

# Instituting a Surgical Skills Competition Increases Technical Performance of Surgical Clerkship Students Over Time

Harold J. Leraas, MHS, MA,\* Morgan L. Cox, MD,<sup>†</sup> Victoria A. Bendersky, BS,\* Shanna S. Sprinkle, MD,<sup>†</sup> Brian F. Gilmore, MD,<sup>†</sup> Rathnayaka M. Gunasingha, BS,\* Elisabeth T. Tracy, MD,<sup>†</sup> and Ranjan Sudan, MD<sup>†</sup>

\*Duke University School of Medicine, Durham, North Carolina; and <sup>†</sup>Department of Surgery, Duke University Medical Center, Durham, North Carolina

**INTRODUCTION:** Surgical skills training varies greatly between institutions and is often left to students to approach independently. Although many studies have examined single interventions of skills training, no data currently exists about the implementation of surgical skills assessment as a component of the medical student surgical curriculum. We created a technical skills competition and evaluated its effect on student surgical skill development.

**METHODS:** Second-year medical students enrolled in the surgery clerkship voluntarily participated in a surgical skills competition consisting of knot tying, laparoscopic peg transfer, and laparoscopic pattern cut. Winning students were awarded dinner with the chair of surgery and a resident of their choice. Individual event times and combined times were recorded and compared for students who completed without disqualification. Disqualification included compromising cutting pattern, dropping a peg out of the field of vision, and incorrect knot tying technique. Timed performance was compared for 2 subsequent academic years using Mann-Whitney *U* test.

**RESULTS:** Overall, 175 students competed and 71 students met qualification criteria. When compared by academic year, 2015 to 2016 students ( $n = 34$ ) performed better than 2014 to 2015 students ( $n = 37$ ) in pattern cut (133 s vs 167 s,  $p = 0.040$ ), peg transfer (66 s vs 101 s,  $p < 0.001$ ), knot tying (28 s vs 30 s,  $p = 0.361$ ), and combined time (232 s vs 283 s,  $p = 0.009$ ). The best time for each academic year also improved (105 s vs 110 s). Fundamentals

of Laparoscopic Surgery proficiency standards for examined tasks were achieved by 70% of winning students.

**CONCLUSIONS:** Implementation of an incentivized surgical skills competition improves student technical performance. Further research is needed regarding long-term benefits of surgical competitions for medical students. (J Surg Ed ■■■■-■■■. © 2017 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

**KEY WORDS:** surgical education, technical skills, medical student education, surgical curriculum

## INTRODUCTION

Surgical skills training for medical students is highly variable between institutions. Expectations for students varies from simple knot tying and suturing to more complex techniques and driving the laparoscopic camera to basic laparoscopic skills. Many of these skills are initially difficult for students to acquire, and no specific metrics have been developed to determine technical aptitude of medical students.<sup>1</sup> Students have reported a gap in proficiency and desired ability upon completion of undergraduate medical training.<sup>2</sup> Students enrolled in subinternships have reported technical skill development as one of the greatest benefits of the subinternship experience, demonstrating a desire of students to learn these skills early in their career.<sup>3</sup> Additionally, some residency programs are now incorporating technical skill evaluations into their selection criteria for applicants, making the development of these skills even more important to students interested in pursuing surgical careers.<sup>4</sup>

Given the high expectations during the surgery clerkship including patient care, obtaining operating room

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*Correspondence:* Inquiries to Harold J. Leraas, MHS, MA, Duke University Medical Center, 2530 Erwin Road, Apt 330, Durham, NC 27710; fax: (919) 681-7934; e-mail: [harold.leraas@dm.duke.edu](mailto:harold.leraas@dm.duke.edu)

experience, and mastering material for the surgical shelf examination, students are often left to learn technical skills at their own discretion without direction or specific expectations.<sup>5</sup> As a result, learning is often conducted through means of quickly acquiring knowledge or skills through, “high yield,” resources and exercises.<sup>6</sup> Technical skills preparation is often based on level of student interest owing to lack of specific expectations set forth formally within the clerkship. Although many institutions offer introductory knot tying courses at the beginning of their clerkship, studies have shown that single interventions to teach surgical skills do not provide long-term retention of these tasks.<sup>7</sup>

Other specialties within medical education have instituted direct learning objectives for lectures and courses to clarify student and instructor expectations.<sup>8,9</sup> However, this practice has not been applied to skills training for students. As a portion of our clerkship, we sought to institute an optional surgical skills championship consisting of tasks deemed to be appropriate for medical students with the goal of establishing expectations for surgical skill development and ample practice time. We hypothesized that the implementation of this program would improve student performance on technical skills over time for students enrolled in the surgery clerkship.

## METHODS

We introduced a surgical skills championship for medical students rotating on the general surgery clerkship at our institution. Students enrolled during the 2014 to 2015 and 2015 to 2016 academic years were evaluated while enrolled in the surgery clerkship. All students participated on a voluntary basis. The surgical skills championship consisted of 3 tasks: simple knot tying on a penrose drain, laparoscopic peg transfer, and laparoscopic pattern cut. Champions for each clerkship group were selected based on best overall time on these events. Students were considered eligible for winning the championship if they completed each task without disqualification criteria including improper knot tying technique, dropping a peg out of view during peg transfer, or compromising the pattern during laparoscopic pattern cut.

Students received demonstration and instruction from faculty and residents on how to properly perform tasks and effective ways to increase performance. This occurred in a standardized fashion for each cohort of clerkship students over 2 45-minute sessions wherein students had access to all materials used during the skills competition. Events were demonstrated for students and students were allowed to practice in the presence of residents and faculty members to receive feedback for improvements. Students were then granted 24-hour access to our Surgical Education and Activities Laboratory for the remainder of their 8-week

rotation. Students were encouraged to practice independently in the Surgical Education and Activities Laboratory. Students were also told to seek out additional training from residents and faculty based on their level of interest in the competition.

Students who won the championship were incentivized with an opportunity to have dinner with the chairman of surgery, the vice chairman of surgical education, and a resident of their choice. Champions from each clerkship period were recorded and their times were posted outside of our surgical skills laboratory. Annually, all champions have been invited to an additional group dinner to track their progress since the surgical skills championship.

For the purpose of this study, times for overall completion and individual events were compared for students who completed this competition without disqualification. Students who disqualified were excluded from the study owing to the observation that these students did not attempt to complete tasks expediently after meeting disqualification status. Times were compared by academic year and plotted over time for subsequent clerkships. Time data was not available for the first two 8-week academic terms of the 2014 to 2015 academic year, but were available for the following 4 terms.

Statistical analysis was conducted using nonparametric tests to reduce the effect of outliers. Analysis was conducted in R version 3.3.0. All tests were 2-tailed. Time was treated as a continuous variable and was analyzed using the Mann-Whitney *U* test to compare academic years.

## RESULTS

Overall, 175 students participated in the surgical skills championship over 10 sequential clerkship periods. In total, 71 students completed the surgical skills championship without disqualification; 37 students were from the 2014 to 2015 academic year, and 34 students from the 2015 to 2016 academic year. In total, 104 students disqualified on the peg transfer or laparoscopic pattern cut events.

When comparing the 2 academic years, the 2015 to 2016 academic year demonstrated statistically significant improvement in performance for laparoscopic peg transfer (101 s [2014-2015] vs 66 s [2015-2016];  $p < 0.001$ ), laparoscopic pattern cut (167 s [2014-2015] vs 133 s [2015-2016];  $p = 0.040$ ), and combined time (283 s [2014-2015] vs 232 s [2015-2016];  $p = 0.009$ ) (Table 1). Although there was improved time for knot tying, statistical significance was not reached (30 s [2014-2015] vs 28 s [2015-2016],  $p = 0.361$ ). Notably, 7 of the 10 champions identified during the study period met criteria for passage of the Fundamentals of Laparoscopic Surgery testing for both time and quality metrics on the examined tasks. Best performance for each individual event and best overall time

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