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A cadaveric procedural anatomy course enhances operative competence



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ABSTRACT

Background: Inadequate anatomy training has been cited as a major contributor to declines in surgical resident operative competence and confidence. We report the impact of a procedurally oriented general surgery cadaveric dissection course on trainee-operative confidence and competence.

Materials and methods: After obtaining institutional review board approval, postgraduate year 2 and 3 general surgery residents were prospectively enrolled into two cohorts: (1) an intervention group ($n = 7$) participating in an 8-wk procedurally oriented cadaver course and (2) controls ($n = 7$) given access to course materials without participation in cadaver dissection. At both the beginning and end of the study, we used two evaluation instruments: (1) an oral examination using standardized templates and (2) a questionnaire assessing operative confidence.

Results: There were no intergroup differences in baseline characteristics, including number of operative procedures performed to date. Residents who took the anatomy course had significantly higher improvements in examination scores on common bile duct exploration (mean \pm standard error, $33 \pm 8\%$ versus $10 \pm 7\%$, $P = 0.04$), femoral endarterectomy ($43 \pm 5\%$ versus $11 \pm 7\%$, $P = 0.003$), fasciotomies ($55 \pm 10\%$ versus $22 \pm 9\%$, $P = 0.04$), inguinal hernia repair ($20 \pm 9\%$ versus $-14 \pm 5\%$, $P = 0.005$), superior mesenteric artery embolectomy ($38 \pm 10\%$ versus $2 \pm 11\%$, $P = 0.04$), and in overall examination scores ($31 \pm 4\%$ versus $8 \pm 3\%$, $P = 0.0006$). In addition, they reported higher operative confidence on common bile duct exploration ($P = 0.008$) and superior mesenteric artery embolectomy ($P = 0.02$), and a trend toward higher overall operative confidence ($P = 0.06$).

Conclusions: In this study, we demonstrate that a procedurally oriented cadaver course covering a wide range of essential general surgery procedures resulted in significant improvements in self-reported operative confidence and competence as assessed by oral examination.

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1. Introduction

The implementation of the 2003 Accreditation Council for Graduate Medical Education duty-hour restrictions was associated with an up to 20% decrease in the total number of operations performed by graduating general surgery residents [1]. This trend was exacerbated by secular trends in the management of surgical diseases reducing the number of open gastrointestinal, vascular, and trauma procedures [2,3].

This decrease in open surgical volume has been accompanied by diminished self-reported operative confidence and expert ratings of the operative ability of recent graduates. National and regional surveys revealed that in nearly half of procedures felt to be within the “essential” purview of graduating general surgery residents; at least 50% of residents reported a lack of confidence in their ability to perform these maneuvers independently [4,5]. A survey of all US surgical fellowship program directors found that 21% reported that new fellows were inadequately prepared for the operating room and two-thirds of new fellows were unable to sustain 30 min of unsupervised, operative autonomy [6]. These trends may play a role in broader concerns around the quality of and access to surgical care nationally [7,8].

Inadequate anatomy training has been cited as a major contributor to the current problem with procedural competence. More than 25% of fellowship program directors in the aforementioned study felt that general surgery graduates did not have sufficient knowledge and experience to recognize anatomic tissue planes [6]. In a survey of surgical faculty, anatomic knowledge was cited as one of the most important areas that surgical residents needed to focus on to improve knowledge gaps they bring to the operating room [9].

Although focused anatomic courses have been associated with increased trainee satisfaction and anatomic knowledge [10–13], previously published work has been marked by limitations in scope, outcome assessment, comparison groups, and generalizability. Here, we report the impact of a procedurally oriented general surgery cadaveric dissection course on trainee-operative confidence and competence.

2. Methods

2.1. Study participants

After obtaining institutional review board approval, midlevel postgraduate year (PGY) 2 and 3 general surgery residents were prospectively enrolled into two cohorts: (1) an intervention group ($n = 7$) of residents in their academic enrichment period participating in an 8-wk, procedurally oriented, formalin-fixed cadaver dissection course (described below) and (2) PGY-matched control clinical residents ($n = 7$) given access to course materials without participation in the cadaver dissection. Midlevel residents were selected for the course because the basic operative experience they have had in their initial years of training provides a framework to assimilate anatomic and procedural knowledge and, yet, they have performed most of the procedures that constitute the focus of the course 0–2 times. As a result of the latter point, the dissection course was their primary introduction to this anatomic knowledge in the context of a surgical procedure.

2.2. Course design

The procedurally oriented anatomy course was developed as a joint venture between surgical faculty, residents, and medical school anatomists. Residents were divided into groups of three and took part in eight, 2-h Department of Surgery faculty-guided sessions including Surgical Council on Resident Education–designated “essential” (competency expected by completion of training) open cervical, thoracic, abdominopelvic, and extremity procedures performed by a variety of general surgery subspecialties (Table 1). Participants were granted access to a full color, online, multimedia course dissection guide with didactic anatomic information and images, procedural steps and figures, and links to surgical videos. The course was modeled after multimodal, integrative anatomy courses which have demonstrated increased participant satisfaction, examination performance, and long-term retention of anatomic knowledge [14,15]. There was one

Table 1 – Procedurally oriented anatomy curriculum.

Week	Session	Sample procedures
1	Cervical visceral and vascular procedures	CEA, tracheostomy, thyroidectomy
2	Thoracic procedures	EDRT, median sternotomy, posterolateral thoracotomy
3	Abdominal wall and hernias	IHR, FHR, VHR, separation of components
4	Abdominal visceral procedures	Left/right medial visceral rotation, anatomic hepatectomy, CBDE, pancreaticoduodenectomy, nephrectomy
5	Pelvis and pelvic visceral procedures	Pelvic packing, LAR, APR
6	Abdominopelvic vascular procedures	AAA repair, SMA embolectomy, IVC repair, iliac bypass
7	Upper and lower extremity procedures	GSV harvest, CFA EA/PA, 4-compartment fasciotomy, femoropopliteal bypass, UE AVF, forearm fasciotomy
8	Make-up/review session	—

AAA = abdominal aortic aneurysm; APR = abdominoperineal resection; CBDE = common bile duct exploration; CEA = carotid endarterectomy; CFA = common femoral artery; EA/PA = endarterectomy and patch angioplasty; EDRT = emergency department resuscitative thoracotomy; FHR = femoral hernia repair; GSV = greater saphenous vein; IHR = inguinal hernia repair; IVC = inferior vena cava; LAR = low anterior resection; SMA = superior mesenteric artery; UE AVF = upper extremity arteriovenous fistula; VHR = ventral hernia repair.

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