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# Does Performance Vary Within the Same Hospital When Separately Examining Different Patient Subgroups?



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- BACKGROUND:** Surgical quality programs, such as the American College of Surgeons NSQIP, provide reports based on specialty or procedure, with patients aggregated together. It is unknown whether hospital performance differs by patient subgroup (eg cancer vs noncancer patients), masking opportunities for improvement. Our objectives were to determine whether performance differs within a given hospital for 6 contrasting patient subgroups and to identify the percentage of hospitals with greater than chance differences in performance.
- STUDY DESIGN:** Using the American College of Surgeons NSQIP data, adults undergoing lung resection, esophagectomy, hepatectomy, pancreatectomy, colectomy, and proctectomy (2005 through 2012) were divided into 6 contrasting subgroups (elderly vs nonelderly, white vs nonwhite, obese vs nonobese, renal insufficiency vs normal renal function, cancer vs noncancer, emergency vs nonemergency). The main end point was serious morbidity or mortality. Observed to expected ratios were constructed using hierarchical models and compared using paired *t*-tests (eg observed to expected for cancer cases compared with noncancer). Variation in performance differences was assessed using a randomization test and *z*-tests for proportions.
- RESULTS:** From 433 hospitals, 221,518 patients were included. Overall quality differed for elderly vs nonelderly, renal insufficiency vs normal renal function patients, cancer vs noncancer, and emergency vs nonemergency ( $p < 0.05$ ). Variation in within-hospital performance differences exceeded chance expectations for renal insufficiency vs normal renal function in 31.1% of hospitals, cancer vs noncancer in 40.8%, and emergency vs nonemergency patients in 55.4% ( $p < 0.001$ ).
- CONCLUSIONS:** Hospital performance within a given hospital varies by patient subgroup. Quality programs can consider separate reports for these subgroups to identify opportunities for quality improvement. (J Am Coll Surg 2016;222:790–797. © 2016 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)
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Hospital performance on postoperative outcomes can be particularly relevant for specific patient subgroups. Interest groups and health policy organizations show

increasing interest in a focused, detailed assessment of their respective constituents and patient populations. For example, Medicare has begun to publicly report

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hospital performance specifically for elderly patients undergoing surgery.<sup>1,2</sup> Yet it is unknown how hospital performance in the elderly, as reported on Hospital Compare, relates to a hospital's overall performance or whether it is generalizable to young patients. If quality varies significantly within a single hospital for contrasting patient subgroups (ie cancer vs noncancer, elderly vs nonelderly), the subgroups associated with large quality differences should be identified. The hospital can then target internal quality-improvement efforts on patient subgroups with poor outcomes.

Current surgical quality reports issued through the ACS NSQIP focus on a specific surgical specialty (eg general surgery) or a procedure group (eg colorectal surgery). Differences in procedure indication (ie cancer vs noncancer, or emergent vs nonemergent) are commonly adjusted in the statistical modeling, with all patient data pooled together. However, this approach might prevent hospitals from examining performance differences between potentially important patient subgroups. For example, a hospital might have a well-developed, multidisciplinary cancer program, but the same processes and resources might not be in place for noncancer patients. If cancer patients undergoing colectomy have excellent outcomes and noncancer patients have poor outcomes, the hospital's performance will appear average when combined into an aggregate report. This limits opportunities for improvement and prevents recognition of the hospital's excellence in caring for certain colectomy patients. Reports that assess different patient subgroups (ie cancer and noncancer, elderly and nonelderly) can provide hospitals with valuable information and fill a gap in our current understanding of hospital quality.

Aggregate performance reports can mask important quality variation and opportunities for improvement. Our objectives were to determine whether performance differs within a given hospital for 6 contrasting patient subgroups, and to identify the percentage of hospitals with greater than chance differences in performance.

## METHODS

### Data source and study population

Using the ACS NSQIP, patients undergoing lung resection, esophagectomy, hepatectomy, pancreatectomy, colectomy, and proctectomy from January 1, 2005 to December 31, 2012 were identified. The ACS NSQIP database has been described in detail previously.<sup>3-5</sup> Briefly, it is a prospective, multi-institutional, clinical quality-improvement program that collects detailed information on more than 200 variables, including patient demographic characteristics, risk factors, operative variables,

and postoperative events for the purposes of providing hospitals with comparative quality-improvement data. Patients are followed for 30 days after the index procedure, regardless of whether they remain inpatient, are discharged, or are admitted to another facility.<sup>6</sup> Data are collected at each ACS NSQIP hospital by surgical certified reviewers who undergo intensive training on data abstraction and continuous education. Variable definitions are centrally defined and are consistent across all centers. Programs are subject to audits to ensure data reliability.<sup>7</sup>

### Patient subgroup classification

Several patient characteristics that might be risk factors for poor outcomes were selected for comparison.<sup>8</sup> The 6 contrasting patient subgroups were elderly vs nonelderly, white vs nonwhite, obese vs nonobese, renal insufficiency vs normal renal function, cancer vs noncancer, and emergency vs nonemergency. Elderly patients were defined as those 65 years and older. White vs nonwhite race was abstracted from patient medical charts and subject to data auditing similar to other NSQIP variables.<sup>7</sup> Obesity was defined as BMI  $\geq 30$  kg/m<sup>2</sup>, and patients with missing data on height or weight were excluded from analyses comparing obese vs nonobese ( $n = 16$ ). Renal insufficiency was defined as stage 3 to 4 chronic kidney disease or requiring dialysis within 2 weeks before surgery. Stage of chronic kidney disease was calculated using the Modification of Diet in Renal Disease formula for estimated glomerular filtration rate and staged according to National Kidney Foundation.<sup>9</sup> For analyses comparing renal insufficiency vs normal renal function, patients who were missing race, sex, or preoperative creatinine variables were excluded ( $n = 30,848$ ). Cancer cases were defined using ICD-9 codes. Cases performed with oncologic intent were classified as cancer cases (eg pancreaticoduodenectomy for a pancreatic cystic lesion), as described previously.<sup>10</sup> Emergency cases were identified using the ACS NSQIP variable, which is based on timing of surgery and designation by the surgeon or anesthesiologist.<sup>11</sup>

### Outcomes

The main end point of interest was a composite measure serious morbidity or mortality within 30 days of the index operation, a composite measure that is endorsed by the National Quality Forum and publicly reported by Medicare on Hospital Compare.<sup>12-14</sup> Serious morbidity includes deep or organ space surgical site infection, wound dehiscence, cardiac arrest requiring CPR, MI, acute renal failure, prolonged ventilation, sepsis, deep vein thrombosis, pulmonary embolism, pneumonia, or

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