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Results of a Surgical Simulation Course Designed to Improve Surgery Clerkship Performance

Joseph LaPorta III, BS, Tanner McClure III, BA and Michael E. Tieman, MD, FACS

Department of Specialty Medicine, Rocky Vista University College of Osteopathic Medicine, Parker, Colorado

BACKGROUND AND OBJECTIVES: During the 2015-2016 academic year, Rocky Vista University College of Osteopathic Medicine (RVUCOM) conducted a required 1-week surgical simulation course as the first week of students' 8-week surgical clerkship. This course was adapted from a pilot RVUCOM surgical simulation course and other surgical simulation courses identified in the literature. The objectives of this course were to teach surgical skills and clinical knowledge, aid students in adjusting to the stress of a surgical clerkship, and improve students' confidence and abilities during the clerkship.

METHODS: In all, 148 students participated in the surgical simulation course. Subjective assessment of this course included each student completing a daily standardized stress survey and student feedback surveys at the end of the course and at the end of the surgical clerkship. Objective assessment of this course compared precourse and postcourse tests of surgical knowledge and instrument identification, as well as comparison of NBME Surgery Subject Assessment percentile ranks of this class with 3 prior classes.

RESULTS: Daily stress surveys indicated decreased stress on day 5 compared to day 1 ($p < 0.01$). Students' confidence level increased significantly on day 5 compared to day 1 ($p < 0.01$). Student feedback surveys demonstrated students' perception that surgical skills and clinical skills had been learned during the course and that the course improved their performance during the surgical clerkship. NBME Surgery Subject Assessment percentile rank improved significantly ($p < 0.01$) from a mean percentile rank of 36.94 for 3 previous classes to a mean percentile rank of 43.82 for the class who completed the simulation course. Surgical knowledge improved significantly ($p < 0.001$) from a pretest mean score of 47.02% to a posttest mean score of 55.14%. Surgical instrument identification improved significantly ($p < 0.001$) from a pretest mean of 13.81% to a posttest mean of 95.28%.

CONCLUSION: The RVUCOM surgery simulation course significantly improved student performance academically and helped students acclimate to stress, increase their confidence level, and acquire surgical skills needed during the third-year surgery clerkship. (J Surg Ed ▮:▮▮▮-▮▮▮. © 2017 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: simulation training, skills development, education, medical, undergraduate, presentation skills, stress adaptation, clerkship, clinical

COMPETENCIES: Patient Care, Medical Knowledge, Interpersonal Skills and Communication

INTRODUCTION

Over the past several years, medical students have spent less time in their undergraduate clinical clerkships.[1] This decrease in exposure has led to mounting concerns that graduated physicians are entering the work force with diminished competency and understanding within their chosen specialty. This trend is particularly apparent in the field of surgery where it has been reported that students spend approximately 30% less time on their clerkships than in the past.[2] Beyond the concerns regarding competency, it is possible that this lack of early exposure to surgery may also play a role in the recent decreased interest in the field of surgery.[3,4] These beliefs echo the American College of Surgeons' conclusion that the clinical clerkship cannot be fully relied upon to provide students with clinically significant experience, and additional education is needed.[5]

Simulation and hands-on learning have been found superior to didactic lecture or problem-based learning when preparing a student for the clinical clerkship.[5] Simulation presents students with an opportunity to learn and fail in a safe environment, resulting in increased confidence and

Correspondence: Inquiries to Michael E. Tieman, MD, FACS, Department of Specialty Medicine, Rocky Vista University College of Osteopathic Medicine, 8401 South Chambers Road, Parker, CO 80134; e-mail: mtieman@rvu.edu

lowered levels of stress during performance on clerkships. Stress has been shown to impair psychomotor performance during surgery, as it is correlated with increased mistakes, imprecision, and time spent during procedures.[6] Therefore, decreasing stress, or helping students acclimate to it, is vital in enhancing students' ability to learn and perform. Simulation exercises operating within a certain limit of stress have been shown to optimize learning and performance and have proven valuable in surgical education.[7] Furthermore, the value of didactic lecture is significantly improved when presented subsequent to simulation, as opposed to lecture presented without associated simulation.[8]

Over recent years, several institutions have incorporated simulation into "surgical boot camps." These courses have been designed to integrate education and simulation in an attempt to bolster medical students' competency and passion for surgery. Some of these courses, such as those found at the University of Pennsylvania School of Medicine,[9] the University of South Dakota,[10] and University of Tasmania School of Medicine,[11] have provided opportunities for fourth-year medical students committed to a surgery residency to improve their skills before graduation. Mayo Medical School,[1] University of Toronto School of Medicine,[3,4] and Ohio State University School of Medicine,[12] have provided similar opportunities as electives for students who are interested in surgery. The University of Minnesota School of Medicine was the first institution to create a surgery simulation course offered to all students entering their surgical clerkships.[13] These courses all demonstrated a positive effect in improving interest and performance within the surgical field.

Rocky Vista University College of Osteopathic Medicine (RVUCOM) developed an Intensive Surgical Skills Course (ISSC) in 2012. The ISSC consisted of a week-long simulation course that featured hyper-realistic training and use of the "Cut-Suit," a human worn surgical simulator.[14,15] This course was offered as an elective to a small group of students, most of whom were enrolled in RVUCOM's Military Track. Analysis of this course demonstrated that students acclimated to stress, acquired surgical knowledge and skills, and felt more confident for entering their surgical clerkship. These findings inspired the RVUCOM Clinical Education Committee to require all third-year medical students entering their surgical clerkship to complete a 5-day surgical simulation course as the first week of their surgical clerkship. Key parts of the ISSC and the previously mentioned courses from other universities were blended to create a course, which focused on the skills and behaviors critical to a surgical clerkship. This study evaluates the results of this surgical simulation course.

METHODOLOGY

Study Population

A total of 148 RVUCOM third-year medical students participated in the surgical simulation course during the 2015-2016 academic year. Students were required to complete the course as the first week of their 8-week surgery clerkship.

Course Curriculum

Over the 5-day course, students were assigned to a 3- or 5-person team. Students were assigned formal presentations on operative and perioperative topics, which they presented to faculty and other students. Students were assigned roles to play in simulated hospital and ER patient scenarios, and they presented these cases to attending surgeons. Students also participated in simulated surgical procedures on the "Cut-Suit," and they were required to learn and exhibit competency in a number of surgical skills.

Course Objectives

- Demonstrate competency in the basic skills of surgery: scrubbing, gowning, gloving and sterile technique, suturing, knot tying, identification of common surgical instruments, surgical first-assisting, NG tube and Foley catheter insertion, airway management, and surgical ultrasound techniques
- Understand and discuss common clinical conditions that present to the emergency room or on postoperative rounds and require evaluation and decision-making about surgical intervention
- Understand and discuss common issues in perioperative care
- Demonstrate skill in surgical case presentations to attending physicians
- Demonstrate detailed and in-depth knowledge of assigned formal presentations

Course Structure

Day 1: Introduction, Pre-testing, Skills Teaching

Day 2: Formal Presentations, ER/Hospital Case Simulations, Attending Rounds, Surgery on "Cut-Suit"

Day 3: Formal Presentations, ER/Hospital Case Simulations, Attending Rounds, Surgery on "Cut-Suit"

Day 4: Formal Presentations, ER/Hospital Case Simulations, Attending rounds, surgery on "Cut-Suit", Surgical Ultrasound, Airway Management

Day 5: Formal Presentations, Post-testing, Skills Competency Testing

Methods of Evaluation

Equivalency of Class Cohorts

Admission data and RVUCOM educational data demonstrated no statistical difference between the RVUCOM Class of 2017 and the Classes of 2014-2016 (Table 1). Furthermore, no significant changes have been made in the curriculum at RVU for these 4 classes.