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Perception does not equal reality for resident vascular trauma skills

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ABSTRACT

Background: Experience with the management of vascular trauma by senior surgical residents is increasingly limited. When queried about their understanding of anatomy and ability to perform specific vascular exposures, residents express a moderately high level of confidence. We hypothesized that this perception does not equal reality.

Methods: A total of 42 senior surgical residents participating in an ongoing validation study of the Advanced Surgical Skills for Exposures in Trauma course were asked to self-assess their baseline (precourse) confidence of their understanding of the anatomy required to perform and their ability to perform exposure and control of the axillary, brachial, and femoral arteries, as well as lower extremity fasciotomy using a 5-point Likert scale. Residents then performed the four procedures on a fresh cadaver model and were scored in real time by experts using a global assessment of anatomic knowledge and readiness to perform." The Student *t*-test was used with α set at $P < 0.05$.

Results: Residents consistently rated their understanding of anatomy and their ability to perform the procedures significantly higher than expert evaluator ultimately scored them. Evaluators also deemed that residents would be unable to perform without help 65%–86% of the time.

Conclusions: Senior residents are ill-prepared to perform the procedures studied and have an unwarranted confidence in their knowledge and abilities. Perception clearly does not equal reality in preparing these trainees to perform as advertized. The low global scores for anatomy and performance should be a wake-up call for surgical educators prompting curricular reform and evaluation.

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1. Introduction

Traumatic injury continues to be a leading cause of worldwide morbidity and mortality [1,2]. Rapid identification and control of bleeding blood vessels are paramount to survival. Additionally, the ability to perform limb-saving skills such as extremity fasciotomy is vital to optimal outcomes. It is therefore vital that surgical trainees be proficient in the management of trauma to include the exposure and operative control of major hemorrhage. Trauma operative management has experienced a significant decline since the introduction of resident work-hour restrictions [3–5]. Additionally, the increasing reliance on the nonoperative management of many traumatic injuries has further limited operative experience during training [6–9]. A recent 20-y review of Accreditation Council for Graduate Medical Education caselogs demonstrated that graduating chief residents performed half the number of designated trauma operations (39.4 ± 21) compared with those of two decades ago (72.5 ± 46) [5].

The average number of trauma and vascular cases submitted to the American Board of Surgery for 2014 graduates of U.S. surgical residencies is remarkably low. In fact, the average number of operative cases for vascular trauma (all vessels) over a 5-y residency was reported as only 2.1, with exposure and repair of peripheral arteries reported as 1.0 and fasciotomy for trauma reported as 0.8. Additionally, nontraumatic vascular experience is also limited with average numbers of cases involving any exposure of the axillary artery at 0.6, open brachial artery exposure at 0.1, and femoral artery at approximately 10.0 [10]. The National Resident Report also lists operative experiences in which the brachial artery might be exposed, namely arteriovenous fistulas and grafts as well as with revision of arteriovenous access with averages of 17.7, 6.6, and 6.3 over a 5-y residency [10]. This limited experience is of great concern, as several investigators have identified experience as one factor in gaining competence [11–13]. An additional consequence of declining experience is a decrease in surgeons' confidence to manage injuries and the potential increase in morbidity and mortality [14].

It is increasingly clear that current surgical trainees receive a very limited exposure to the operative management of vascular trauma and that we are graduating specialists who when called on to care for victims of trauma may or may not have the requisite skillset to ensure optimal outcomes. As such there is a critical need to change the way we train and maintain the skills of the surgeon caring for trauma in the future. To meet this perceived need, the American College of Surgeons Committee on Trauma leadership established a Surgical Skills Committee in 2005. This committee was charged with developing a standardized, skills-based cadaver course designed to teach surgical exposure of vital structures that are most likely to pose an immediate threat to life or limb when injured [14–17]. The result of this effort was the development of the Advanced Surgical Skills for Exposure in Trauma (ASSET) course.

We have previously reported the experience with the first 25 ASSET courses in a prospective fashion detailing marked improvement over baseline of self-reported comfort levels and confidence in all the skills taught in the course by virtue of taking the course [17]. The course is continuing to be evaluated in a prospective fashion, and we are conducting a study to validate the course skills and evaluate skills retention and degradation. In this ongoing study, we are testing the baseline skills of novice (have not taken the ASSET course or received the course materials) senior surgical residents on four of the skills taught in the course as follows: exposure and control of the axillary artery; the brachial artery; the femoral artery (to include control of the common femoral, superficial femoral (SFA), and profunda); and performance of a two incision, four compartment fasciotomy of the lower leg. After establishing baseline performance, the subjects participate in an ASSET course as a student and are then retested to establish a post-course trained baseline and will return at either 12 or 18 mo to test for skills retention and durability. While conducting this study, it was noted anecdotally that residents tended to overestimate their knowledge of anatomy and their ability to perform these procedures. Based on this observation, we hypothesized that the resident participants self-reported perception of skills and knowledge does not equal reality when asked to perform. This article details the resultant study to test this hypothesis.

2. Methods

The studies described in this article were approved by the University of Maryland School of Medicine Institutional Review Board, the Maryland State Anatomy Board, and the US Army Office of Research Protection for research involving humans, human data, human specimens, or cadavers. Research subjects underwent a consent process and completed informed consent before participation.

Senior surgical residents (postgraduate year [PGY] 3–5) participating in an ongoing study to validate the ASSET course comprised the subject population in this report. Between August 2013 and July 2014, 42 surgical residents from 11 different residency programs in the greater Baltimore area and adjacent states were recruited to participate in the aforementioned ASSET validation study. Ten of these residents were used to establish a baseline performance on four skills taught in the ASSET course; exposure and control of the axillary artery, brachial artery, femoral artery (common, SFA, and profunda) at the groin, and fasciotomy of the lower extremity before participation in the course. The other 32 residents are involved in a longitudinal study of the ASSET course in which they established a baseline performance on the four skills listed previously, followed by a reevaluation on these skills after participation in an ASSET course and then again at 12 or 18 mo to validate the course and evaluate retention of the skills learned.

The metrics used to evaluate the resident performances were developed by interviewing four expert surgeons regarding the key points of patient management and decision making for each of the procedures to include key anatomic landmarks and structures, common errors, and complications. Ten expert surgeons were then asked to perform the procedures on a fresh cadaver model while talking out loud with audio and visual capture using a cognitive work analysis