Advances in Surgery 49 (2015) 131–141

ADVANCES IN SURGERY

Trainee Participation in Emergency Surgery

What Are the Consequences?

George Kasotakis, MD, MPH[a,*], Gerard Doherty, MD[b]

[a]Section of Trauma, Acute Care Surgery & Surgical Critical Care, Department of Surgery, Boston Medical Center, Boston University School of Medicine, 840 Harrison Avenue, Dowling 2 South, Suite #2414, Boston, MA 02118, USA; [b]Department of Surgery, Boston Medical Center, Boston University School of Medicine, 88 East Newton Street, Suite C500, Boston, MA 02118, USA

Keywords

• Emergency surgery • Residents • Trainees • Outcomes
• Graduate medical education • Operative time • Supervision

Key points

- Research on the effect of surgical trainee involvement in emergency surgery is mostly retrospective, and focuses on mostly safe, common procedures (appendectomy, cholecystectomy).
- Resident participation in emergency general surgery is associated with longer operative times, and possibly a small increase in postoperative complications.
- Resident involvement does not appear to affect mortality after emergency surgery, although its effect on hospital length of stay is unclear; when length of stay is prolonged, it appears that costs also increase.

INTRODUCTION

The enactment of the Patient Protection and Affordable Care Act of 2010 has significantly expanded medical coverage [1], whereas an aging population with a greater number of chronic conditions, coupled with only a modest projected expansion in the physician workforce, has led to a widening gap in the clinician supply-and-demand equation [2,3]. At the epicenter of this conundrum is graduate medical education, which is tasked to balance two important needs: provide affordable, efficient, and quality health care to those who need it, and at the same time safely train junior physicians in their specialty of choice. Extensive research has demonstrated both beneficial and adverse effects associated with resident participation in many fields of medicine, including, but not

*Corresponding author. *E-mail address*: gkasot@bu.edu

0065-3411/15/$ – see front matter
http://dx.doi.org/10.1016/j.yasu.2015.04.001

limited to, radiology [4], cardiology [5], gastrointestinal medicine [6], and elective surgery [7–10]. Polanczyk and colleagues [11] demonstrated lower mortality after acute coronary events at teaching institutions, and Buchner and colleagues [6] demonstrated higher colonic malignancy-detection rates in endoscopies performed with resident involvement. Contrary to these reports, however, a substantial body of evidence suggests that trainee participation may be associated with adverse outcomes. In a study investigating the diagnostic competency of radiology residents, most junior trainees misidentified prominent trauma abnormalities on imaging [4], and in primary care, adverse outcomes have been linked to more prescribing errors made by junior trainees compared with their senior counterparts [12].

Among the most commonly cited factors for adverse outcomes when trainees are involved are lack of experience and inadequate supervision. These aspects may be even more pronounced in surgical training programs, in which trainees' lack of sophisticated technical skills, experience, and familiarity with complex procedures and evolving surgical technologies may play important roles [7,13]. A growing body of evidence suggests that surgical procedures tend to require longer operative times when trainees are involved, with a small, yet appreciable effect on clinical outcomes related to the longer operating room (OR) stay [14–16]. On the other hand, it appears that resident participation may improve outcomes when complications arise postoperatively, as more health care professionals assess patients with increased frequency, allowing early recognition of potential clinical deterioration [17,18].

The question remains, however, what the trainee effect is in patients undergoing *emergency* surgery. The unique characteristic of this type of surgical intervention is that time is of the essence: total time from presentation to definitive source control may affect outcomes to a greater extent than seen in elective surgery, as an appreciably deranged host physiology and prolongation of the inflammatory phase may exert their deleterious effects [19]. With this article, we aim to review currently available literature on the "resident effect" on outcomes in patients undergoing *emergency* surgery.

SUMMARY OF THE "RESIDENT EFFECT" ON SPECIFIC OUTCOMES AND DISCUSSION

Effect of resident participation on operative time and postoperative morbidity

We recently demonstrated, through an extensive retrospective review and analysis of the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP), that residents required longer time in the OR to perform common emergency operations (75.1 $\pm$ 54.8 minutes vs 59.2 $\pm$ 44.8 minutes, $P<.001$), after matching our resident (RES) and no-resident (NO-RES) cohorts on patient demographic and clinical characteristics, as well as procedure-related factors [19]. A small increase in intraoperative and postoperative morbidity, such as unplanned returns to the OR, need for intraoperative transfusions, surgical site infections and sepsis, and pulmonary and