Use of National Surgical Quality Improvement Program Data as a Catalyst for Quality Improvement

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BACKGROUND: Semiannually, the National Surgical Quality Improvement Program (NSQIP) provides its participating sites with observed-to-expected (O/E) ratios for 30-day postoperative mortality and morbidity. At each reporting period, there is typically a small group of hospitals with statistically significantly high O/E ratios, meaning that their patients have experienced more adverse events than would be expected on the basis of the population characteristics. An important issue is to determine which actions a surgical service should take in the presence of a high O/E ratio.

STUDY DESIGN: This article reviews case studies of how some of the Department of Veterans Affairs and private-sector NSQIP participating sites used the clinically rich NSQIP database for local quality improvement efforts. Data on postoperative adverse events before and after these local quality improvement efforts are presented.

RESULTS: After local quality improvement efforts, wound complication rates were reduced at the Salt Lake City Veterans Affairs medical center by 47%, surgical site infections in patients undergoing intraabdominal surgery were reduced at the University of Virginia by 36%, and urinary tract infections in vascular patients were reduced at the Massachusetts General Hospital by 74%. At some sites participating in the NSQIP, notably the Massachusetts General Hospital and the University of Virginia, the NSQIP has served as the basis for surgical service-wide outcomes research and quality improvement programs.

CONCLUSIONS: The NSQIP not only provides participating sites with risk-adjusted surgical mortality and morbidity outcomes semiannually, but the clinically rich NSQIP database can also serve as a catalyst for local quality improvement programs to significantly reduce postoperative adverse event rates. (J Am Coll Surg 2007;204:1293-1300. © 2007 by the American College of Surgeons)

The National Surgical Quality Improvement Program (NSQIP) collects preoperative demographics and comorbidities, operative data, and 30-day postoperative mortality and morbidity outcomes on a systematic sample of patients undergoing major operations at participating medical centers. The preoperative data are used to develop prediction models for 30-day postoperative mortality and morbidity.[1-3] Observed-to-expected (O/E) mortality and morbidity ratios and 90% confidence intervals for mortality and 99% confidence intervals for morbidity are calculated for each medical center. These risk-adjusted outcomes are fed back to the participating medical centers every 6 months so that the medical centers can compare their performance with those in other centers in the program. Validation studies have shown that the O/E ratios are indicators of quality of surgical care.[4,5]

If the lower limit of the confidence interval for the O/E ratio is greater than 1.0, this means that the center's patients are experiencing more adverse outcomes than would be expected on the basis of the patient characteristics. If the upper bound of the confidence interval is less than 1.0, this means that the center's patients are experiencing fewer adverse outcomes than would be ex-

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Abbreviations and Acronyms

ACS = American College of Surgeons
ASA = American Society of Anesthesiologists
BMI = body mass index
MGH = Massachusetts General Hospital
NSQIP = National Surgical Quality Improvement Program
O/E = observed-to-expected
SSI = surgical site infection
UTI = urinary tract infection
UVA = University of Virginia
VA = Veterans Affairs

pected on the basis of the patient characteristics. If the confidence interval includes 1.0, this means that the center's patients are experiencing an adverse event rate that would be expected on the basis of the patient characteristics. Most medical centers have O/E ratios that are in the middle, that is, are not statistically significantly high or low. In each reporting period, there are a few medical centers that have statistically significant low O/E ratios (a desirable outcome) or statistically significant high O/E ratios (an undesirable outcome).

In the Veterans Affairs (VA) NSQIP, data have been collected for a long time on which processes and structures of care might have resulted in low mortality O/E ratios, and these data on "best surgical practices" have been shared with all participating VA medical centers in the VA NSQIP annual reports. In the case of medical centers with high-mortality O/E ratios, paper audits of deaths have been performed and reviewed by personnel in the VA Central Office and by the VA NSQIP Executive Board. If a medical center has had high-mortality O/E ratios in several consecutive reporting periods, site visits have been made by teams of surgeons, anesthesiologists, and surgical nurses.[6-9]

The most vexing situation is when a medical center has a high O/E ratio for 30-day postoperative mortality or morbidity. The resulting questions are: What should the surgical service do about the high O/E ratio? How should the situation be investigated to determine the causative factors underlying the high O/E ratio among the many surgical processes and structures that are involved in the care of the surgical patients and their risk-adjusted outcomes?

The purpose of this article is to describe some investigations and maneuvers accomplished by surgical services participating in the NSQIP that have used their clinically rich, local NSQIP database to try to explain their high O/E ratios and to improve their risk-adjusted surgical outcomes. In the private-sector NSQIP, which has been made available to qualified sites, the American College of Surgeons (ACS) NSQIP data collection is accomplished through an Internet-based system that supports many online reports available to the participating centers to help them in this effort. These online reports will be described as well.

METHODS

Patients included in the NSQIP are those undergoing major operations under general, spinal, or epidural anesthesia. In the VA, eight major surgical subspecialties are represented (general, vascular, orthopaedics, urology, thoracic, otolaryngology–head and -neck surgery, neurosurgery, and plastic surgery); in the private sector, data was originally limited to general and vascular surgery but has been recently expanded to include the eight subspecialities captured by the VA and two additional subspecialities, neurosurgery and cardiac surgery in a multispecialty participation option. Exclusions include operations with known low postoperative mortality and morbidity, defined by specific current procedural terminology (CPT) codes. To ensure a representative sample of surgical patients from all days of the week, the first 40 (36 in the VA) consecutive, eligible surgical patients are assessed in each 8-day cycle, with each cycle starting on a different day of the week. Certain very high volume operations, such as inguinal hernia repairs and breast lumpectomies, are limited to the first 5 in each 8-day cycle so that these operations do not overwhelm the database.

Preoperative, operative, and postoperative variables in the data collection were selected on the basis of clinical relevance, reliability of data collection, and availability and ease of data collection. Preoperative variables include demographics; some lifestyle variables; functional status; American Society of Anesthesiologists (ASA) classification; selected laboratory tests; and selected pulmonary, cardiac, hepatobiliary, renal, vascular, central nervous system, nutritional, and immunologic comorbidities. Operative data include CPT codes of the primary operation and secondary operations, emergency status, wound classification, anesthesia method, operative times, and blood loss and replacement. Outcome variables include 30-day mortality from any cause inside or outside the hospital, length of stay, return to the operating room, and 19 different postoperative complications occurring in the 30-day postoperative period. An