The Sex Difference in Basic Surgical Skills Learning: A Comparative Study☆,☆☆

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BACKGROUND: Very little is known of sex-related differences among medical students in the acquisition of basic surgical skills at an undergraduate level. The aim of this study was to investigate the sex differences in basic surgical skills learning and the possible explanations for sex disparities within basic surgical skills education.

METHODS: A didactic description of 10 surgical skills was performed, including knot tying, basic suture I, basic suture II, sterile technique, preoperative preparation, phlebotomy, debridement, laparotomy, cecectomy, and small bowel resection with hand-sewn anastomosis. The students were rated on a 100-point scale for each basic surgical skill. Later during the same semester all the students took the final theoretical examination. Results: A total of 342 (male = 317 and female = 25) medical students participated in a single skills laboratory as part of their third-year medical student clerkship. The mean scores for each of the 10 surgical skills were higher in female group. The difference in sterile technique, preoperative preparation, cecectomy, and small bowel resection with hand-sewn anastomosis reached the significant level. Compared with male medical students, the mean theory examination score was significantly higher in female medical students. Approximately 76% of the (19 of 25) female students expressed their interest in pursuing a surgical career, whereas only 65.5% (207 of 317) male students wanted to be surgical professionals ($p = 0.381$).

CONCLUSIONS: Female medical students completed basic surgical skills training more efficiently and passed the theoretical examination with significantly higher scores than male medical students. In the future, studies should be done in other classes in our institution and perhaps other schools to see if these findings are reliable or valid or just a reflection of this 1 sample. (J Surg Ed 73:902-905. © 2016 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: basic surgical skill, medical students, sex, learning motivation

COMPETENCIES: Interpersonal and Communication Skills, Practice-Based Learning and Improvement, Systems-Based Practice

BACKGROUND

Women are increasingly participating in the surgical profession,[1] although the profession remains male-dominated, with women representing 10% to 20% of surgeons according to different studies.[2,3] Also, the percentage of female medical students remains below the percentage of male medical students in China. Previous studies reported that females are less attracted than males to surgical specialties, which may be because of differences in the acquisition of skills.[4] However, very little is known of sex-related differences among medical students in the acquisition of basic surgical skills at an undergraduate level.

The aim of this study was to investigate the sex differences in basic surgical skills learning and the possible explanations for sex disparities within basic surgical skills education.

☆Zheng Lou, Zhi-qing Zhao, Wei Zhang, and En-da Yu were involved in performing the education and drafted the manuscript; Fei-hu Yan, Xian-qi Shui, Jia Liu, Dong-lan Zhuo, and Li Li co-ordinated and provided the collection of all the data in addition to providing financial support for this work; Fei-hu Yan, Xian-qi Shui, Jia Liu, Dong-lan Zhuo, Li Li participated in its design and coordination and helped to draft the manuscript. All authors have read and approved the final manuscript.

☆☆This work was supported by Medical Students' Education Reform and Research Fund from the Second Military Medical University (CMC2014011 and CMC2014016), Shanghai, China.

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  1931-7204/$30.00 http://dx.doi.org/10.1016/j.jsurg.2016.04.002

METHODS

This study was approved by the Ethics Committee of the Second Military Medical University. All experimental dogs were treated in accordance with the guidelines of the Ethics Committee of the Second Military Medical University. In this study, the students were senior undergraduates of clinical medicine at the Second Military Medical University. At the beginning of this training, they had finished 2 years of basic medicine and began to study clinical medicine. As an essential course for the students, the aim of this training is to help them to master the basic theories and skills of surgery in the present study. A 12-week surgical training curriculum was a part of the teaching syllabus of the Second Military Medical University for these students. The curriculum consisted of theoretical learning and practical training. The evaluation forms were drafted by the Department of Surgical Education, Chang-hai Hospital, China and consisted of 10 surgical skills, including knot tying, basic suture I, basic suture II, sterile technique, preoperative preparation, phlebotomy, debridement, laparotomy, cecectomy, and small bowel resection with hand-sewn anastomosis. The students were rated on a 100-point scale for each basic surgical skill. The 100-point rating system is a scoring system for evaluation of the students' performance including accuracy, proficiency, quantity, etc., in China. For example, in the small intestine resection and anastomosis learning process, teachers made an assessment according to student's aseptic and suture technique, operative time, and other parameters, then gave a final score, between 0 and 100. A total of 60 points is a line to pass the examination and evaluation.

Animate surgical skills laboratory was conducted using Beagle dogs housed at the Second Military Medical University Laboratory Animal Resources. General anesthesia was induced with pentobarbital sodium 20 mg/kg intraperitoneal injection. Endotracheal tubes and intravenous access were placed after induction. Continuous monitoring of the respiratory rate and heart rate was maintained throughout the laboratory. On completion of the last laboratory, death was accomplished with intravenous potassium chloride solution (0.125 g/ml).

First, students acquired the basic knowledge and skills in a 20 minutes lecture unit. After a didactic description of the surgical skills to be performed, the students were divided into small groups (4 students per animal). A total of 4 students per group; in each group, a person served as the anesthesiologist, instrument nurse, surgeon, or assistant in turns. The arrangement helps students get familiar with the working environment of operating room and have a chance to practice basic surgical skills. We evaluated students' performances according to their characteristics. All these points were given by 2 teachers experienced both in teaching and performing operations, and the average was calculated. Therefore, there was no difference in the score bias whether the students were first in the group or last. Of course, difference in the scores might exist among different students because of the differences of students' ability but not whether the students were first in the group or last.

Each group was supplied with a set of standard surgical instruments, including scalpel, forceps, scissors, needle drivers, needles, hemostats, towel clamps, laparotomy sponges, and nonabsorbable sutures. Each group was allotted 120 minutes to complete the assigned basic surgical skills under the guidance of their teacher. The laboratory was proctored by 7 faculty instructors and senior surgical doctors, but all the tasks were completed entirely by the students. Each student group was required to complete the following procedures: knot tying (types and method for knot tying), basic suture I (suture size, suture needles, and suture type), basic suture II (intestinal anastomosis simulation training), sterile technique (surgery area disinfection and draping), preoperative preparation, phlebotomy, debridement, laparotomy, cecectomy, and small bowel resection with hand-sewn anastomosis.

After completing all 10 skills training, the students were required to complete a theoretical examination to test their understanding of the course content. The theoretical examination includes a fill-in-the blank (5 items, 3 points each), multiple-choice section (15 items, 2 points each), identification (5 items, 3 points each) and question and answer section (4 items, 10 points each). For example, in the question and answer section, 1 question was as follows: Please briefly describe the main steps of appendectomy.

In our center and most of the similar teaching centers in China, the 10 surgical skills and the theoretical or written examination are independent, but inextricably related. The theoretical examination is a written examination designed to check the basic theories and knowledge. The 10 surgical skills examination is designed to highlight the operational capabilities and to check whether the students can put the theories into practice. Both examinations are the basic means of evaluating the students' study and the quality of teaching in medical colleges. It also plays a very important role in teaching management.

A questionnaire survey was given to these students to find whether they were interested in pursuing a surgical career and to assess differences in attitudes towards surgical career between male and female medical students.

STATISTICAL ANALYSIS

Descriptive statistics (mean and standard deviation) were calculated for each of the 10 surgical skills. *t*-Tests were used to compare the mean test values for each of the ten surgical procedures and theoretical examination. A value of $p < 0.05$ was used to determine the level of statistical significance. Analyses were conducted using SPSS version 17.0 (SPSS, Chicago, IL).