Expanding the scope of quality measurement in surgery to include nonoperative care: Results from the American College of Surgeons National Surgical Quality Improvement Program emergency general surgery pilot

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BACKGROUND: Patients managed nonoperatively have been excluded from risk-adjusted benchmarking programs, including the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP). Consequently, optimal performance evaluation is not possible for specialties like emergency general surgery (EGS) where nonoperative management is common. We developed a multi-institutional EGS clinical data registry within ACS NSQIP that includes patients managed nonoperatively to evaluate variability in nonoperative care across hospitals and identify gaps in performance assessment that occur when only operative cases are considered.

METHODS: Using ACS NSQIP infrastructure and methodology, surgical consultations for acute appendicitis, acute cholecystitis, and small bowel obstruction (SBO) were sampled at 13 hospitals that volunteered to participate in the EGS clinical data registry. Standard NSQIP variables and 16 EGS-specific variables were abstracted with 30-day follow-up. To determine the influence of complications in nonoperative patients, rates of adverse outcomes were identified, and hospitals were ranked by performance with and then without including nonoperative cases.

RESULTS: Two thousand ninety-one patients with EGS diagnoses were included, 46.6% with appendicitis, 24.3% with cholecystitis, and 29.1% with SBO. The overall rate of nonoperative management was 27.4%, 6.6% for appendicitis, 16.5% for cholecystitis, and 69.9% for SBO. Despite comprising only 27.4% of patients in the EGS pilot, nonoperative management accounted for 67.7% of deaths, 34.3% of serious morbidities, and 41.8% of hospital readmissions. After adjusting for patient characteristics and hospital diagnosis mix, addition of nonoperative management to hospital performance assessment resulted in 12 of 13 hospitals changing performance rank, with four hospitals changing by three or more positions.

CONCLUSION: This study identifies a gap in performance evaluation when nonoperative patients are excluded from surgical quality assessment and demonstrates the feasibility of incorporating nonoperative care into existing surgical quality initiatives. Broadening the scope of hospital performance assessment to include nonoperative management creates an opportunity to improve the care of all surgical patients, not just those who have an operation. (*J Trauma Acute Care Surg.* 2017;83: 837–845. Copyright © 2017 Wolters Kluwer Health, Inc. All rights reserved.)

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Efforts to enhance the quality of surgical care have resulted in improved clinical outcomes after surgery.[1–4] The foundation of successful surgical quality initiatives is the collection of accurate clinical information that can be translated into meaningful, risk-adjusted hospital performance feedback. This approach has helped quality programs, such as the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP), decrease perioperative complication rates, mortality rates, and costs at participating hospitals.[5–7]

The scope of existing surgical quality initiatives is primarily limited to the care of patients undergoing operative interventions. However, there are an increasing number of patients with surgical diagnoses being managed nonoperatively each year, particularly for patients presenting to hospitals with acute surgical diagnoses, such as diverticulitis, small-bowel obstruction (SBO), cholecystitis, and appendicitis.[8] The systematic exclusion of this growing segment of the surgical patient population from current surgical quality initiatives has created a “blind spot” in surgical quality assessment. For many surgeons, nonoperative management of surgical disease may only comprise a small portion of their clinical practice. However, for surgeons who routinely provide emergency general surgery (EGS) care, nonoperative management may play a far more substantial role.

Patients with EGS diagnoses are an important component of the surgical patient population, accounting for nearly 7% of all hospital admissions in the United States each year at a cost of nearly US $38 billion.[9] Despite the higher complication rates and increased costs associated with the acute management of surgical disease, widely accepted surgical quality initiatives do not currently focus on EGS.[10–12] Although the reasons for this are multifactorial, challenges collecting data on patients managed

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nonoperatively and difficulties providing adequately risk-adjusted performance feedback are likely to be key contributing factors.

We hypothesized that by leveraging ACS NSQIP to create an EGS clinical data registry, we could (1) evaluate clinical outcomes for both the operative and nonoperative management of surgical disease, (2) assess hospital performance on key surgical quality metrics for operative and nonoperative treatment modalities, and (3) demonstrate the influence the addition of nonoperative management can have on overall hospital-level performance rankings.

METHODS

Data were obtained from the ACS NSQIP EGS pilot project. The ACS NSQIP is a clinical data registry containing more than 200 variables related to perioperative surgical care, including pre-operative patient characteristics, operative information, and postoperative outcomes. Trained clinical abstractors at participating institutions prospectively collect all data included in ACS NSQIP. To ensure the consistency and reliability of included data, highly standardized data definitions are used. Results of

TABLE 1. Baseline Demographic and Risk-Factor Characteristics of Study Sample

	Overall, n (%)		Appendicitis, n (%)		Cholecystitis, n (%)		SBO, n (%)	
	Operative Management	Nonoperative Management	Operative Management	Nonoperative Management	Operative Management	Nonoperative Management	Operative Management	Nonoperative Management
Total Patients	1,518 (72.6)	573 (27.4)	911 (93.4)	64 (6.6)	424 (83.5)	84 (16.5)	183 (30.1)	425 (69.9)
Age, mean (SD)	46.5 (19.0)	62.5 (18.9)	40.2 (17.0)	50.1 (21.7)	52.6 (17.7)	67.3 (18.5)	63.3 (16.7)	63.4 (17.8)
Sex								
Male	743 (49.0)	290 (50.6)	477 (52.4)	34 (53.1)	180 (42.5)	39 (46.4)	86 (47.0)	217 (51.1)
Female	775 (51.1)	183 (49.4)	434 (47.6)	30 (46.9)	244 (57.6)	45 (53.6)	97 (53.0)	208 (48.9)
Preoperative functional status								
Independent	1,457 (96.0)	541 (94.4)	885 (97.2)	63 (98.4)	401 (94.6)	77 (91.7)	171 (93.4)	401 (94.4)
Partially dependent	16 (1.1)	17 (3.0)	3 (0.3)	0 (0.0)	7 (1.7)	4 (4.8)	6 (3.3)	13 (3.1)
Totally dependent	8 (0.5)	12 (2.1)	2 (0.2)	0 (0.0)	3 (0.7)	3 (3.6)	3 (1.6)	9 (2.1)
Unknown	37 (2.4)	3 (0.5)	21 (2.3)	1 (1.6)	13 (3.1)	0 (0.0)	3 (1.6)	2 (0.5)
Preoperative history								
Hypertension	392 (25.8)	242 (42.2)	145 (15.9)	19 (29.7)	163 (38.4)	46 (54.8)	84 (45.9)	177 (41.7)
CHF	5 (0.3)	9 (1.6)	1 (0.1)	1 (1.6)	1 (0.2)	1 (1.2)	3 (1.6)	7 (1.7)
Dyspnea	20 (1.3)	17 (3.0)	8 (0.9)	1 (1.6)	6 (1.4)	4 (4.8)	6 (3.3)	12 (2.8)
COPD	33 (2.2)	30 (5.2)	8 (0.9)	2 (3.1)	8 (1.9)	3 (3.6)	17 (9.3)	25 (5.9)
Smoker in past year	200 (13.2)	50 (8.7)	104 (11.4)	6 (9.4)	70 (16.5)	9 (10.7)	26 (14.2)	35 (8.2)
Ventilator dependent	2 (0.1)	7 (1.2)	0 (0)	1 (1.6)	0 (0)	1 (1.2)	2 (1.1)	5 (1.2)
Diabetes	113 (7.4)	74 (12.9)	34 (3.7)	3 (4.7)	57 (13.4)	25 (29.8)	22 (12.0)	46 (10.8)
Corticosteroid use	53 (3.5)	34 (5.9)	16 (1.8)	2 (3.1)	24 (5.7)	0 (0.0)	13 (7.1)	32 (7.5)
Albumin <3.0 g/dL	67 (4.4)	44 (7.7)	11 (1.2)	6 (9.4)	39 (9.2)	11 (13.1)	17 (9.3)	27 (6.4)
Ascites	8 (0.5)	11 (1.9)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	7 (3.8)	11 (2.6)
Renal failure/dialysis	14 (0.9)	26 (4.5)	2 (0.2)	1 (1.6)	3 (0.7)	6 (7.1)	9 (4.9)	19 (4.5)
Bleeding disorder	50 (3.3)	60 (10.5)	19 (2.1)	6 (9.4)	14 (3.3)	21 (25.0)	17 (9.3)	33 (7.8)
SIRS	270 (17.8)	74 (12.9)	179 (19.7)	4 (6.3)	67 (15.8)	18 (21.4)	24 (13.1)	52 (12.2)
Sepsis	121 (8.0)	25 (4.4)	91 (10.0)	12 (18.8)	20 (4.7)	9 (10.7)	10 (5.5)	4 (0.9)
Septic shock	5 (0.3)	7 (1.2)	0 (0.0)	1 (1.6)	0 (0.0)	1 (1.2)	5 (2.7)	5 (1.2)
Disseminated cancer	20 (1.3)	63 (11.0)	1 (0.1)	1 (1.6)	4 (0.9)	4 (4.8)	15 (8.2)	58 (13.7)
Abdominal comorbidities	497 (32.7)	429 (74.9)	181 (19.9)	18 (28.1)	174 (41.0)	41 (48.8)	142 (77.6)	370 (87.1)
BMI								
< 18.5	29 (1.9)	18 (3.1)	11 (1.2)	2 (3.1)	4 (0.9)	0 (0.0)	14 (7.7)	16 (3.8)
18.5–24.9	384 (25.3)	108 (18.9)	254 (27.9)	14 (21.9)	66 (15.6)	9 (10.7)	64 (35.0)	85 (20.0)
25.0–29.9	372 (24.5)	93 (16.2)	227 (24.9)	4 (6.3)	114 (26.9)	15 (17.9)	31 (16.9)	74 (17.4)
30.0–34.9	221 (14.6)	42 (7.3)	112 (12.3)	5 (7.8)	90 (21.2)	7 (8.3)	19 (10.4)	30 (7.1)
> 35.0	176 (11.6)	40 (7.0)	78 (8.6)	2 (3.1)	83 (19.6)	10 (11.9)	15 (8.2)	28 (6.6)
Unknown	336 (22.1)	272 (47.5)	229 (25.1)	37 (57.8)	67 (15.6)	43 (51.2)	40 (21.9)	192 (45.2)
Disease severity*								
Normal	72 (4.7)	15 (2.6)	35 (3.8)	5 (7.8)	36 (8.5)	9 (10.7)	1 (0.6)	1 (0.2)
Mild	920 (60.6)	427 (74.5)	592 (65.0)	26 (40.6)	265 (62.5)	58 (69.1)	63 (34.4)	343 (80.7)
Moderate	369 (24.3)	108 (18.9)	186 (20.4)	28 (43.8)	94 (22.2)	10 (11.9)	89 (48.6)	70 (16.5)
Severe	68 (4.5)	7 (1.2)	38 (4.2)	4 (6.3)	10 (2.4)	2 (2.4)	20 (10.9)	1 (0.2)
Unknown	89 (5.9)	16 (2.8)	60 (6.6)	1 (1.6)	19 (4.5)	5 (6.0)	10 (5.5)	10 (2.4)

*Disease severity is categorized into normal, mild, moderate, and severe using AAST disease severity grades. Normal represents the absence of local disease at the time of operation.

data collection audits periodically performed at participating hospitals have proven the data contained within the NSQIP clinical data registry to be highly reliable.[13] Full details of the ACS NSQIP have been previously described.[14–16]

The EGS pilot project was developed by the ACS NSQIP in conjunction with the American Association for the Surgery of Trauma (AAST) to collect data important to the care of patients with common EGS diagnoses, regardless of whether or not they underwent operative intervention. This pilot project is the first time that the ACS NSQIP has been used to collect data on the nonoperative management of surgical patients. Thirteen NSQIP hospitals in the United States and Canada volunteered to participate in the initial phase of the EGS pilot. Data were collected at participating sites between March 1, 2015, and November 30, 2015.

Eligibility criteria for patients to be included in the EGS pilot were documentation of acute appendicitis, acute cholecystitis, or SBO by a physician, imaging supporting the diagnosis, evaluation or management by a general surgeon, and age 18 years or older. Patients were excluded if the diagnosis of appendicitis, cholecystitis, or SBO was made 48 hours or longer after admission or if any diagnosis-specific exclusion criteria were met. The three included diagnoses were selected for the EGS pilot because they are common surgical diagnoses, are often managed by surgeons, and can be managed either operatively or nonoperatively. Detailed inclusion and exclusion criteria are provided in the Supplemental Digital Content (see Table, Supplemental Digital Content 1, http://links.lww.com/TA/B32).

Standard ACS NSQIP demographic, risk factor, and 30-day outcome data were collected for each patient included in the EGS pilot. Patient characteristics included in these analyses are listed in Tables 1 and 2. When necessary, ACS NSQIP variable definitions were modified to make them applicable to patients managed nonoperatively. EGS-specific demographic and risk factor data were also collected, including initial admitting service, physiologic, and laboratory data at the time of general surgery consultation, initial management plan (i.e., operative vs. nonoperative), AAST disease severity grade,[17] and presence of abdominal comorbidities, such as previous operations, Crohn's disease, radiation, and carcinomatosis.

To determine the extent to which nonoperative management was used in the treatment of appendicitis, cholecystitis, and SBO, operative and nonoperative management rates at participating hospitals were calculated in aggregate and by diagnosis. Demographic and comorbidity information were assessed for the overall EGS patient population, as well as independently for the appendicitis, cholecystitis, and SBO patient cohorts.

Clinical outcomes associated with appendicitis, cholecystitis, and SBO were evaluated by calculating rates of adverse events occurring within 30 days of initial evaluation by a surgeon. Outcome rates were independently derived for both the operative and nonoperative management of patients with each diagnosis to quantify the complication burden of both management strategies. Statistical comparisons between operative and nonoperative management strategies were not performed because this was beyond the scope of this study. The clinical outcome metrics assessed included death, serious morbidity, a death or serious morbidity composite measure (DSM), failure to rescue, and hospital readmission. Serious morbidity is an ACS NSQIP composite measure defined by the presence of one or more of the following postoperative occurrences: cardiac event (myocardial infarction or cardiac arrest), pneumonia, venous thromboembolism (deep venous thrombosis or pulmonary embolism), acute renal failure, septic shock, urinary tract infection, deep or organ space surgical site infection, wound dehiscence, unplanned operation, and unplanned intubation. In

TABLE 2. Unadjusted 30-Day Outcomes

	Overall No. Events (Rate, %)		Appendicitis No. Events (Rate, %)		Cholecystitis No. Events (Rate, %)		SBO No. Events (Rate, %)	
	Operative Management (n = 1,518)	Nonoperative Management (n = 573)	Operative Management (n = 911)	Nonoperative Management (n = 64)	Operative Management (n = 424)	Nonoperative Management (n = 84)	Operative Management (n = 183)	Nonoperative Management (n = 425)
Death	10 (0.7)	21 (3.7)	2 (0.2)	0 (0.0)	2 (0.5)	2 (2.4)	6 (3.3)	19 (4.5)
Serious morbidity	88 (5.8)	46 (8.0)	39 (4.3)	9 (14.1)	18 (4.3)	9 (10.7)	31 (16.9)	28 (6.6)
Cardiac event (MI/arrest)	6 (0.4)	4 (0.7)	2 (0.2)	1 (1.6)	3 (0.7)	1 (1.2)	1 (0.6)	2 (0.5)
Pneumonia	9 (0.6)	5 (0.9)	3 (0.3)	0 (0.0)	3 (0.7)	2 (2.4)	3 (1.6)	3 (0.7)
Venous thromboembolism	6 (0.4)	5 (0.9)	1 (0.1)	0 (0.0)	2 (0.5)	2 (2.4)	3 (1.6)	3 (0.7)
Acute renal failure	4 (0.3)	2 (0.4)	2 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.1)	2 (0.5)
Septic shock	4 (0.3)	2 (0.4)	0 (0.0)	0 (0.0)	1 (0.2)	0 (0.0)	3 (1.6)	2 (0.5)
Urinary tract infection	1 (0.1)	4 (0.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.6)	4 (0.9)
Deep/organ space SSI	42 (2.8)	9 (1.6)	26 (2.9)	6 (9.4)	5 (1.2)	2 (2.4)	11 (6.0)	1 (0.2)
Wound dehiscence*	3 (0.2)	n/a	0 (0.0)	n/a	0 (0.0)	n/a	3 (1.6)	n/a
Unplanned operation	33 (2.2)	18 (3.1)	14 (1.5)	3 (4.7)	5 (1.2)	2 (2.4)	14 (7.7)	13 (3.1)
Unplanned intubation	7 (0.5)	2 (0.4)	2 (0.2)	0 (0.0)	3 (0.7)	0 (0.0)	2 (1.1)	2 (0.5)
Death or serious morbidity**	98 (6.5)	67 (11.7)	41 (4.5)	9 (14.1)	20 (4.7)	11 (13.1)	36 (19.7)	47 (11.1)
Failure to rescue	5 (5.7)	2 (4.3)	1 (2.6)	0 (0.0)	1 (5.6)	0 (0.0)	3 (9.7)	2 (7.1)
Hospital readmission	96 (6.3)	69 (12.0)	40 (4.4)	7 (10.9)	35 (8.3)	15 (17.9)	21 (11.5)	47 (11.1)

*Wound dehiscence is not applicable to nonoperative management because a wound is not created.
**Failure to rescue is defined as the number of mortalities after the occurrence of one or more serious postoperative morbidities.

this analysis, a patient meeting criteria for failure to rescue was a patient who died after experiencing one or more serious postoperative morbidities.

To assess hospital-level performance in EGS, each of the 13 participating hospitals were ranked based on rate of DSM. Unadjusted DSM rates were derived for both operative and nonoperative management at each hospital. Performance rankings from 1 to 13 were then assigned to hospitals based on rates of DSM. A performance ranking of 1 reflects the hospital with the lowest DSM rate, while a performance ranking of 13 was assigned to the hospital with the highest rate.

The influence of incorporating nonoperative management into surgical quality assessment was evaluated by ranking hospital performance on the DSM outcome measure with and without the inclusion of patients managed nonoperatively. To account for variability in patient factors and hospital diagnosis mix, risk-adjusted odds ratios for DSM were derived for each hospital with and without the inclusion of nonoperative patients using a hierarchical logistic regression model with hospital random intercepts. Age, sex, functional status, comorbidities (see "Preoperative History" in Table 1 for full list), BMI, hospital diagnosis mix, and disease severity were each selected as covariates a priori and adjusted for in the model. Hospitals were ranked from 1 to 13 using the risk-adjusted odds ratios calculated with and without the inclusion of nonoperative patients in the model.

All analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC). The Chesapeake Research Review Institutional Review Board approved this study and granted a waiver of informed consent due to the de-identified nature of the data that were collected.

RESULTS

Of the 2,091 patients meeting inclusion criteria, 975 (46.6%) had a diagnosis of appendicitis, 508 (24.3%) had cholecystitis, and 608 (29.1%) had a SBO. The rate of nonoperative management was 6.6% for appendicitis, 16.5% for cholecystitis, and 69.9% for SBO, yielding a 27.4% overall rate of nonoperative management in the EGS pilot. Baseline characteristics of the operative and nonoperative patient cohorts are provided in Table 1.

EGS pilot patients who underwent operative management experienced a 5.8% rate of serious morbidity, a 0.7% rate of mortality, and a 6.5% rate of DSM. The most common serious morbidity among these patients was deep/organ space surgical site infection, occurring at a rate of 2.8%. Among patients managed nonoperatively, the serious morbidity rate was 8.0%, the mortality rate was 3.7%, and the DSM rate was 11.7%. The most common serious morbidity for patients managed nonoperatively was unplanned operation, which occurred in 3.1% of patients after discharge from the hospital. Rate of hospital readmission after operative management was 6.3%, whereas the readmission rate after nonoperative management was 12.0%. Despite comprising only 27.4% of patients included in the EGS pilot, patients managed nonoperatively accounted for a significant portion of the overall 30-day morbidity and mortality, including 42.0% of all DSMs, 34.3% of serious morbidities, 67.7% of deaths, and 41.8% of hospital readmissions. Complete unadjusted 30-day outcome data are provided in Table 2.

Hospital-level performance assessment revealed substantial variability in unadjusted rates of DSM across hospitals. Among the 13 hospitals participating in the EGS pilot, DSM rates after operative management ranged from 3.2% at the top performing hospital to 14.3% at the bottom performing hospital. DSM rates for nonoperative management ranged from 4.4% to 22.2% among participating hospitals (Table 3). DSM rates for operative management did not closely correlate with those for nonoperative management with hospitals. This is reflected in the differences in performance ranking for DSM between operative and nonoperative management at participating hospitals, with eight hospitals having rank changes of three or more positions between these two management approaches (Table 3).

After risk adjustment, odds ratios for 30-day DSM across hospitals ranged from 0.80 to 1.44 for the operative management cohort and from 0.81 to 1.26 for the overall EGS patient cohort (Table 4). However, due to limited size of patient sample all confidence intervals overlap. Measures of fit this model included a c-statistic of 0.86 (95% confidence interval [CI],

TABLE 3. Unadjusted Hospital Performance for 30-Day Death or Serious Morbidity

	Event Rate, %		Performance Ranking	
	Operative Management	Nonoperative Management	Operative Management	Nonoperative Management
Hospital A (n = 242)	3.2%	12.9%	1st	T-6th
Hospital B (n = 118)	3.6%	16.7%	T-2nd	T-10th
Hospital C (n = 188)	3.6%	6.3%	T-2nd	2nd
Hospital D (n = 208)	3.6%	10.0%	T-2nd	4th
Hospital E (n = 107)	4.2%	11.1%	5th	5th
Hospital F (n = 285)	6.2%	9.3%	6th	3rd
Hospital G (n = 233)	6.4%	15.1%	7th	9th
Hospital H (n = 36)	6.7%	16.7%	8th	T-10th
Hospital I (n = 91)	7.3%	22.2%	9th	13th
Hospital J (n = 243)	8.2%	12.9%	10th	T-6th
Hospital K (n = 152)	11.5%	13.6%	11th	8th
Hospital L (n = 114)	12.1%	4.4%	12th	1st
Hospital M (n = 74)	14.3%	16.7%	13th	T-10th

TABLE 4. Risk-Adjusted Odds Ratios for 30-Day Death or Serious Morbidity, by Hospital

	Odds Ratio (95% CI)	
	Operative Management	Operative + Nonoperative Management
Hospital A (n = 242)	1.06 (0.57–1.97)	1.01 (0.67–1.53)
Hospital B (n = 118)	0.85 (0.51–1.42)	0.89 (0.59–1.33)
Hospital C (n = 188)	1.02 (0.58–1.79)	0.98 (0.66–1.57)
Hospital D (n = 208)	0.83 (0.48–1.45)	0.93 (0.62–1.40)
Hospital E (n = 107)	1.27 (0.81–1.97)	1.22 (0.77–1.93)
Hospital F (n = 285)	1.44 (0.67–3.06)	1.05 (0.71–1.55)
Hospital G (n = 233)	0.84 (0.49–1.43)	0.81 (0.48–1.37)
Hospital H (n = 36)	1.05 (0.84–1.32)	1.01 (0.71–1.42)
Hospital I (n = 91)	1.32 (0.81–2.16)	1.16 (0.73–1.82)
Hospital J (n = 243)	0.83 (0.54–1.27)	0.92 (0.63–1.33)
Hospital K (n = 152)	0.80 (0.43–1.48)	1.03 (0.70–1.51)
Hospital L (n = 114)	1.29 (0.66–2.53)	1.26 (0.68–2.34)
Hospital M (n = 74)	0.81 (0.50–1.32)	0.89 (0.59–1.35)

Please note that all confidence intervals overlap due to limited sample size and low event rates.

0.83–0.90) and Hosmer-Lemeshow test of 21.9 ($p < 0.01$). Odds ratios could not be derived for the nonoperative management cohort due to limited sample size. Comparison of risk-adjusted performance rankings for operative management alone to those including both operative and nonoperative management reveal the influence the addition of nonoperative care can have on surgical performance assessment. The addition of nonoperatively managed patients to risk-adjusted hospital performance assessment influenced the performance ranking of 12 of the 13 hospitals included in the analysis, with four hospitals changing rank by three or more positions (Fig. 1). The c-statistic of the model for the combined operative and nonoperative patient population was 0.82 (95% CI, 0.79–0.85) and the Hosmer-Lemeshow test was 12.87 ($p = 0.12$).

DISCUSSION

Nonoperative management is an important treatment modality in EGS that is used in more than one fourth of patients with common EGS diagnoses, though utilization rates vary considerably by diagnosis. Patients receiving nonoperative surgical care are also at risk for adverse outcomes, including complications, readmissions, and/or death, as demonstrated by the rates of adverse outcomes among patients who receive this treatment modality. The potential value in incorporating nonoperative management into surgical quality assessment is supported by the effect its inclusion has on hospital performance rankings.

The results of this pilot study suggest that operative and nonoperative management approaches both contribute to adverse outcome burden in EGS. In fact, the nonoperative management of surgical disease may actually account for a disproportionately high rate of complications when compared to operative management of the same diagnoses. Hospital-level outcomes analyses identified considerable variability in morbidity and mortality rates among hospitals participating in the EGS pilot for both operative and nonoperative care. These findings highlight

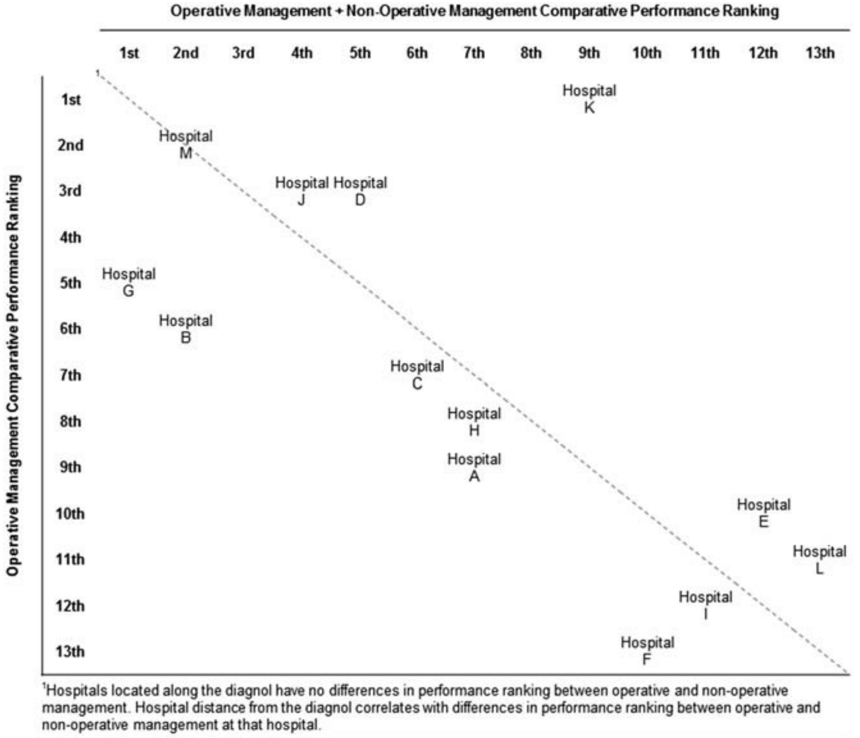

Figure 1. Concordance of risk-adjusted hospital performance rankings for 30-day death or serious morbidity with and without the inclusion of patients managed nonoperatively.

opportunities for performance improvement at hospitals for both operative and nonoperative EGS care.

In addition to the identification of variability in outcomes across hospitals, this study revealed performance variability within hospitals as well. Hospital-level outcomes analyses revealed that morbidity and mortality rates for operative management do not consistently correlate with adverse outcome rates for nonoperative management within hospitals. This finding is reflected in differences in hospital performance rankings that exist when independently evaluating operative and nonoperative management. The changes in rankings identified in this study demonstrate that the delivery of high quality operative care does not always translate into the delivery of high quality nonoperative care. These results underscore the importance of incorporating nonoperative management into surgical quality assessment efforts and the opportunity that exists to improve upon the quality of care being delivered to surgical patients.

The majority of outcomes research in EGS has focused on the burden of EGS diagnoses in the United States and the postoperative morbidity and mortality associated with these diagnoses.[9,11,18,19] Despite the increasing utilization of nonoperative management in surgery, clinical outcomes related to nonoperative management strategies are rarely evaluated. Diseases, such as diverticulitis, SBO, cholecystitis, choledocholithiasis, and even appendicitis, are being managed nonoperatively at increasingly high rates.[20–26] However, little has been done to systematically evaluate the way in which nonoperative care is being provided. Similarly, little has been done to identify which patients should be selected for nonoperative management and how long patients should be managed nonoperatively before converting to operative management. This study establishes the feasibility of collecting data on the nonoperative management of surgical disease in a national clinical data registry and highlights the benefits of including nonoperative care in surgical quality assessment efforts.

The ability to leverage the infrastructure of an existing clinical data registry was a major strength of this study. Although this study represents the first time that nonoperatively managed surgical patients have been included in ACS NSQIP, detailed patient characteristics and clinical outcome information were able to be collected. The ability to collect EGS-specific data points, including disease severity, was another strength of this study. The data collected during the ACS NSQIP EGS pilot can facilitate robust analyses beyond those that are possible using institutional or administrative data sets. Additional strengths of this study include the utilization of a well-established methodology for hospital-level performance assessment in surgery, the inclusion of a diverse group of hospitals, and the ability to obtain reliable 30-day outcome information.

However, this study was not without limitations. As a pilot project, the primary objective was to demonstrate the feasibility of collecting data and evaluating performance on the nonoperative management of surgical disease using the ACS NSQIP. The EGS pilot was therefore not powered to conduct robust risk-adjusted analyses. Consequently, statistical analyses were unable to be performed on each of the included diagnoses independently. Similarly, meaningful statistical comparisons between outcomes for operative and nonoperative management strategies were not possible. Small sample size in conjunction with low event rates limited statistical analyses of clinical outcomes to the DSM composite outcome measure. Lastly, the inability to follow patients for longer than 30 days is a significant limitation. This is particularly true in the nonoperative management of surgical disease, where failures of nonoperative management (complications) are likely to manifest as disease recurrence requiring hospital readmission and/or operative intervention beyond the 30 days patients are followed by the ACS NSQIP. The optimal duration of time EGS patients should be followed for adverse outcomes is unclear. Practical constraints are likely to limit the potential for consistent follow-up beyond 1 year. However, extending the follow-up period to 1 year would likely provide valuable outcome information beyond what is currently collected, particularly among the nonoperatively managed patients.

The results of this study illustrate the importance and the feasibility of expanding the scope of surgical quality assessment to include the nonoperative management of surgical disease. However, establishing the importance and feasibility of nonoperative surgical quality assessment is just the first step. Moving forward, nonoperative care should be incorporated into surgical quality initiatives, such as clinical data registries and public reporting programs. The detailed clinical data collected for these initiatives will hold the information necessary to identify optimal practices in the nonoperative management of surgical disease and ultimately improve the quality of care provided to surgical patients.

AUTHORSHIP

M.W.W., A.B.N., and C.Y.K. participated in the literature search, study design, data collection, data analysis, data interpretation, writing, and critical revisions for this article. P.E.B., C.C., H.G.C., J.J.D., T.M.D., S.M.H., M.M.H., M.H.M., J.L.R., P.M.R., H.D.R., J.L.S., K.L.S., and G.H.U. participated in the data collection, data interpretation, and critical revisions for this article. M.L.C. and K.Y.B. participated in the data interpretation and critical revisions for this article.

DISCLOSURE

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DISCUSSION

Dr. Walter L. Biffl (Honolulu, Hawaii): Thanks. Walt Biffl from Honolulu. This is a really important topic. And it's a nice presentation.

The populations of patients that you selected, the small bowel-obstruction, non-operative management is generally the right thing to do and appendicitis, it's the right thing to do if it's perforated.

In cholecystitis we often make that decision because the patient looks too sick to operate. So with the data on the morbidities and the readmissions, which patients are those and why are they being readmitted? Is it related to the decision not to operate? Or is it related to the reason why the surgeons didn't want to operate? Thanks.

Dr. Ronald M. Stewart (San Antonio, Texas): So, Dr. Wandling, first of all, great paper, great presentation. I think this is a perfect example of where this needs to go with respect to this partnership between the AAST and the ACS and NSQIP. So, first, kudos to that.

And for those of you in the audience who don't know, Mike is one of the ACS Clinical Scholars, spent two years working on these projects. And he, you really helped in key ways a lot of the Committee on Trauma and the Trauma/Acute Care Surgery group. And I will give you a specific example of Dr. Wandling.

For pay-for-performance and performance measures we have to have performance measures. And literally, the day before the ABSIITE, probably after five p.m., Dr. Wandling was tasked with coming up with a list of performance measures with the criteria that go along with those. And by the next morning those measures were all done so kudos to all you have done, Mike.

My specific questions, though, with respect to this are this is a great pilot. Where does the pilot need to go next? What are the next steps with respect to this? And how could we further encourage and facilitate this partnership between the AAST and the American College of Surgeons for Emergency General Surgery?

Again, kudos.

Dr. Kevin M. Schuster (New Haven, Connecticut): Kevin Schuster, New Haven. Excellent work. I agree totally with Dr. Stewart's comments. This is incredibly important work.

My question – in full disclosure, we are one of the sites. And so my question is the mechanism by which the patients are identified in that ten-day cycle or eight-day cycle, the ten patients are not entirely consistent across centers and I was curious how you think that might affect your results.

Dr. Anthony A. Meyer (Chapel Hill, North Carolina): Tony Meyer from Chapel Hill. This is an incredibly important effort to try to start measuring quality in not just trauma but what acute surgery does, the entire spectrum.

The concern I have is you might have been able to do it for your pilot programs but each place has its own sometimes unique structure of who admits what. Does acute pancreatitis go to acute surgery? Does acute pancreatitis go to medicine or GI surgery?

And then in the post-ops, you know, does a patient who comes back with a problem after a cancer operation go to surgical oncology or does it go to acute surgery?

Is that something you are going to be able to factor in because that will be a confounding factor. But, again, this is a remarkably important effort to do this.

Dr. Michael W. Wandling (Chicago, Illinois): Thank you for your questions Dr. Biffl. The high complication rates in the patients who were managed non-operatively likely reflect, in part, the reality that many of the patients managed non-operatively in the EGS pilot had small bowel obstructions and cholecystitis. As you stated, the more comorbidities those patients tend to have, the less likely we are to want to take them to the operating room, so I think that likely does play a role. As we collect more and more data moving forward we hope to be able to recognize who those sick patients are, address their comorbidities through the risk-adjustment process, and then look at the actual decision making that is occurring and try to determine who is optimally suited for operative management and who is optimally suited for non-operative management.

But I do think that right now your point is correct and is well-taken. There is a component of non-operatively managed patients being sicker at baseline, which contributes to why they're not being operated on and why they are having adverse outcomes. That's an important issue that we hope to address moving forward as we collect more data.

Regarding the next steps for the EGS pilot, we are planning on making a formal NSQIP program in 2017 that will be available to all hospitals participating in ACS NSQIP. We are trying to recruit as many hospitals as possible to participate in this program in hopes of increasing the numbers of patients that we collect data on so we can better understand the non-operative practices in surgery and begin to identify optimal strategies, or best practices, for providing non-operative surgical care.

And to Dr. Stewart's second comment about facilitating the partnership between the ACS and the AAST, I think that the collaboration thus far has been great and speaks to the shared commitment these two organizations have to improving the care of all emergency general surgery patients, not just those undergoing operative intervention. has been great and I think it's a really important thing too. Obviously the trauma/acute care surgery field is particularly interested and invested in this topic given the frequency non-operative management is utilized in our field. Fostering the collaboration with the AAST can really help move this initiative forward and help us make a difference with this work in the future.

Dr. Schuster, the mechanism by which patients are identified is definitely a challenge. It was very interesting going through and talking to all of our different pilot sites about how exactly they would go about doing this.

Places that have a dedicated emergency surgery service may be more easily able to capture every single surgery consult that comes in as opposed to other hospitals where general surgery call is staffed by a different sub-specialist every night.

For the pilot we actually let sites decide on their own how they were going to go about doing this. And right now we don't have a way to evaluate whether or not there is systematic bias in how that was carried out. However, moving forward we hope to be able to do this if the selection process is not standardized. Ultimately we hope to create a standardized protocol for reviewing the manner in which hospitals are actually identifying their non-operative cases so that we can ensure that the cases that they are sampling reflect the true population of non-operative patients at their hospital.

With respect to Dr. Meyer's comment regarding each place having its own structure on who admits these patients and how to handle that, I think it's a very important issue. There are certainly institutional cultural factors that influence admission patterns at hospitals. This is something I have experienced firsthand at the hospitals where I train, particularly for diagnoses such as small bowel obstruction and diverticulitis.

To your point, we felt this was an important issue and are collecting data specifically about the admitting service for each patient. If through our data collection and analyses we find that patients are better managed or have better outcomes when admitted to a surgical service, I think that that's an important thing to recognize and should prompt us to reassess our admitting practices and really focus getting them to the service that has been proven by the data to provide the best care and the most favorable outcomes.

Thank you again for the privilege of the podium.