Evaluation of Medical Students' Attitudes and Performance of Basic Surgery Skills in a Training Program Using Fresh Human skin, Excised During Body Contouring Surgeries

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BACKGROUND: Learning surgical skills in the operating room may be a challenge for medical students. Therefore, more approaches using simulation to enable students to develop their practical skills are required.

OBJECTIVES: We hypothesized that (1) there would be a need for additional surgical training for medical students in the pre–final year, and (2) our basic surgery skills training program using fresh human skin would improve medical students' surgical skills.

DESIGN: We conducted a preliminary survey of medical students to clarify the need for further training in basic surgery procedures. A new approach using simulation to teach surgical skills on human skin was set up. The procedural skills of 15 randomly selected students were assessed in the operating room before and after participation in the simulation, using Objective Structured Assessment of Technical Skills. Furthermore, subjective assessment was performed based on students' self-evaluation. The data were analyzed using SPSS, version 21 (SPSS, Inc., Chicago, IL).

SETTING: The study took place at the Inselspital, Bern University Hospital.

PARTICIPANTS: A total of 186 pre–final-year medical students were enrolled into the preliminary survey; 15 randomly selected medical students participated in the basic surgical skills training course on the fresh human skin operating room.

RESULTS: The preliminary survey revealed the need for a surgical skills curriculum. The simulation approach we developed showed significant ($p < 0.001$) improvement for all 12 surgical skills, with mean cumulative precourse and postcourse values of 31.25 ± 5.013 and 45.38 ± 3.557, respectively. The self-evaluation contained positive feedback as well.

CONCLUSION: Simulation of surgery using human tissue samples could help medical students become more proficient in handling surgical instruments before stepping into a real surgical situation. We suggest further studies evaluating our proposed teaching method and the possibility of integrating this simulation approach into the medical school curriculum. (J Surg Ed 72:868-874. © 2015 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: basic surgery skills, fresh human skin, medical education, postbariatric surgeries, training

COMPETENCIES: Patient Care, Medical Knowledge, Practice-Based Learning and Improvement

INTRODUCTION

Teaching medical students basic surgical skills used in the operating room is very important. However, little formal training on educational methods and principles is available.[1]

To overcome these barriers, simulation has become an important part of medical training programs in recent decades.[2-5] A variety of simulator platforms including pigs' feet, synthetic skin, and anatomically accurate mannequins have become available commercially. However, most of this equipment is expensive, difficult to access, or a poor replica of the conditions encountered with actual human

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patients.[2,6] Furthermore, the functional similarity of the model to its real-life counterpart in simulation-based training is crucial.[6,7]

The current surgical curriculum of the University of Bern Medical School includes a suturing course using pigs' feet and rotations in which students participate in inpatient care, outpatient care, and surgical interventions. There is no opportunity for the medical students to practice handling a scalpel or working with human tissue in a situation where there is no possibility of patient harm.

To address these issues, we set up a pilot study using fresh human skin excised during postbariatric surgeries, one of the most common surgical procedures performed by plastic surgeons, as teaching material to train medical students in basic surgical skills.[8] We evaluated the students' attitudes and surgical performance before and after they participated in a training course.

METHODS

Participants and Design

This study was conducted from March to August 2014 and was approved by the institutional review board (KEK-Nr: 088/13). Informed consent was obtained from all patients and volunteers. A total of 186 students in the pre–final year of study at the Bern Medical School participated in the study; 8 patients undergoing body contouring surgery volunteered for the study (with negative results for all viral markers). In proportion to the amount of weight lost, patients undergoing bariatric surgery develop contour deformities caused by skin excess; the resected skin during body contouring surgeries such as abdominoplasty or circumferential body lift[8-10] was used as a teaching material in this study.

Preliminary Survey

First, a preliminary questionnaire was sent to each of the medical students, asking them to express their attitude regarding learning more basic surgery skills. This questionnaire was made up of 12 questions with Likert-type responses (Table 1). It was a modified version of similar questionnaires used in previously published and validated studies.[2,3,11-13]

Basic Surgery Skills Training Package

After review of similar previous studies,[14,15] each of the students who answered the preliminary questionnaire was anonymized by receiving a code. We then randomly selected 15 students from them (Research Randomizer, Version 4.0) for participation in the basic surgery skills training. First, they were invited to a theoretical surgical training course in small groups (2-3 students). This training lecture included the following issues: knowledge of sterility in the operation room, handling and identification of surgical instruments, physiology of wound healing and skin transplantation, theoretical knowledge of how to perform an elliptical skin excision, split and full-thickness skin grafts, and wound closure with different kinds of suturing methods.

Then, a 120-minute hands-on session by a senior plastic surgeon followed. After the surgeon had excised the patient's skin, the teaching was started in a separate operating room, on a sterile operating table (Fig. S2).

Each student performed the following procedures:

- Elliptical skin excision and wound closure using multiple single sutures (Fig. S3).
- Harvest of a full-thickness skin graft (Fig. S4).
- Harvest of a split-thickness skin graft using the Humby knife (Fig. S5).

Objective Skills Assessment

Students' procedural skills were assessed in the operating room before and after participation in the simulation basic surgery training course by another plastic surgeon using the Objective Structured Assessment of Technical Skills (OSATS), which covers 7 global and 5 specific surgical skills (Table 2). To provide an objective assessment that has both good validity and reliability, we modified the previously developed OSATS rating questionnaire with our task-specific checklist. This tool, which included global rating scales based on the work by Reznick et al., had internal consistency reliability of $r = 0.896$. This method includes 5 to 8 surgical behaviors, such as respect for tissues, economy of motion, and appropriate use of assistants.[16-21]

Subjective Skill Assessment

After participation in the basic surgery skills training, students were asked to complete a self-evaluation questionnaire with 17 questions that provided subjective feedback of their experience (Table 3). This questionnaire was also a modified version of previously published and validated studies.[2,3,11-13]

Data Analysis

All analyses were conducted using the SPSS version 21.0 (SPSS, Inc., Chicago, IL). Descriptive statistics were reported as mean ± standard deviation. The 12 surgical skills grades were also reported as mean ± standard deviation. The paired t test was used to compare the 12 surgical skills and the cumulative mean scores (combining all surgical skills and students' attitudes) before and after