Development and Implementation of a Clinical Pathway Approach to Simulation-Based Training for Foregut Surgery

Kiyoyuki W. Miyasaka, MD,[*] Joseph Buchholz, BS,[†] Denise LaMarra, MS,[‡] Giorgos C. Karakousis, MD,[*] and Rajesh Aggarwal, PhD[§]

[*]Department of Surgery, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania; [†]Sidney Kimmel Medical College, Thomas Jefferson University, Philadelphia, Pennsylvania; [‡]Standardized Patient Program, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania; and [§]Arnold and Blema Steinberg Medical Simulation Centre, Faculty of Medicine, McGill University, Montreal, Canada

INTRODUCTION: Contemporary demands on resident education call for integration of simulation. We designed and implemented a simulation-based curriculum for Post Graduate Year 1 surgery residents to teach technical and nontechnical skills within a clinical pathway approach for a foregut surgery patient, from outpatient visit through surgery and postoperative follow-up.

METHODS: The 3-day curriculum for groups of 6 residents comprises a combination of standardized patient encounters, didactic sessions, and hands-on training. The curriculum is underpinned by a summative simulation "pathway" repeated on days 1 and 3. The "pathway" is a series of simulated preoperative, intraoperative, and postoperative encounters in following up a single patient through a disease process. The resident sees a standardized patient in the clinic presenting with distal gastric cancer and then enters an operating room to perform a gastrojejunostomy on a porcine tissue model. Finally, the resident engages in a simulated postoperative visit. All encounters are rated by faculty members and the residents themselves, using standardized assessment forms endorsed by the American Board of Surgery.

RESULTS: A total of 18 first-year residents underwent this curriculum. Faculty ratings of overall operative performance significantly improved following the 3-day module. Ratings of preoperative and postoperative performance were not significantly changed in 3 days. Resident self-ratings significantly improved for all encounters assessed, as did reported confidence in meeting the defined learning objectives.

CONCLUSIONS: Conventional surgical simulation training focuses on technical skills in isolation. Our novel "pathway" curriculum targets an important gap in training methodologies by placing both technical and nontechnical skills in their clinical context as part of managing a surgical patient. Results indicate consistent improvements in assessments of performance as well as confidence and support its continued usage to educate surgery residents in foregut surgery. (J Surg 72:625-635. ©2015 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: simulation, surgery, education, residency, standardized patient

COMPETENCIES: Patient Care, Medical Knowledge, Practice-Based Learning and Improvement, Interpersonal and Communication Skills, Professionalism, Systems-Based Practice

INTRODUCTION

Simulation-based training is gaining attention in residency education as a way to address contemporary demands for increased patient safety and accountability. Governing bodies for graduate medical education, as well as various professional societies, are requiring surgical residency programs to use competency-based methods of evaluation and encourage integration of simulation into training curricula. However, the specifics of how to design and implement such curricula have yet to be established and are left to individual institutions.

Foregut surgery is a growing field encompassing diseases of the esophagus and the stomach, as well as bariatric surgery. Foregut surgery can be technically challenging, with

Correspondence: Inquiries to Kiyoyuki W. Miyasaka MD, Penn Medicine Clinical Simulation Center, Penn Medicine at Rittenhouse, 1800 Lombard Street, Philadelphia, PA 19146; e-mail: kiyoyuki.miyasaka@uphs.upenn.edu

  1931-7204/$30.00 http://dx.doi.org/10.1016/j.jsurg.2015.01.017

even classic foregut surgery procedures such as esophagectomy still associated with considerable complication rates.[1] Emerging procedures such as bariatric surgery are also associated with unique technical challenges in perioperative management.[2] A recent needs assessment of national stakeholders in surgery training has also revealed that nontechnical skills of communication with patients and families spanning the perioperative period is perceived as one of the key themes that should be addressed in surgical training.[3]

Complex issues such as duty-hour standards, combined with the ever-increasing demand to staff clinical services, create significant tension between residency programs' aims to provide rigorous yet well-balanced education and health systems that seek to remain financially solvent through reimbursement for health care services rendered.

We designed and implemented a simulation-based curriculum for first-year surgery residents to provide integrative training of technical and nontechnical skills centered around a clinical pathway approach for a foregut surgery patient. The clinical pathway represents a continuum of care for a foregut surgery patient and comprises a sequence of patient care encounters between a resident and a patient, from an outpatient visit through surgery and postoperative follow-up. Using this patient-centric approach allows for balanced delivery of education as well as evaluation of technical and nontechnical skills in their appropriate context.

MATERIAL AND METHODS

Setting

This research was conducted as part of the residency program in general surgery at the Hospital of the University of Pennsylvania. Pursuant to institutional standards, we submitted our protocol to the Institutional Review Board and received confirmation of exemption under 45 CFR 46.101, category 1 for human subjects research regarding the effectiveness of instructional curricula in an established educational setting. Written consent was sought from all participating residents regarding the collection of data on their simulated clinical performances for the purpose of ongoing curricular improvement, research, and publication, with the understanding that their consent or refusal would not have any effect on the provided educational content or their standing as a resident in the program.

The entire educational curriculum was implemented on site at the Penn Medicine Clinical Simulation Center.[4] This 22,000 ft^2 facility incorporates various classrooms and skills training rooms, as well as simulated operating rooms, inpatient ward, and outpatient clinic environments. Each simulation room is equipped with an electronic audiovisual system (SimCapture, B-Line Medical, Washington, DC) that allows for simultaneous live monitoring as well as recording of encounters of multiple camera angles from multiple rooms. These live or recorded video streams may be accessed from a dedicated viewing room or by logging into a portal site from a browser on any computer on the same network. Recorded videos are only accessible by the system administrators, the study team, and the learners themselves using individual login information and passwords.

Learning Objectives

Foregut surgery was selected as 1 of 6 surgical specialty areas in which first-year residents would benefit from simulation-based training (the others areas being acute care, biliary, cardiovascular, colorectal, and trauma/surgical critical care). The surgery simulation program director consulted with surgery faculty to outline learning objectives for the curriculum.

Content from the Surgical Council on Resident Education (SCORE) Portal was referenced as a starting point for the selection of level-appropriate curricular content.[5] Table 1 shows the topics selected for inclusion in the module content from the relevant SCORE curricular headings: Alimentary Tract—Stomach, and Alimentary Tract—Esophagus and Endoscopy. Priority was given to reinforce topics and skills that are expected to be a routine part of the

TABLE 1. Selected SCORE Content

SCORE Heading	Alimentary Tract—Stomach	Alimentary Tract—Esophagus	Endoscopy
Topic	Duodenal ulcer Gastrectomy—partial/total Gastric cancer Gastric ulcer Morbid obesity Morbid obesity—operation Peptic ulcer disease with bleeding Peptic ulcer disease with obstruction Peptic ulcer disease with perforation	Antireflux procedure—laparoscopic Antireflux procedure—open dysphagia Gastroesophageal reflux/Barrett esophagus	Esophagogastroduodenoscopy