REVIEW

Objective Assessment of General Surgery Residents Followed by Remediation ☆

Becca L. Gas, BS, EeeLN H. Buckarma, MD, Monali Mohan, MBBS, T.K. Pandian, MD and David R. Farley, MD, FACS

Department of Surgery, Mayo Clinic College of Medicine, Rochester, Minnesota

OBJECTIVE: Surgical training programs often lack objective assessment strategies. Complicated scheduling characteristics frequently make it difficult for surgical residents to undergo formal assessment; actually having the time and opportunity to remediate poor performance is an even greater problem. We developed a novel methodology of assessment for residents and created an efficient remediation system using a combination of simulation, online learning, and self-assessment options.

DESIGN: Postgraduate year (PGY) 2 to 5 general surgery (GS) residents were tested in a 5 station, objective structured clinical examination style event called the Surgical X-Games. Stations were 15 minutes in length and tested both surgical knowledge and technical skills. Stations were scored on a scale of 1 to 5 (1 = Fail, 2 = Mediocre, 3 = Pass, 4 = Good, and 5 = Stellar). Station scores $\leq$ 2 were considered subpar and required remediation to a score $\geq$ 4. Five remediation sessions allowed residents the opportunity to practice the stations with staff surgeons. Videos of each skill or test of knowledge with clear instructions on how to perform at a stellar level were offered. Trainees also had the opportunity to checkout take-home task trainers to practice specific skills. Residents requiring remediation were then tested again in-person or sent in self-made videos of their performance.

SETTING: Academic medical center.

PARTICIPANTS: PGY2, 3, 4, and 5 GS residents at Mayo Clinic in Rochester, MN.

RESULTS: A total of, 35 residents participated in the Surgical X-Games in the spring of 2015. Among all, 31 (89%) had scores that were deemed subpar on at least 1 station. Overall, 18 (58%) residents attempted remediation. All 18 (100%) achieved a score $\geq$ 4 on the respective stations during a makeup attempt. Overall X-Games scores and those of PGY2s, 3s, and 4s were higher after remediation ($p < 0.05$). No PGY5s attempted remediation.

CONCLUSIONS: Despite difficulties with training logistics and busy resident schedules, it is feasible to objectively assess most GS trainees and offer opportunities to remediate if performance is poor. Our multifaceted remediation methodology allowed 18 residents to achieve good or stellar performance on each station after deliberate practice. Enticing chief residents to participate in remediation efforts in the spring of their final year of training remains a work in progress. (J Surg Ed ▮:▮▮▮-▮▮▮. © 2016 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: simulation, surgical education, remediation, assessment, general surgery

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

INTRODUCTION

With the current climate of surgical training and an increasing demand for simulation competency-based education, valid surgical skills and knowledge assessments with subsequent remediation are of utmost importance. Our surgical program and others have struggled to find opportunities to assess and remediate residents, while the training paradigm is shifting toward one that must document clinical competencies as part of the ACGME milestones.[1]

Simulation has proven to be a useful tool in providing objective assessment that helps transfer knowledge and skill to the operating room, intensive care unit, emergency

☆Presented at the Association of Program Directors in Surgery meeting, April 14-16, 2016 in Boston, MA.

Correspondence: Inquiries to David R. Farley, MD, FACS, Department of Surgery, Mayo Clinic College of Medicine, 200 First St, SW, Rochester, MN 55905; fax: (507) 284-5196; e-mail: farley.david@mayo.edu, scipubs@mayo.edu

  1931-7204/$30.00 http://dx.doi.org/10.1016/j.jsurg.2016.07.002

department, and clinical arenas.[2] Fann and colleagues[3] reported improved operative performance after distributed practice with a coronary artery anastomosis task trainer. They also concluded that simulation can be a means to recognize those in need of remedial efforts. Barsuk et al[4] and Laack et al[5] have confirmed similar findings in placement of central venous catheters. To date, there are limited data regarding the implementation of remediation and its effectiveness for general surgery (GS) residents and residency programs. Medical education as a whole is in need of remediation best practices.[6]

Changes in surgical training, partly in response to patient safety concerns, financial pressures, and residency work hour limitations, have compelled educators to evaluate different methods of teaching and assessing surgical residents. Our remediation method consists of a 4 step process: 1—objective skill and knowledge assessment, 2—recognition of deficiencies, 3—deliberate practice sessions with individualized feedback and instruction, and 4—reassessment. A thematic review of medical remediation literature by Hauer et al[6] suggests that these 4 components together create the best model for remediation of trainees. Our biannual GS assessments (Surgical Olympics for interns; Surgical X-Games for postgraduate year [PGY] 2 to 5s) are a unique means of permitting direct observation of trainee performance within an environment that does not compromise patient safety while identifying those in need of remediation. In addition, we believe we have developed a novel methodology to more conveniently, effectively, and efficiently remediate residents using online learning, simulation, and self-assessment efforts.

MATERIALS AND METHODS

Assessment

PGY 2 through 5 categorical GS residents at Mayo Clinic-Rochester are required to participate in an objective structured clinical examination style, 5 station assessment event called the Surgical X-Games. This competition, since 2012, occurs twice each year (identical tests held in the fall and spring) in our simulation center. Each station is 15 minutes in length and consists of one or more surgical skill or knowledge-based tasks. Some stations are given to all trainee levels (e.g., abdominal anatomy), whereas others are specific toward one selected PGY class (Table 1).

Raw scores from 2014 to 2015 were tabulated using checklists for each station. Objective checklist items for skill stations consist of the proper use of surgical equipment, accurate verbalization and performance of procedural steps, and capturing time. Points on knowledge stations were awarded based on correct responses. Once a raw score was obtained, scores for each task were converted to a scale of 1 through 5, 1 = Fail, 2 = Mediocre, 3 = Pass, 4 = Good, 5 = Stellar. To achieve a stellar score, performance reached mastery level for that specific task based on attending staff input and the staffs' own performance of such tasks; scoring standards were refined over 3 years of previous competition data (i.e., when most trainees either all failed or all achieved stellar scores, the standard was altered to facilitate a more Gaussian distribution).

Remediation

Residents were required to remediate any scores of fail (1) or mediocre (2) to a score of good (4) or stellar (5). A staff surgeon was available for 5 separate 2-hour remediation sessions in which trainees had the opportunity to practice their remedial stations. Videos of each station with clear instruction on how to perform at a stellar level were made available online. Additionally, "X-boxes," take-home X-Games skills stations consisting of the model, instruments, instructions, and the scoring rubric were packaged in a covered plastic box and offered for residents to checkout and use.

TABLE 1. X-Games Stations for the 2014 to 2015 Academic Year. Knowledge Stations are *Italicized*, All Others are Skills Stations

PGY2 Tasks = 12	PGY3 Tasks = 9	PGY4 Tasks = 9	PGY5 Tasks = 10
Abdominal anatomy	*Abdominal anatomy*	*Abdominal anatomy*	*Abdominal anatomy*
*Mock orals**	*Mock orals**	*Mock orals**	*Mock orals**
*Imaging**	*Imaging**	*Imaging**	*Imaging**
FAST examination	FAST examination	FAST examination	*Video commentary I*
Video commentary I	*Video commentary I*	*Video commentary I*	*Video commentary II*
Video commentary II	*Video commentary II*	*Video commentary II*	Lap knot-tying
Lap knot-tying	Lap knot-tying	Lap knot-tying	Tracheostomy
Fascial closure	Fascial closure	Lap small bowel anastomosis	Lap run small bowel
Chest tube securement	Hernia repair	Gastrojejunostomy	*SMV injury*
Central line			Lap hernia mesh manipulation
FLS peg transfer			
FLS circle cut			

FAST, focused assessment with sonography for trauma; SMV, superior mesenteric vein.
*Different examinations for each PGY level.