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Effect of simulating training of the fundamentals of laparoscopic surgery on the attitude of operating room nurses students: an intervention study

Original article

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Abstract: **Objective:** Clinical education plays a key role in preparing students for patient care. Laparoscopy is one of the most important minimally invasive surgeries (MISs) wherein surgical technologists are responsible for camera navigation and assistant surgeons are responsible for peg transfer. Therefore, it is necessary to improve the attitude of the operating room students toward these skills during their study period. The present study was conducted to determine the effect of simulating training in the fundamentals of laparoscopic surgery (FLS) on the attitude of the operating room students.

Methods: This interventional study was conducted on 28 operating room students of Iran University of Medical Sciences in 2019. The census sampling method was used. The data-collection tool included the "Intrinsic motivation inventory (IMI) questionnaire." The educational intervention was carried out in theoretical (booklet design) and practical (simulation) sections. Data analysis was carried out using descriptive and inferential analyses including the paired *t*-test, Mann–Whitney *U* test, and independent *t*-test. The collected data were analyzed using R and SPSS software. *P*-value <0.05 was considered as the significant level.

Results: The mean ± SD of the participants' age was 22.93 ± 2.14 years, and the majority of them were women (67.9%). There was a significant difference in the mean scores of students' attitudes toward the FLS before and after the educational intervention ($P < 0.001$) in all dimensions (interest, perceived competence, perceived choice, and tension). There was also a significant correlation between gender and interest dimension ($P = 0.005$).

Conclusions: The results of the present study showed that simulating the training FLS curriculum positively affects students' attitudes. Therefore, the researchers suggest that for creating a positive attitude, increasing students' interest in laparoscopic surgery, and ensuring a more effective presence in the operating room, this training should be considered in the operating room curriculum.

Keywords: *attitude • education • fundamentals of laparoscopic surgery • nurse, operating room students • stimulation*

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1. Introduction

Clinical education is an essential part of the operating room course and is considered as the heart of professional training.[1] Clinical education allows students to gain useful experiences through learning clinical interventions that play a key role in their professional preparation for patient care.[2] Despite the importance of clinical education, it still faces many challenges. A relevant study, which was conducted in Iran, showed that 88% of nursing graduates are dissatisfied with the quality of clinical education.[3]

The operating room is one of the high-risk and high-stress environments for patients and one where clinical education is very important. Some of the problems occurring in patients postoperatively are due to the errors committed by the operating room staff. Although the number of these errors is not high, they may lead to patient death. Therefore, studies show the lack of clinical skills of operating room graduates.[4,5]

The operating room is a new field of study and is dependent mainly on the practical and clinical skills of operating room graduates. A previous study has shown that despite having a strong theoretical foundation, operating room students do not have the skills and abilities needed in various surgeries.[6] Operating room students, as the future professional staff, may commit medical errors, and practical training courses give students the opportunity to implement their theoretical knowledge in a real environment.[1] Considering the increase in the number of minimally invasive surgeries (MISs) and the rapid development of surgical technology in this field, the use of new curricula to improve the attitude of operating room personnel is essential.[7] Recently, simulation training has become a common method of teaching surgical skills. Although simulation training is widely used for residents, it is not yet common for operating room students, who will play the role of scrubs and assistant surgeons in the future. Simulation training aims to make the learning conditions closer to the real environment.[8]

Laparoscopy is one of the most important MISs in which surgical interventions are performed through small incisions in the abdominal wall using long instruments. Lower pain and bleeding and shorter length of stay are among the advantages of laparoscopic surgery compared with open surgeries.[9] In most operating rooms, surgical technologists, as assistant surgeons in the laparoscopic surgery team, are responsible for camera navigation and peg transfer, which means that the surgeon's eyes are in the hands of another person. For this reason, the skills of the surgeon's assistant are highly important in MISs.[10] Thus, the attitude of operating room students toward these skills is essential.[9] Considering that surgical errors can have an irreparable impact on patients, it is necessary to improve students' attitudes toward controlling and reducing these errors.[11]

Measuring and improving students' attitude is extremely important to treatment goals, especially in hospital wards.[12] People's performance and skills are influenced by their attitudes. Gordon Allport believes that attitude is a state of mind that directly affects a person's reaction to all situations.[13] A positive attitude is the main factor required for improving the performance and skills of surgeon's assistants, so that they can develop the appropriate skills needed during surgery.[14,15]

The laparoscopic surgery team needs to practice in the simulation environment before working in the real operating room.[16] Accordingly, operating room students as future nurses play an important role in providing high-quality care to surgical candidate patients, and the performance and skills of operating room nurses are influenced by the attitude they possess. Also, to our knowledge, there was no similar study in Iran. Therefore, the present study was conducted to determine the effect of simulating the training of the fundamentals of laparoscopic surgery (FLS) on the attitude of operating room students.

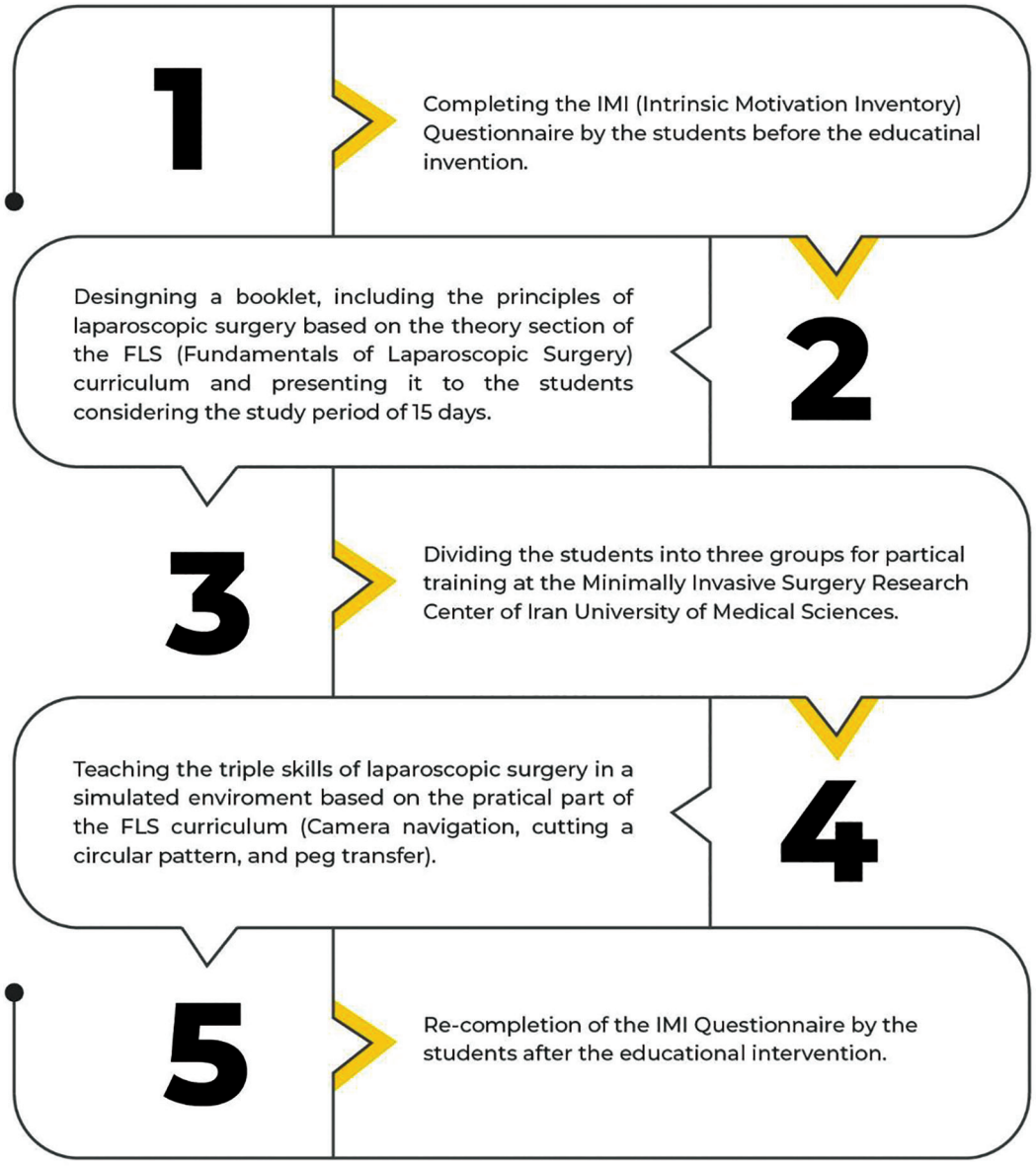
2. Materials and method

2.1. Study design and participants

This single-group intervention study was conducted on 30 operating room students at Iran University of Medical Sciences, Tehran in 2019. The census sampling method was used. Inclusion criteria were the willingness to participate in the study, being a student in the last semester of the BSc period, and completing a training theoretical course in gastrointestinal and endocrine surgical technology. Exclusion criteria were absent during the educational intervention and transferring from another university. The research was carried out in 5 stages (Figure 1).

2.2. Educational intervention

At the beginning of the study, aspects such as the purpose of the study, how to complete the questionnaire, and how to run the educational simulator were explained to the participants. Prior to the educational intervention, for determining the attitude of the students, the attitude-measurement questionnaire was completed by the students. The booklet containing the principles of laparoscopic surgery, which was designed based on the FLS curriculum and also following the operating room technology curriculum in Iran under the supervision of the operating room professors, was delivered to the students. This curriculum focuses on laparoscopic



Note: FLS, fundamentals of laparoscopic surgery; IMI, Intrinsic motivation inventory.

Figure 1. Five stages of the research undertaken.

surgical techniques and includes 2 components (theoretical knowledge and practical skills). The general goal of this curriculum is to provide standard training in the FLS to surgical assistants.

The theoretical part of the FLS curriculum consists of 10 sections: (1) indications for laparoscopic surgery, (2) surgical position, (3) tools and equipment, (4) anesthesia care, (5) access to viscera and care of ports, (6) hemostasis, suture, and stapler, (7) gas pressure and biopsy, (8) exit from abdomen, (9) perforation of intestines and large vessels and embolism, and (10) bleeding and hypothermia. The practical skills section of the FLS curriculum includes five main laparoscopic surgery skills: (1) peg transfer skill, (2) cutting a circular pattern, (3) creating a ligation loop, (4) intracorporeal suturing, and (5) extracorporeal suturing.[17–20] In newer studies, the "camera navigation" item was also added to this curriculum.[21,22] Considering the role of the operating room student who will work as a surgeon's assistant in the future, 3 tasks including peg transfer, cutting a circular

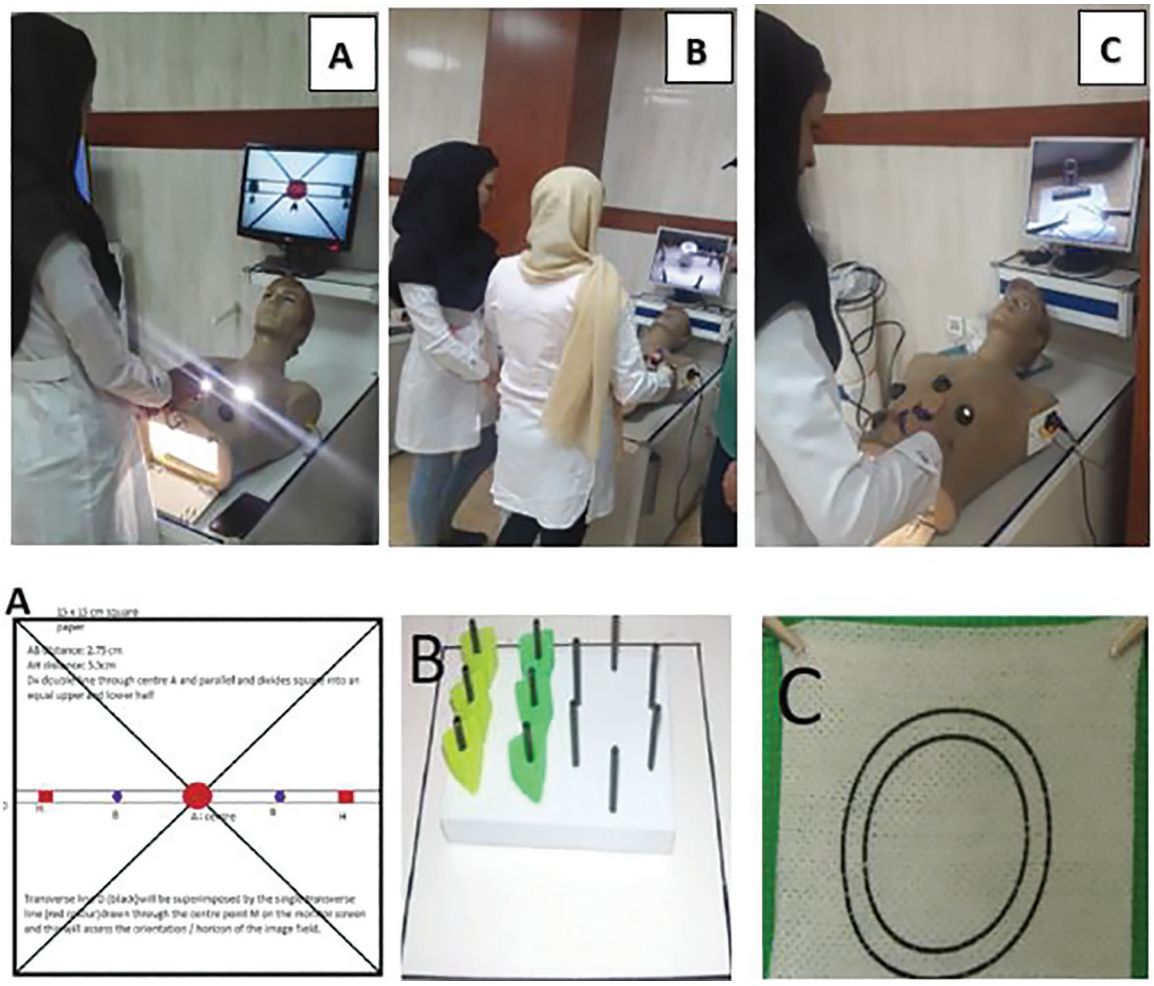


Figure 2. Training and assessing the triple laparoscopic surgery skills in the MISs research center at Rasoul Akram Hospital. (A) camera navigation skill; (B) peg transfer skill; and (C) cutting a circular pattern skill. MISs, minimally invasive surgeries.

pattern, and camera navigation were investigated in this study.[9,23] Figure 2 shows the students' performance.

Students studied this booklet for 30 days. To track the study status of the students, a group on the Telegram social network was used, and their questions were answered. In the next stage, the students were divided into 3 groups of 10 people each based on their attending the minimally invasive surgery-simulation training center. For each group, one day of simulated center time was allocated for the teaching of and practicing the practical skills. After completing this stage, the same attitude-measurement questionnaire was completed again by the students.

2.3. Data-collection tools

The Intrinsic motivation inventory (IMI) was used to measure students' attitude toward laparoscopic surgery, and included 22 questions in 4 dimensions, including (1) interest, (2) perceived competence, (3) perceived choice, and (4) pressure/tension. This questionnaire was scored based on a 7-point Likert scale ranging from 1 (completely disagree) to 7 (completely agree). Also, questions 2, 9, 11, 14, 19, and 21 were scored in reverse. The possible score range was from 22 to 154. This questionnaire was developed by Ryan et al.[24] and was used by Nielson et al.[25] to investigate the attitude of laparoscopic surgery students. The validity and reliability of this questionnaire were calculated to be 0.86 and confirmed by Hamldar et al.[26] in Iran.

2.4. Data analysis

Data analysis was done using descriptive and inferential analyses. The Shapiro–Wilk test was used to check the normality of the variable distribution before and after the educational intervention.

Considering that the student's attitude scores had a normal distribution, the paired *t*-test was used to investigate and compare the attitude of the operating room students toward the FLS before and after the educational intervention. The Mann–Whitney *U* test and the independent *t*-test were used to investigate the correlation between gender and the attitude of the operating room students. According to the normality of interest and pressure variables, the parametric independent *t*-test was used to compare the average of these 2 variables in different genders; also due to the non-normality of perceived choice and perceived competence variables, the non-parametric Mann–Whitney *U* test was used to compare the average of these 2 variables in different genders. In order to investigate the relationship between variables, Pearson's correlation coefficient test was used for parametric variables and Spearman's test was used for non-parametric variables. Data were analyzed using the statistical software R version 3 (R Core Team, Vienna, Austria) and SPSS 18.0 (IBM Corporation, Armonk, NY, United States).

2.5. Ethical approval and considerations

The present research was approved by the Ethics Committee of Iran University of Medical Sciences with the code of ethics (IR.IUMS.REC 1396.9511101009) and an access link (https://b2n.ir/k27781). Before the study, the participants were informed about the objectives of the study and they signed the informed consent form. Participants' information was kept confidential, and their names were replaced with codes. The participants could withdraw from the study at any stage. A consent form was obtained from the participants of the study to publish the image.

3. Results

The mean ± SD of students' age was 22.93 ± 2.14 years. The majority of the sample participants were female (n = 19, 67.9%). The present study showed a significant difference between the mean scores of students' attitude toward the FLS before and after the educational intervention ($P < 0.001$). Table 1 shows the mean ± SD and the significant difference in students' attitude scores in the 4 dimensions before and after the educational intervention.

The results of our study also showed a significant and positive correlation between gender and the interest dimensions with students' attitudes ($P = 0.005$) as given in Table 2.

Women had more "interest" scores. However, no significant relationship was observed in the other dimensions. Also, a significant and negative correlation was found between age and pressure/tension ($P = 0.041$), so that pressure/tension may decrease with age.

4. Discussion

The present study aimed to determine the effect of simulating training in the FLS on the attitude of the operating

Dimensions	Mean ± SD Before intervention	Mean ± SD After intervention	*P*-value
Interest	291.67 ± 67.69	492.86 ± 46.35	<0.001
Perceived competence	280 ± 45.60	288.46 ± 47.04	<0.001
Perceived choice	352.59 ± 76.69	498.52 ± 66.08	<0.001
Pressure/tension	378.57 ± 64.61	330.71 ± 61.21	<0.001
Total	291.67 ± 67.96	492.86 ± 46.35	<0.001

Table 1. The mean, standard deviation, and significant difference of students' attitude scores in 4 dimensions before and after the educational intervention.

Dimensions	Mean		*P*-value (sex)	*P*-value (age)	*R* (age)
	Male	Female			
Interest	490.00	498.00	0.005**	0.921***	0.020
Perceived competence	11.80	15.08	0.311*	0.411****	0.165
Perceived choice	17.80	12.80	0.131*	0.438****	0.153
Pressure/tension	311.00	340.00	0.511**	0.041***	–0.389

Note: **P*-value was obtained using the Mann–Whitney U test; ***P*-value was obtained using the independent t-test; ****P*-value was obtained using Pearson's correlation coefficient test; *****P*-value was obtained using the Spearman correlation coefficient test.

Table 2. Determining the relationship among gender, age, and the dimensions of students' attitudes.

room students. The results showed a significant difference between the attitudes of the operating room students toward the FLS before and after the educational intervention in the 4 dimensions, namely, interest, perceived competence, perceived choice, and tension. These results are consistent with the study conducted by Lee and Kim.[27]

In the study of Hafford et al.[28] the attitudes of surgeons and operating room personnel regarding the effectiveness of FLS principles improved after a simulated educational intervention. Also, in the study of Lee and Kim,[27] the attitude of operating room nurses improved after the implementation of a simulated intervention about patient safety during surgery.

Other studies also confirm the results of the present study. For example, the result of Burden et al.'s[29] study emphasizes that the simulated training of the principles of laparoscopic surgery will improve the attitude of gynecologists.

The use of simulation in nursing can lead to the expansion of knowledge, skills, performance, critical thinking, and self-confidence in nurses. Also, the results of another study showed that using the training manual can also improve the attitude of nurses regarding preparedness in crises.[30]

The current study showed a significant increase in the interest of students to perform the FLS after the educational intervention. This increased interest among students can be due to the greater knowledge now possessed, correct understanding of the laparoscopic environment, the presence of technology, and the attractiveness of the workplace found for this type of surgery. Nilsson et al.[25] in 2016 conducted a study with the aim of comprehending the effect of laparoscopic surgery simulation training on students' attitudes and skills. Unlike the present study, the results of Nielson's study showed that the level of interest in the control group was higher than that in the simulation group. Considering that the control group did not receive any training on the skill of camera navigation in laparoscopic surgery, it is possible that in Nilsson's study, lack of familiarity with the environment of laparoscopic surgery caused this result in the control group.

The perceived competence of the students was also investigated in the present study, and the results show a significant improvement in this dimension after the educational intervention. The low preintervention perceived competence may be due to lack of knowledge and understanding of laparoscopic procedures, techniques, and skills, but the students felt higher perceived competence after the intervention. LaPorta et al.[31] investigated the effect of simulating surgical skills on the self-confidence and clinical knowledge of students. Consistent with the current study, they concluded that this training course may increase the self-confidence and clinical knowledge of surgical students. Geoffrion et al.[32] further showed that theoretical knowledge training alone does not change the self-confidence of surgical students, but that simulation-based training together with theoretical knowledge training helps to improve people's self-confidence. In addition, the study of Amiri and Khademian mentioned the use of simulated training as a basic principle in fostering the clinical competence of nurses. Operating room students, as a group of future personnel based in the surgical team, have an abstract thinking of the conditions of facing problems in clinical environments; thus, the use of educational methods based on simulation to improve clinical decision-making in this group is also recommended.[33]

Also, in the present study, a third dimension showed the rate of perceived choice of operating room students and their preference in choosing to study laparoscopic surgeries compared with other surgeries. The results obtained show a significant difference in the perceived choice mean scores after the educational intervention, which was inconsistent with the study by Nilsson et al.[25] This discrepancy shows that students preferred laparoscopic surgeries compared to other surgeries with the increase in their knowledge and awareness of the laparoscopic surgery environment and workplace.

The fourth dimension of the IMI investigated the tension rate of students during laparoscopic surgery. The mean score of tension/pressure was significantly reduced after the intervention. The high preintervention tension/pressure rate shows that students are anxious when facing laparoscopic surgery techniques for the first time, which is probably due to their low level of knowledge and skills. However, with an increase in their skills and self-confidence, they felt more comfortable and had lower tension and pressure after the intervention. Consistent with the present research, Pupkiewicz et al.[34] showed that novice students experienced fear and anxiety when performing surgical techniques. The participants also stated that they needed more comprehensive curricula so that they can acquire sufficient skills and knowledge to participate in surgical procedures. In line with the results of the present study, the study of Ebrahimian et al.[35] showed that simulation can reduce the anxiety and tension of operating room students during the internship period.

The present study also revealed a significant relationship between interest and gender. The higher level of interest seen among female students can be because the majority of participants were female, and these results are consistent with the study by Glaser et al.[36] In the present study, there was a significant and negative correlation between age and pressure/tension, so that with increasing age, the amount of pressure/tension may decrease. In line with this finding, in the study of

Mahdaviseresht et al.[37] it was pointed out that increasing age reduces the work tension of nursing students, and this may be due to greater familiarity of the stressful environment of clinical work and increased experience.

5. Conclusions

The results of the present study show that simulating training of FLS has a positive effect on students' attitudes. Also, despite the short period of training and performing it on simulated laparoscopic mollage, the results show that the curriculum was highly effective in all dimensions. With the addition of this subject to the operating room curriculum, it can be expected that students have a positive attitude toward the FLS and prepare themselves for effective attendance in the operating room.

Limitations

Among the limitations of the present study is the fact that the authors were uncertain whether the students thoroughly studied the booklet or not. To overcome this problem, online tests were used. Also, the small sample size may have affected the generalizability of the results. Therefore, it is recommended that this research be carried out with a larger sample size.

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Ethical approval

This study was approved by the Ethics Committee of Iran University of Medical Sciences with the code of ethics (IRB approval number: IR.IUMS.REC 1396.9511101009).

Conflicts of interest

All contributing authors declare no conflicts of interest.

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