
Differences in Hospital Performance for Noncancer vs Cancer Colorectal Surgery



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- BACKGROUND:** Considerable hospital-to-hospital variations in surgical outcomes have been reported across surgical procedures. However, it is unclear whether hospital quality rankings are consistent for noncancer and cancer operations. We investigated the differences in hospital performance for noncancer and cancer colorectal resections at 52 hospitals participating in the Michigan Surgical Quality Collaborative (MSQC).
- STUDY DESIGN:** Patients undergoing colorectal resections between 2008 and 2012 were identified. Hierarchical risk-adjusted models were used to evaluate hospital level 30-day morbidity, major morbidity, extended length-of-stay (LOS > 75th percentile), and mortality outcomes. Hospital performance, as ranked by observed-to-expected ratios, was compared by rank-order changes, interquartile ranges (IQR), and Spearman's correlations.
- RESULTS:** Of the 19,990 colorectal resections, 7,292 (36.5%) were for cancer. We observed wide variations in all risk-adjusted 30-day outcomes between hospitals, but only weak correlations in cancer and noncancer performance within hospitals. Overall hospital performance in mortality after noncancer and cancer operations was not correlated (Spearman's rho: 0.02). Of the best performing hospitals in mortality after noncancer resections, 69% were reclassified to a worse quartile for cancer operations (median rank-change of 12.5 ranks [IQR 5 to 27]). Similarly, hospital performance in morbidity was only moderately correlated (rho: 0.59; $p < 0.001$). Of the hospitals with lowest morbidity rates for noncancer resections, 31% were reclassified. We noted a similar lack of relationship in major morbidity and extended LOS.
- CONCLUSIONS:** A hospital's performance ranking in risk-adjusted outcomes after noncancer colorectal resections does not correlate to its performance for cancer-related colorectal resections. Indication for operation should be considered when leveraging risk-adjusted hospital outcomes for quality improvement efforts. (J Am Coll Surg 2014;219:450–459. © 2014 by the American College of Surgeons)
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Multiple reports have consistently demonstrated wide variation in outcomes after surgical procedures across hospitals, and measuring quality using risk-adjusted outcomes has become a widespread practice. However, the vast majority of these data are reported at the procedural level and do not uniquely distinguish between differing indications for the procedures themselves.¹⁻⁵ This makes it difficult to fully

understand outcomes after colorectal resections, which are commonly performed operations at all types of hospitals and are done for a wide range of indications.

Although colorectal procedures are thought of as technically similar, noncancer and cancer patients represent distinct populations with varying risk factors and different perioperative circumstances. As yet, there are no robust mechanisms in place to specifically assess the quality of cancer surgery care at hospitals. Current quality reports are based on the assumption that hospital performance rankings are consistent among all indications for similar procedures.^{6,7} So current colorectal surgery benchmarks may not truly represent reality. Further, grouping patients with and without cancer into the same quality profiling models may obfuscate valuable information regarding best practices for noncancer and cancer resections and respective targets for improvement.

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Abbreviations and Acronyms

ASA	= American Society of Anesthesiologists
IQR	= interquartile range
LOS	= length of stay
MSQC	= Michigan Surgical Quality Collaborative
O/E	= observed/expected
ONNCC	= Oncology NSQIP National Cancer Institute Center Consortium
SSI	= surgical site infection

To our knowledge, there have not been any published studies comparing hospital performance rankings for noncancer and cancer indications across similar procedures. In this context, we investigated the differences in hospital performance when different indications were examined using risk- and reliability-adjusted short-term outcomes after colorectal resections at 52 hospitals participating in a regional collaborative in the state of Michigan.

METHODS

Data sources

The Michigan Surgical Quality Collaborative (MSQC) is a 52-hospital consortium representing diverse practice settings throughout the state. Abstraction of MSQC data and data quality assurance details have been described elsewhere.^{8,9} In brief, specially trained data abstractors conduct chart reviews to comprehensively collect patient demographics, preoperative risk factors, laboratory values, technical details of the operations, perioperative processes of care, and 30-day outcomes for patients undergoing specified surgical operations, using a sampling algorithm that minimizes selection bias. Regular data audits ensure registry data validity. Data collection for MSQC is Institutional Review Board (IRB) exempt at participating hospitals, and this study was deemed nonregulated by the University of Michigan's IRB.

Patient population

Patients aged 18 years and older, who had undergone a colorectal resection based on index Current Procedural Terminology (CPT) codes at any of the 52 participating hospitals, were identified from the MSQC dataset from 2008 to 2012 (CPT codes 44139–44160, 44204–44213, 45110–45135, and 45395–45550). International Classification of Disease (ICD-9) codes were analyzed and patients were categorized to the cancer group if their ICD-9 codes represented any invasive or metastatic malignancy (ICD-9 codes 140–209.3), the remaining ICD-9 codes in the noncancer category encompassed 8 different indications, namely, diverticulitis,

benign neoplasms, vascular insufficiency, obstruction/volvulus, inflammatory bowel disease (IBD), hemorrhage, stoma complications, and other diagnoses. Polyps with or without carcinoma in situ and benign neuroendocrine tumors were classified as benign neoplasms.

Independent variables

Clinical and demographic data analyzed included age, race, sex, American Society of Anesthesiologists (ASA) class, functional status, body mass index (BMI), indication for operation (from postoperative diagnosis ICD-9 codes), type of operation (from CPT codes), complexity of the operation and concurrent procedures, and emergent status. Comorbidities included preoperative cardiac, pulmonary, gastrointestinal, renal, neurologic, hematologic, infectious, and endocrine diagnoses. Patients may have had disseminated cancer unrelated to their colorectal resection hospitalization and were classified in the noncancer operation cohort.

Outcomes variables

The primary outcomes of interest were any morbidity, major morbidity, extended length of stay (LOS), and mortality within 30 days of the index operation, in patients who had colorectal resections for noncancer and cancer indications. Morbidity was defined as having documentation of at least 1 postoperative complication, including superficial surgical site infection (SSI), deep space SSI, organ space SSI, wound dehiscence, pneumonia, unplanned intubation, pulmonary embolism, ventilator dependence greater than 48 hours, acute kidney injury, urinary tract infection, neurologic event, cardiac arrest, myocardial infarction, bleeding requiring transfusion, venous thromboembolism (deep vein thrombosis or pulmonary embolism), sepsis, severe sepsis, central line associated blood stream infection, *Clostridium difficile* infection, and anastomotic leak. Major morbidity was defined as above, with the exclusion of deep vein thrombosis without evidence of pulmonary embolism, superficial SSI, deep space SSI, UTI, and *C. difficile* infection. Patients could experience more than 1 of the listed complications. Conditions present preoperatively were not included as a complication because this study focused on postoperative outcomes. Extended LOS was defined as extending beyond the 75th percentile for LOS in this cohort. Readmission data were not available for this patient population.

Statistical analyses

Clinical and demographic variables for patients who underwent noncancer and cancer colorectal resections were compared using chi-square tests for categorical and

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