Implementation of a Low-Cost Laparoscopic Skills Curriculum in a Third-World Setting

Kristin L. Long, MD,[*] Carol Spears, MD,[†] Daniel E. Kenady, MD,[*] and John Scott Roth, MD[*]

[*]Department of General Surgery, University of Kentucky, Lexington, Kentucky; and [†]Department of Surgery, Tenwek Hospital, Bomet, Kenya

BACKGROUND: Training outside the operating room has become a mainstay of surgical education. Laparoscopic training often takes place in a simulation setting. Advanced laparoscopic procedures are now commonplace, even in third-world countries with minimal hospital resources. We sought to implement a low-cost laparoscopic skills curriculum in a general surgery residency program in East Africa.

STUDY DESIGN: The laparoscopic skills curriculum created and validated at the University of Kentucky was presented to the 10 general surgery residents at Tenwek Hospital. The curriculum and all materials were purchased for approximately $50 (USD). The residents in Kenya had access to laparoscopic trainer boxes and personal laptops to perform the simulations. Residents were timed on their performance at the initiation of the project and after 3 weeks of practice.

RESULTS: Residents were tested on 3 separate tasks (cannulation drill, peg board, and rope pass). At the initiation of the project, residents were unable to complete the 3 tasks chosen for timing without a critical error (i.e., dropping a peg out of view). After 3 weeks of independent practice, residents were able to successfully complete the tasks, nearing the time limits established in the curriculum manual. Additional practice and testing sessions are scheduled for the remainder of the year.

CONCLUSIONS: Implementation of a low-cost laparoscopic skills curriculum in a third-world setting is feasible. This approach offers much-needed exposure and opportunities for residents with extremely limited resources and promises to be a vital aspect of the growing surgical residency training in third-world settings. (J Surg 71:860-864. © 2014 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: laparoscopic, curriculum, resident, surgical education, international, Africa

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

INTRODUCTION

Training outside the operating room has become a vital part of surgical education. With the advent of advanced laparoscopic procedures, simulation models have been developed to address skills required for the 2-dimensional operating, precise movements, and impaired tactile feedback of laparoscopy. Use of visual feedback based on monitors or other screens makes laparoscopy ideally suited for simulation training.[1] Likewise, laparoscopic training using box models is known to significantly improve surgical dexterity and economy of movement.[2] Improved operative performance after laparoscopic skills training has been widely reported.[1,3,4] Participation in a formal skills curriculum produces dramatic improvement in residents' performance, with novice learners showing the greatest improvement.[5] Low-fidelity training models range from webcam use to a simple cardboard box to successfully simulate the laparoscopic environment and can be implemented in an office or home setting.[6-8]

Surgical residency programs now span the globe, and many of the lowest-resource areas struggle with providing advanced skills training, such as laparoscopy. Training programs have been successfully established in sub-Saharan Africa, where the need for surgeons is unparalleled. Across Africa, there are an average of 250,000 people for each surgeon and 2.5 million people per surgeon in the most rural areas.[9]

Integration of complete surgical training programs is a vital aspect of addressing Africa's surgical workforce crisis.[10] Isolated 3-day courses have attempted the Fundamentals of Laparoscopic Surgery course for surgeons in Africa, with

Correspondence: Inquiries to Kristin L. Long, MD, Department of General Surgery, University of Kentucky, 800 Rose Street, Lexington, KY 40536; fax: (859) 323-6840; e-mail: Kristin.long@uky.edu

This work was presented at the American College of Surgeons Clinical Congress Surgical Forum, Global Health section, in Washington, DC, in October 2013.

  1931-7204/$30.00 http://dx.doi.org/10.1016/j.jsurg.2014.05.004

results showing that more than the single 3-day course is necessary for laparoscopic proficiency.[11] Recognizing the dire need for consistent, early exposure to laparoscopic skills for Africa's surgical trainees, we sought to introduce the laparoscopic skills curriculum used by the residents at the University of Kentucky (UK) to the residents in a third-world surgical training program. Our goal was to assess the feasibility of implementing a low-cost, formal training curriculum in this setting of minimal resources.

METHODS

Following a protocol exempted by the UK's institutional review board (12-1011-X3B), the laparoscopic skills curriculum and supplies used by the residents at this institution were presented to the 10 general surgery residents currently training at Tenwek Hospital in Bomet, Kenya. The initial instruction and training occurred over the course of a 3-week period in January 2013 while a current postgraduate year-4 (PGY-4) resident from the UK was serving on a short-term surgical mission trip.

Printed copies of the laparoscopic training manual used at UK were provided for reference by the local residents. Before beginning the study, each local resident was given a letter of consent and informed of his/her right to decline participation. All residents enthusiastically elected to participate. The 8 tasks of the first-year curriculum were discussed with the local residents (PGY-1 through PGY-4), and several were demonstrated using supplies brought from the United States (Fig. 1). Most of the supplies, however, are available locally in Kenya.

Supplies for the curriculum instruction were purchased in the United States for approximately $50 (USD). These included pipe cleaners, small rubber tubing, small pegs, thin white rope, black markers, small blocks of wood with hooks, and plastic dishes. Several laparoscopic instruments (needle drivers, graspers, and scissors) were donated by Ethicon EndoSurgery. The local residents used previously available box trainers and their personal laptops to perform the timed tasks.

FIGURE 1. Residents at Tenwek Hospital are introduced to the laparoscopic trainer equipment.

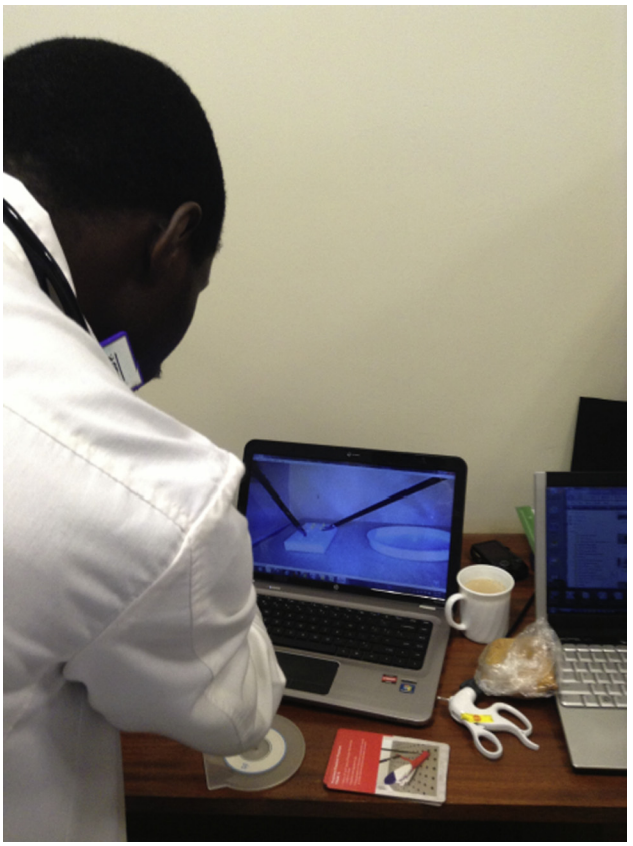

FIGURE 2. Residents were able to perform simulation exercises using personal laptops and trainer boxes.

Tasks chosen for initial instruction and timing included the cannulation drill, the peg board exercise, and the rope pass exercise. Local residents were timed by the visiting resident, as well as by their local faculty, while performing the tasks. The residents were given 3 weeks to practice independently and were timed once more before the end of the visiting resident's stay in Kenya. Senior residents were also instructed in timing and future tasks to facilitate continued testing by the local team.

RESULTS

On the first day of the study, the local residents were able to successfully use box trainers and webcams with personal laptops to set up the tasks (Fig. 2). All 10 of the general surgery residents at Tenwek Hospital were introduced to the laparoscopic curriculum.

The first task introduced to the residents was the cannulation drill (Fig. 3). This drill was designed to mimic cannulation of a small duct, i.e., within the biliary system.