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# Adrenalectomy Outcomes Are Superior with the Participation of Residents and Fellows



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- BACKGROUND:** Adrenalectomy is a complex procedure performed in many settings, with and without residents and fellows. Patients often ask, “Will trainees be participating in my operation?” and seek reassurance that their care will not be adversely affected. The purpose of this study was to determine the association between trainee participation and adrenalectomy perioperative outcomes.
- STUDY DESIGN:** We performed a cohort study of patients who underwent adrenalectomy from the 2005 to 2011 American College of Surgeons NSQIP database. Trainee participation was classified as none, resident, or fellow, based on postgraduate year of the assisting surgeon. Associations between trainee participation and outcomes were determined via multivariate linear and logistic regression.
- RESULTS:** Of 3,694 adrenalectomies, 732 (19.8%) were performed by an attending surgeon with no trainee, 2,315 (62.7%) involved a resident, and 647 (17.5%) involved a fellow. The participation of fellows was associated with fewer serious complications (7.9% with no trainee, 6.0% with residents, and 2.8% with fellows;  $p < 0.001$ ). In a multivariate model, the odds of serious 30-day morbidity were lower when attending surgeons operated with residents (odds ratio = 0.63; 95% CI, 0.45–0.89). Fellow participation was associated with significantly lower odds of overall (odds ratio = 0.51; 95% CI, 0.32–0.82) and serious (odds ratio = 0.31; 95% CI, 0.17–0.57) morbidity. There was no significant association between trainee participation and 30-day mortality.
- CONCLUSIONS:** In this analysis of multi-institutional data, the participation of residents and fellows was associated with decreased odds of perioperative adrenalectomy complications. Attending surgeons performing adrenalectomies with trainee assistance should reassure patients of the equivalent or superior care they are receiving. (J Am Coll Surg 2014;219:53–61. © 2014 by the American College of Surgeons)
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Adrenalectomy is being performed with increasing frequency due to the widespread availability of minimally invasive techniques and the detection of incidentalomas

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on imaging for other indications.<sup>1-3</sup> This complex procedure requires focused, intraoperative training to become proficient and to achieve acceptable complication and conversion rates.<sup>4</sup> The majority of general surgery residents trained in the United States have little exposure to this operation, with a mean of 1.7 adrenalectomies performed per general surgery resident during their training (maximum 11, mode 0), based on the most recent analysis of Residency Review Committee summary statistics in 2004,<sup>5</sup> possibly related to limited access to high-volume surgeons or restrictions on duty hours.<sup>6</sup> Given the projected increase in demand for adrenalectomy and evidence of improved outcomes after the learning curve is surpassed and for high-volume surgeons, improved training of general surgery residents and endocrine surgery or minimally invasive fellows is needed to ensure adequate numbers of competent adrenal surgeons beginning independent clinical practice and the maintenance of high-quality surgical care.<sup>1,4,6</sup>

A challenge to this training paradigm is that patients often ask attending surgeons if trainees will be assisting in their operation, and often request that trainees not be allowed to operate. Although many patients might be comfortable with trainees participating in their general hospital care, up to one third of them state on a questionnaire that they do not want trainees performing any part of their operation.<sup>7</sup> Therefore, attending surgeons are often left with the task of reconciling the educational needs of their trainees plus workforce demands with respect for the wishes and autonomy of their patients.<sup>8</sup>

There are a limited number of studies that evaluate how the participation of residents and fellows in adrenalectomy affects patient outcomes, adjusting for patient comorbidities and operative technique. Documentation of equivalent outcomes would provide reassurance to patients undergoing surgery at teaching institutions and peace of mind for attending surgeons responsible for training the next generation of endocrine surgeons. Therefore, the goal of this study was to investigate the association between resident and fellow participation in adrenalectomy and perioperative outcomes using multivariate logistic regression models to analyze data from a contemporary multi-institutional database. Our hypothesis was that patients operated on by attending surgeons with the assistance of residents and fellows do not have inferior 30-day outcomes compared with patients operated on by attending surgeons without a trainee.

## METHODS

### Database and patient selection

We used the 2005 to 2011 American College of Surgeons (ACS) NSQIP Participant Use Data File for our analysis. This database contains prospective, multi-institutional information on preoperative risk factors, intraoperative variables, and 30-day morbidity and mortality outcomes for a systematic sample of major inpatient and outpatient surgical procedures at participating institutions. Dedicated and specifically trained Surgical Clinical Reviewers examine medical records and obtain complete 30-day follow-up on all selected patients. The quality of collected data is regularly evaluated with an inter-rater reliability audit of participating institutions, with audits to date demonstrating an overall disagreement of only 1.8% for all variables.<sup>9</sup> Additional information on ACS NSQIP data collection and practices has been described previously<sup>10</sup> and can be accessed on the ACS NSQIP website (<http://www.acsnsqip.org/>).

The ACS NSQIP Participant Use Data File contains 135 variables, including the highest level of supervision provided by the attending surgeon for the case and the

highest postgraduate year of any trainee who assisted in the case. These variables were used to differentiate adrenalectomies that were performed by attending surgeons without a trainee vs those in which a resident (PGY1 through 5) or fellow (PGY>5) assisted. Patients with no information on trainee participation were excluded from the study. To limit our analysis to adrenalectomies performed at participating institutions from 2005 to 2011, we searched for all principal operative procedures with the CPT codes for adrenalectomy (60540, 60545, 60650) during that time period. The CPT code 60650 was used to differentiate laparoscopic from open adrenalectomies. Sensitivity analyses were performed to rule out bias from grouping CPT codes for open adrenalectomies (60540 and 60545). Data on demographics, preoperative comorbidities, American Society of Anesthesiologists class, and preoperative laboratory values were obtained for all patients.

### Outcomes

The ACS NSQIP contains data on a large number of 30-day perioperative outcomes. To analyze the association of trainee participation on overall perioperative morbidity, we created a variable for the occurrence of any documented complication within 30 days of operation. This included pulmonary complications (eg, pneumonia, unplanned intubation, or ventilator dependence), cardiac complications (eg, cardiac arrest or myocardial infarction), neurologic complications (eg, stroke or coma >24 hours), renal complications (eg, acute renal failure or progressive renal insufficiency), bleeding complications, sepsis, surgical site infections, wound dehiscence, deep vein thrombosis requiring therapy, pulmonary embolus, urinary tract infections, and peripheral nerve injuries. We also created a variable for the occurrence of any serious complication within 30 days of operation, which excluded urinary tract infections, superficial surgical site infections, and peripheral nerve injury, the clinical significance of which are not uniform. Additional 30-day outcomes included mortality, mean length of procedure, intraoperative blood transfusion, reoperation, and mean length of stay (LOS).

### Statistical analysis

Chi-square statistics were used to compare differences in categorical variables related to baseline patient demographic and health characteristics, in addition to perioperative outcomes among the 3 trainee groups. Odds ratios (ORs) were calculated to evaluate the degree of association between trainee group and each preoperative variable with statistically significant results on chi-square test. Analysis of variance was used to compare differences

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