accommodate large numbers of trainees, ensuring them a fair chance of exposure to learning opportunities.	142 (47.3%)	122 (40.7%)	11 (3.7%)	25 (8.3%)	-
2. Simulation maintains competencies and reduces medical errors.	160 (53.3%)	111 (37.0%)	27 (9.0%)	2 (0.7%)	-
3. Gynaecological simulations help trainees overcome problems performing intimate-area examinations and improve their gynecology- related history-taking skills with real patients.	156 (52.0%)	86 (28.7%)	40 (13.3%)	17 (5.7%)	1 (0.3%)
4. Simulation exposes trainees to rare cases and emergencies in interactive scenarios, and it improves their rapid response skills	133 (44.3%)	133 (44.3%)	15 (5.0%)	17 (5.7%)	2 (0.7%)
5. Simulation helps build trainees' confidence before real-life exposure to patients.	151 (50.3%)	118 (39.3%)	14 (4.7%)	16(5.3%)	1 (0.3%)
6. The use of simulation tools during trainees' examinations helps evaluators conduct fair and objective assessments of large numbers of candidates.	122 (40.7%)	137 (45.7%)	10 (3.3%)	30 (10.0%)	1 (0.3%)
7. It is recommended that simulation clinical-skills centers must be established of in every hospital and medical college.	164 (54.7%)	89 (29.7%)	28 (9.3%)	17 (5.7%)	2 (0.7%)
<i>Value of simulation use in medical education during COVID-19</i>					
8. During the pandemic, the use of simulation tools helped in the teach precautions regarding infection control to small groups of trainees.	140 (46.7%)	116 (38.7%)	24 (8.0%)	20 (6.7%)	-
9. Given the limited number of suitable clinical cases during COVID-19, the simulation provides a valuable alternative source of clinical cases.	102 (34.0%)	100 (33.3%)	50 (16.7%)	31 (10.3%)	17 (5.7%)
10. During the COVID-19 pandemic the use of simulation tools was helpful in interactive virtual demonstrations of simple clinical examinations and procedures.	97 (32.3%)	155 (51.7%)	33 (11.0%)	15 (5.0%)	-
11. To what extent do you agree with the use of online simulation tools after COVID-19?	63 (21.0%)	87 (29.0%)	68 (22.7%)	60 (20.0%)	22 (7.3%)
<i>Overall ratings of the benefits of simulation tools in medical education</i>					
12. The overall ratings of the benefits of simulation tools in medical practice.	Extremely helpful 109 (36.3%)	Very helpful 109 (36.3%)	Somewhat helpful 76 (25.3%)	Not so helpful 3 (1.0%)	Not at all helpful 3 (1.0%)



## DISCUSSION

SBE is a rapidly growing field in our community and worldwide. It's used in healthcare education<sup>16</sup>. Interacting with a lecturer is more effective than passively listening. medical education has seen many innovations.<sup>17</sup> SBE provides effective and safe learning environments for students, as confirmed by KAU-CSSC questionnaire-based study. Part-task trainers, mannequins, simulated patients, or computer-generated simulations create clinical learning and teaching situations.<sup>10</sup> Simulations create a realistic and safe training environment for advanced scenarios without putting patients at risk.<sup>18</sup> KAU-CSSC was founded on 2008. The Royal College of Physicians and Surgeons of Canada accredited the center in 2016 and 2017. It also won the Aspire award of excellence in simulation in 2017 from Association for Medical Education in Europe (AMEE) The center teaches undergraduates and postgraduates basic to advanced healthcare simulation techniques. Given its outstanding resources, experience, and expertise, the center's facilities become more evident and important during the COVID-19 Pandemic, which prompted our study on trainees' attitudes toward simulation in the OB-GYN specialty during regular and pandemic periods. This familiarizes our participants with most common, widely used forms and advanced SBE. Others reported using simulation to teach OB-GYN in clerkships, residencies, and maternal-fetal medicine fellowships.<sup>19</sup> This study included 300 participants. The result of SBE questionnaire indicated positive mean of total score for simulation use equal 49.63 out of 60. Two hundred and eighteen (72.7%) trainees had a positive attitude toward simulation This cumulative mean score suggested that the trainees were satisfied with simulation-based modules and practical learning. SBE provided a valuable alternative opportunity for exposure to clinical cases during COVID-19, allowing interactive virtual demonstrations of simple clinical examinations and procedures while attending to infection control concerns relating to COVID-19.,but further results analysis of the participants responses showed that, Simulations were used most frequently for skills training (91.3%), followed by mannequin-based scenarios (63.0%), virtual reality (41.3%), standardized patients (34.0%), and tissue-based scenarios (32.1%). In this study, 50.3% of the participant strongly agreed that simulations gave students more confidence before they worked with real patients ,this result was the same as what Jude et al. found, which was that students who had simulation training were more likely to say they were more confident in their ability to define labor stages on their own or with little help (P= 0.031).<sup>13</sup> Deering et al. assessed medical students' satisfaction during their obstetric rotation. First group (intervention group) received a simulation lab covering basic obstetric methods, and second group (standard group) received traditional didactics without simulation. Simulation-trained students were more comfortable with Leopold maneuvers, fetal scalp electrode placement, fundal height measurements, artificial membrane rupture, and intra-uterine pressure catheter placement, with statistically significance difference.<sup>20</sup> Holmström et al. studied 113 medical students, the authors randomized medical students to lecture or simulation for vaginal delivery performance, simulation group was more confident in its ability to perform vaginal delivery and scored higher on end-of-rotation oral and written exams than traditional group.<sup>21</sup> Establishment of simulation clinical-skills centers in every hospital and medical colleges

was strongly recommended by 54.7% of our participants, this is consistent with Fox et al findings that simulation is an important method for teaching medical skills, interviewing, teamwork, and leadership in obstetrics.<sup>22</sup> 53.3% of students agreed simulation helps maintain competencies and reduce medical errors similarly Scholz et al. reported that using high-fidelity simulation improved students' understanding of parturition physiology and obstetric procedures, making them better prepared for obstetric house jobs and better doing obstetric procedures with minimal errors.<sup>23</sup> Fifty two percent of study participants strongly agreed that OB-GYN simulations can help students overcome difficulties in performing intimate-area examinations and gynecological history-taking skills on real patients. in this regard Goffman et al and Deering et al. both reported that simulation training improved residents' actions, communication, and documentation.<sup>24,14</sup> In terms of the utility of simulation in emergency situations, our trainee participants were considering its value as other studies have found that simulation methods are effective in providing obstetricians and midwives with better knowledge, improved clinical skills, and a more efficient approach to care.<sup>25-29</sup> This questionnaire-based study on SBE and current studies provided substantial evidence of the benefits of SBE.<sup>30,31</sup> But other studies, were unable to demonstrate any differences between simulator-based teaching and lecture teaching,<sup>32</sup> so more researches on the use of simulation in medical education is needed to compare the impact of simulation non-simulation-based modules.

## STRENGTH AND LIMITATIONS

The strength of this study was that it was conducted during normal and pandemic periods consecutively, which allowed for easy comparison. However, there are several limitations to this study, including small sample size. Moreover, it did not measure or assess competence or confidence in specific clinical skills, such as real-life labor and delivery experience. Thus, future studies can be designed to directly measure the impact of various types of SBE on the desired learners-based outcomes. For example, whether simulation training increased students' confidence in their abilities or whether the improved confidence maintained during the in vivo experience.

## CONCLUSIONS

Our study and other current studies provided substantial evidence of the benefits of SBE. During the pandemic, SBE provided a valuable alternative source of providing exposure clinical cases by providing interactive virtual demonstrations of simple clinical examination and procedures with adhering to infection control precautions. Following the COVID-19 pandemic, participants suggested the use of online simulation technologies and the mandatory establishment of simulation clinical skill training centers at every hospital and medical colleges.

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### Conflict of interests

The authors of this paper declare no competing or conflict of interest and deny the presence of any financial or external affiliations regarding this paper.

### Ethical approval

There is no need for ethical approval for this study.

## Authorship contributions

The authors have the same contributions

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