Original Article

The Effect of a Short Training Course of Hysteroscopic Myoma Resection on the Non-Technical Skills of Gynecologic Surgeons

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Received May 2024; Revised and accepted June 2024

Abstract

Objective: To assess the impact of a hysteroscopic myoma resection (HMR) two-day training course on non-technical (cognitive) surgical skills among gynecologists.

Materials and methods: A 2-day educational course was held in which 95 consultant gynecologic surgeons and beginner infertility fellowship residents took part. Among all 80 participants (84.2%) had ever performed diagnostic hysteroscopy and 30 (31.3%) had performed non-resectoscopic operative hysteroscopy. The training program included instructive speeches, simulated surgical presentations, and a live hands-on myomectomy workshop. Non-technical skills were assessed two times, once before and the other after the course through two written tests with 10 multiple-choice questions for each.

Results: Concerning the 95 participants, 43 (47.3%) took the pre-course test and all of them (100%) took the post-course one. The mean score improved significantly from 3 (interquartile range [IQR], 0–4.0) to 7 (IQR, 5.0– 8.0) [bootstrap p<0.0001] for each of the randomly chosen pairings. The majority of candidates showed significantly improved cognitive skills after the HMR course despite their poor cognitive skills before the course. According to further analysis, there were significant enhancements in grades for all topics, especially regarding the basic principles of the procedure and management of complications (bootstrap p<0.0001). The odds ratio for the pre- versus post-course mean test results was 5.23. Due to the confidentiality stipulation, the pre- and post-course scores were not matched.

Conclusion: A two-day continuing medical educational course could be efficient in improving the non-technical (cognitive) skills for HMR.

Keywords: Surgical Training; Non-Technical Skills; Hysteroscopy; Gynecologic Surgeons; Surgical Competency

Introduction

Surgical training plays a crucial role in any Gynecologic residency syllabus (1). The traditional educational system which took place in the operating room under the supervision of the attending surgeons has been associated with certain drawbacks. Intuitive dissimilarities of the attending in employing different techniques along with their personal preferences on one hand and the limited amount of time each resident is permitted to perform a specified

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procedure, on the other hand, are the principal reasons why solely relying on this tuition method does not suffice (1-3). With the decline in residency working hours and caseloads, the probability that future surgeons' qualifications do not indeed meet the standard criteria in surgical competency will increase unless some measures are taken (4). Furthermore, given the widespread application of minimally invasive procedures and the higher concerns of society regarding patient safety and legal issues, reinforcement of coaching methodology to improve both technical and non-technical skills is highly warranted (1-5). The employment of skills laboratories has allowed the trainees to practice the procedures independently and as much as they need to be qualified for. Doing the procedures in simulated-based environments would further enhance their competence. Both of these methods have been proven to be effective (2-5).

Many modalities of simulators for teaching new surgical skills are available, including bench models, animal models, cadavers, and computer software-based virtual reality simulators (Table 1).

It seems that skills learned on a simulator are transferable to the clinical setting.

Simulators might also prove useful for the evaluation of the surgical proficiency of a trainee (6).

Several models exist for hysteroscopic training that ranges from cow uteri and bladders to virtual reality models.

Apart from technical skills which are fundamental in surgical training, the importance of nontechnical skills (NTS) meanwhile, should not be overlooked. This group of capabilities which is further categorized into cognitive and interpersonal skills, has a key role in the prevention of serious errors in the operating theatre (8, 9). Cognitive skills consisting of decision-making, planning, and situational awareness, just as important as technical skills should be included in any surgical educational program (10, 11). Surgical proficiency is more dependent on NTS rather than technical skills according to the rule of 75% to 25% (12). Furthermore, a lack of expertise in NTS is mostly blamed for medical errors that, occur in the operating field (10-12). Unfortunately, due to socioeconomic and cultural barriers, these issues are not fully addressed in the residency training system of developing countries (13). Continuing medical educational courses (CME) are held for different specialties in our country like many other countries. However, the efficacy of them has not been evaluated till now. Moreover, these courses are only lecture-based which does not seem to be adequate for highly technical specialties like gynecology (14, 15). According to a study by Alvand et al, a mixed educational course including didactic lectures, interactive surgical demonstrations, and hands-on workshops, came out to be effective in enhancing NTS for a complicated orthopedic procedure (14). Given the practicality and cost-effectiveness of such courses, our study was designed to investigate the impact of a mixed course on NTS improvement for a demanding gynecologic operation.

Materials and methods

This prospective study was approved by the Reproductive Health Research Center, Tehran University of Medical Sciences with ID number "IR.TUMS.VCR.REC.1397.916" in which 95 consultant gynecologic surgeons and beginner infertility fellowship residents attended a two-day course on hysteroscopic myoma resection (HMR).

Table 1: Types of Simulations Available (7)

Simulation	Advantages	Disadvantages	Best Use
Bench models	Cheap, portable, reusable, minimal risks	Acceptance by trainees; low fidelity; basic tasks, not operations	Basic skills for novice learners, discrete skills
Live animals	High fidelity, availability, can practice hemostasis and entire operations	Cost, special facilities, and personnel required, ethical concerns, single-use, anatomical differences	Advanced procedural knowledge, procedures in which blood flow is important, dissection skills
Cadavers	High fidelity, only "true" anatomy simulator currently, can practice entire operations	Cost, availability, single-use, compliance of tissue, infection risk	Advanced procedural knowledge, dissection, continuing medical education
Human Performance simulators	Reusable, high-fidelity, data capture, interactivity	Cost, maintenance, and downtime; limited "technical" applications	Team training, crisis management
Virtual reality surgical simulators	Reusable, data capture, minimal setup time	Cost, maintenance, and downtime; acceptance by trainees; three dimensions not well simulated	Basic laparoscopic skills, endoscopic and transcutaneous procedural skills

Eighty (84.2%) of the candidates had performed diagnostic hysteroscopy, whereas thirty (31.3%) had performed non-resectoscopic operative hysteroscopy beforehand. On the first day, the participants were asked questions regarding the selection of electrodes, electro-surgery settings, distending media, fluid management system, and management of complications. This pretest was answered by the attendees based only on the training they had received during residency or their private experiences. Each subject then received instruction on hysteroscopic instrumentation and the performance of hysteroscopy. This consisted of 1-hour didactic session covering surgical indications, contraindications, anticipated complications, and basics of equipment and media options, followed by two interactive demonstrations of hysteroscopic myoma resection. After a 30-minute break, the participants were provided with a 2-hour hands-on workshop where they had an opportunity to assemble the diagnostic and operative hysteroscopes. The second day started with another 1-hour instructive lecture describing the whole HMR procedure followed by a practical simulated-based workshop in which the candidates could review the main points once more. The simulation sessions used a Versa point Bipolar Electrosurgery System, a video tower and camera system, a hysteroscopic trainer that was designed by Ethicon Women's Health and Urology, and a uterine tube and pelvic model from Limbs and Things (Bristol, UK). The simulated uterine tube contains a markedly irregular surface on the inner aspect that resembles either endometrial polyps or submucosal myomata. The material in this simulated tube is capable of being resected by bipolar electrosurgery, with the same settings used in clinical practice. The subjects were re-evaluated at the end of the course. In pre and post-training tests they were given two questionnaires each comprised 10 multiple-choice questions (with 5 possible answers). The maximum test score was considered to be 10. According to Rasmussen's theory, human task performance is classified into three categories: skill-based, rule-based, and knowledge-based (14, 16). With regards to skill-based performance, mainly technical aspects of doing a procedure are meant. Concerning the principal goal of our study, however, which was focusing on cognitive skills, the questions designed were rule-based knowledge-based, or a combination of both (Table 1).

Statistical analysis: Data were analyzed using SPSS 20. Multilevel modeling was used to compare the pre and post-course test scores. The matching of pre- and post-course scores was impossible due to confidentiality stipulations. P value < 0.05 was considered to be statistically significant.

Results

Of the 95 delegates, 43 (47.3%) took the pre-course test and 95 (100%) took the post-course test. The median score improved significantly from 3 (interquartile range [IQR], 0–4.0) to 7 (IQR, 5.0–8.0) [bootstrap p<0.0001] for every single one of the randomly allocated pairings. Most delegates had poor cognitive skills for the HMR before the course and improved significantly after the course. Sub-analysis of each question topic showed significant improvement in scores for all topics after the course (bootstrap p<0.0001). Nonetheless, the extent to which individual topic scores improved varied widely. The odds ratio for the pre- versus post-course total test score was 5.23 (Table 2).

Table 2: Questions to test cognitive skills according to Rasmussen-based human performance domains

Topic examined	Rasmussen-based human performance domains	% of the delegates who answered the question correctly Pre-course test post-course test (n= 43) (n= 95)
Contraindications for performing Hysteroscopy	Rule-based	37%
Hysteroscopy principles when performing resectoscopy	Rule-based	16%
Interpretation of postoperative radiographs	Rule- & Knowledge-based	9%
Complication: uterine perforation	Rule- & Knowledge-based	8%
Complication: bleeding	Knowledge-based	31%
Principles of cauterization	Rule-based	27%
Causes and treatment of pulmonary edema	Rule- & Knowledge-based	39%
Causes of postoperative pain	Knowledge-based	7%
Complication: other pelvic organs' trauma	Knowledge-based	29%
Management of bleeding	Knowledge-based	18%

Discussion

This was a trial to investigate whether mixed educational courses would enhance surgical performance in postgraduate gynecologists about their cognitive skills. The procedure selected was HMR which is highly technical and complicated. Less than half of the participants answered each question correctly at the beginning of the course. This shows that the majority of the postgraduate gynecologists are not adequately acquainted with this hysteroscopic procedure. Although hysteroscopy is already included in the residency educational curriculum, HMR is in the category of advanced hysteroscopic surgeries which is at the level of the fellowship training in our country and is not professionally taught during residency (17). Apart from the technical aspects of performing the procedure like manual dexterity or handling of the instruments which are acquired with time and practice, there exist some defects regarding the fundamentals. In other words, some primary steps mainly consisted of cognitive skills like decision making or error detection should be taken to be qualified for performing such complex tasks (18). Therefore, a higher quality training system for residents is warranted and its center of attention should be on both technical and non-technical aspects of any procedure (18, 19). With the advent of new technology, the current educational methodology does not seem adequate, particularly in the field of minimally invasive surgery which deserves even higher levels of expertise. Considering the limited working hours of residents and their attending tutors, other educational technologies should be employed that is both time saving and efficient. Simulation is one of them which though not identical to real-life situations, has been gainful in improving the learning curves of trainees (18-21).

This method was adopted as a part of the mixed course in our study too. According to our results, there was a significant improvement in pre-test scores in comparison with the post-test ones which was consistent with that of Alv et al study (14). The principal focus of our study was on the non-technical performance of the participants which was in line with a recent study by Pena et al (22). It was shown in their study that NTS can be trained successfully in simulated environments apart from didactic workshops. In our study, however, the impact of simulation-based training was not assessed separately.

Of the ten questions designed for each test, the worst responses both in the pre and post-tests were regarding the causes of postoperative pain which is in close association with patient satisfaction. Since the application of minimally invasive surgery in modern gynecology, many studies have been published concerning its benefits compared to open surgery including lower postoperative pain (23). Consequently, optimal management of complications in this era should be prioritized in the training curricula of new generation surgeons to be successfully employed by them.

In the study by Erian et al, a training algorithm was suggested for hysteroscopy. Based on this algorithm, a gynecologist should pass through workshops, animal labs, and virtual reality simulators before entering the operating field (18). Except for the costly animal labs, the other two were utilized in our study. Workshops are valuable tools for improving knowledge-based skills. Simulators meanwhile, enhance surgeons' psychomotor skills and clinical judgment (20, 21).

Our study had some limitations. First of all, the educational impact of each of the training modalities was not assessed independently; hence, it cannot be concluded which option had the highest influence. Secondly, the assessment method was solely in the written format of 10 multiple choice questions which may not be regarded as a reliable means of judgment. Moreover, due to confidentiality stipulations, matching of the pre and post-test scores was not possible for each participant independently, i.e. 43 paired and 52 extra post-test scores were compared in the same analysis using multilevel modeling.

Conclusion

A mixed continuing medical educational course could be efficient in enhancing the non-technical (cognitive) skills for hysteroscopic myoma resection. Given the importance of nontechnical skills as part of surgical competency, the integration of mixed training courses consisting of simulated environments seems mandatory in postgraduate surgical curricula.

Conflict of Interests

Authors declare no conflict of interests.

Acknowledgments

None.

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Citation: Jafarabadi M, Gorginzadeh M, Rezayof E. **The Effect of a Short Training Course of Hysteroscopic Myoma Resection on the Non-Technical Skills of Gynecologic Surgeons.** J Family Reprod Health 2024; 18(2): 80-4.