

Racial/Socioeconomic Disparities

Racial disparities in surgical outcomes: Does the level of resident surgeon play a role?

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Background. Despite recognition of racial/ethnic surgical disparities, few studies have considered the role of surgical residents. This study aimed to elucidate whether disparities in postoperative outcomes are associated with the presence/level of surgical residents involved in procedures.

Methods. Patients who were classified as having laparoscopic cholecystectomy, laparoscopic appendectomy, and open hernia repair in the 2005–2010 American College of Surgeons National Surgical Quality Improvement Program database were compared by level of provider (junior residents postgraduate year 1–2, senior residents, attending alone) for differences in patient demographics, clinical case-mix, and postoperative outcome information by the use of descriptive statistics and multivariable logistic regression.

Results. A total of 196,770 patients met inclusion criteria. Attendings performed 43.0% of operations alone (senior residents 37.5%, junior residents 20.1%). They operated on 44.1% white, 30.1% black, and 43.9% Hispanic patients compared with 35.5%, 48.7%, and 41.3% and 20.4%, 21.3%, and 14.8% for senior and junior residents, respectively. Compared with attendings alone, senior residents were more likely to operate on black patients (adjusted odds ratio [OR] 2.02, 95% confidence interval [95% CI] 1.95–2.09) and have major (OR 1.13, 95% CI 1.06–1.21) and minor complications (OR 1.20, 95% CI 1.11–1.31). Junior residents also were more likely to operate on black patients but did not experience significantly worse outcomes.

Conclusion. Greater risk-adjusted odds of complications among patients treated by senior residents need to be carefully weighed given the group's higher likelihood of operating on minority patients. (*Surgery* 2015;158:547-55.)

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HEALTH DISPARITIES IN SURGICAL OUTCOMES HAVE BEEN INCREASINGLY STUDIED, helping to establish a growing body of evidence that suggests that multifactorial causes of health disparities can be broadly classified into system-, provider-, and patient-level

factors.¹⁻³ Within surgery, various studies have demonstrated racial/ethnic disparities in use and outcomes.^{1,4-7} A recent review further delved into the different factors surrounding racial disparities and poor surgical outcomes. In this review, black patients were found to have greater rates of mortality in appendectomy, gastric fundoplication, and gastric bypass operations. Greater morbidity also was seen in anterior spinal cord surgeries and vascular surgery procedures.² At the provider level, previous studies have considered the role of the attending surgeon.^{8,9} Minority patients with rectal and ovarian cancers were found to have an increased likelihood of being operated on by low-volume attending surgeons.^{8,9} Apart from attendings, however, the role of the operating surgeon

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on potential disparity-related differences in surgical outcomes seldom has been considered, despite an operating surgeon's direct involvement in how a procedure is performed.

In 2008, surgical residents comprised 28.3% of the general surgical workforce,¹⁰ making them an essential part of the surgical team. Surgical residents are not independent physicians but rather operate under the supervision of an attending surgeon. They gain increased operating independence as they progress through their 5-year residency training. Although not focused on racial/ethnic disparities, previous studies have identified mixed surgical outcomes when residents are involved.¹¹⁻¹⁴ Kasotakis et al¹¹ reported adverse outcomes among emergency general surgery procedures that included surgical residents. They showed that resident involvement is independently associated with intra- and postoperative events, wound, pulmonary, venous thromboembolic complications, and urinary tract infections. Similarly, in evaluating the role of residents in appendectomy, Scarborough et al¹² found greater rates of postappendectomy complications. Hwang et al¹³ observed no difference in complications, whereas Kiran et al¹⁴ found resident involvement to be associated with minor complications, the majority of which were superficial wound infections.

In an effort to address the lack of what is known about how the role of surgical residents, as a provider-level factor, may influence postoperative outcomes among minority patients, we elucidated, via the use of a nationally validated, outcomes-based surgical research database, whether disparities in postoperative outcomes are associated with the presence and/or level of surgical residents involved in procedures.

METHODS

Dataset. A retrospective analysis of the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database from 2005 to 2010 was conducted. Since 2004, the ACS-NSQIP has provided validated clinical outcomes data after general and select subspecialty surgical procedures at collaborating hospitals. ACS-NSQIP uses a systematic sampling strategy that permits detailed qualitative comparisons between procedures and among participating institutions. Data items collected comprise patient risk factors and comorbidities, preoperative and operative information, and perioperative and postoperative outcomes that occur within 30 days of the index procedure. On-site audit programs standardize data collection and ensure data consistency

and reliability.¹⁵ Dedicated Surgical Clinical Reviewers use a coding convention that permits identification of surgical procedures that are initiated laparoscopically and subsequently converted to open; a primary Current Procedural Terminology (American Medical Association) code for the open procedure is accompanied by additional codes indicating the laparoscopic equivalent.¹⁶

Case selection criteria and data abstraction. Procedures selected for analysis were laparoscopic cholecystectomy (LC), laparoscopic appendectomy (LA), and open hernia repair (OHR)—the most frequently encountered procedures in the ACS-NSQIP.¹⁷ These procedures were identified using Current Procedural Terminology for LA (44,970), LC (47,562, 47,563, and 47,564), and OHR (49,525, 49,505, and 49,520). All 3 procedures are performed commonly by attending surgeons and surgical residents at various levels of training.¹⁸ Patient demographic and clinical case characteristic data, including age at surgery, sex, race/ethnicity, and preoperative comorbidities and risk factors, were collected (Table I). For each case, various intraoperative and postoperative data also were collected, including the level of operating attending/resident surgeon and information on postoperative complications. Patients were categorized into ACS-NSQIP-defined racial/ethnic groups (white, Hispanic, black, Asian, American Indian or Alaska Native, and Native Hawaiian or Pacific Islander) and by the level of training of the operating surgeon (junior-level postgraduate year [PGY] 1–2, upper level/senior residents [PGY 3–PGY 10], or the attending alone).

Patients with unknown race/ethnicity, emergency cases, and cases without information on resident level involvement were excluded. Postoperative complications were grouped into major complications, minor complications, and wound infections. Major complications included organ space surgical-site infection (SSI), sepsis, shock, reintubation, pulmonary embolus, cardiac arrest, myocardial infarction, cardiovascular accident, renal failure, and return to the operating room. Minor complications included superficial SSIs, deep incisional SSI, dehiscence, and urinary tract infections. Wound infections included superficial SSI, deep incisional SSI, organ space SSI, and dehiscence. The primary outcome of interest was occurrence of a major complication. Secondary outcomes included minor complications, postoperative wound infections, 30-day mortality, and return to the operating room.

Data analysis. A descriptive analysis of patient demographics and clinical case information was performed in which we compared patients

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