CLOS-IT: A Simulation-Based Laparotomy Closure Curriculum

LT Ashley Hafer MD, MPA; CPT Kal Gunasingha MD; CPT Christopher Dyke, MD; CAPT(ret) W. Brian Sweeney MD, FACS; MAJ Brenton Franklin MD, MHPE, FACS

Military Health System
health.mil

Walter Reed National Military Medical Center

INTRODUCTION

Incisional hernias occur in 10 to 15% of patients with previous abdominal surgeries.[1] Midline abdominal incisions are associated with the highest risk of incisional hernia development with rates approaching 20% for average risk patients. Incisional hernia risk is based on several factors including: smoking, obesity, multiple prior surgeries, and wound complications; however, surgical technique also plays an important role.[2]

Currently there is no dedicated laparotomy closure curriculum in surgical education. Additionally, with the ever-increasing prevalence of minimally invasive techniques, students and residents have less exposure to laparotomy closure in the operating room and thus, fewer opportunities for skill development. Cadaver and animal labs can provide such opportunities but are expensive and time consuming.

To address this need, we created a simulation-based laparotomy closure curriculum.

MATERIALS AND METHODS

Using the Closure of Laparotomy in Open Surgery-Instructional Trainer (CLOS-IT), a novel task trainer featuring a multi-layered silicone abdominal wall, we created a curriculum that incorporates didactic instruction and dedicated practice

The findings of the STITCH trial, by Deerenberg et al[3], served as a basis for curriculum development, with the incorporation of the small bite technique in addition to the traditional large bite technique

REFERENCES

1. Nachiappan S, Markar S, Karthisesalingam A, Ziprin P, Faiz O. Prophylactic mesh placement in high-risk patients undergoing elective laparotomy: a systematic review. *World J Surg*. 2013;37(8):1861-1871.
2. Sanders DL, Kingsnorth AN. The modern management of incisional hernias. *BMJ*. 2012;344(7856). doi:10.1136/bmj.e2843
3. Deerenberg EB, Harlaar JJ, Steyerberg EW, et al. Small bites versus large bites for closure of abdominal midline incisions (STITCH): A double-blind, multicentre, randomised controlled trial. *Lancet*. 2015;386(10000). doi:10.1016/S0140-6736(15)60459-7
4. Mizell JS. Principles of Abdominal Wall Closure. UpToDate. Published 2020. https://www-uptodate-com.usu01.idm.oclc.org/contents/principles-of-abdominal-wall-closure?search=principles of abdominal wall closure&source=search_result&selectedTitle=3~150&usage_type=default&display_rank=3
5. Hope Wi. Midline Laparotomy Closure with a 4:1 Suture. In: *The Devil Is in the Details Session: Technical Tips from the Masters-Ventral Hernia, SAGES Conference*; 2017.

FIGURES

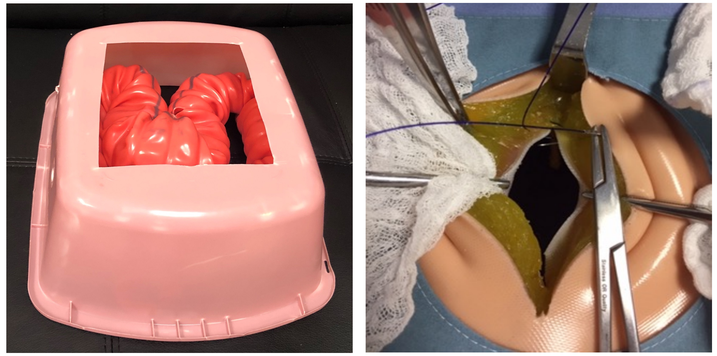


Figure 1. CLOS-IT System with base containing simulated bowel (left) covered by multi-layer silicone abdominal wall (right)

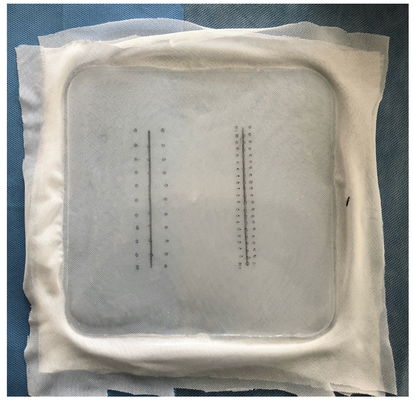


Figure 2. Simulated fascia for dedicated practice with large bite (10 mm) and small bite (5 mm) markings

CURRICULUM DESIGN

Curricular elements:

- Pre-assessment: simulated laparotomy closure on CLOS-IT System
- Didactic material and dedicated practice
  - Didactics:
    - Two articles: The STITCH Trial[3] and Principles of Abdominal Wall Closure[4]
    - One video: Midline laparotomy Closure with a 4:1 Suture[5]
  - Dedicated practice: students provided simulated fascia to practice large (10 mm) and small (5 mm) bite techniques (figure 2)
    - Needed to achieve 5 repetitions of each bite size without mistakes to progress
- Post-assessment: simulated laparotomy closure on CLOS-IT System

Both the pre and post-assessments are scored using a rubric designed specifically for use with the curriculum

Rubric Elements	
Task Criteria:	Technical Criteria:
Suture selection	Integrity of anchor knot
Needle selection	Closure tension
Closure style	Bite size
Safe closure technique	Travel distance
	Ending knot security

CONCLUSIONS

We created a laparotomy training curriculum for surgical trainees develop essential laparotomy closure skills. The curriculum is currently being implemented on novice medical students and general surgery interns.

Disclaimer: The views expressed in this presentation are those of the authors and do not reflect the official policy of the Department of Defense or the U.S. Government.