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Risk Associated With Complications and Mortality After Urgent Surgery vs Elective and Emergency Surgery

Implications for Defining "Quality" and Reporting Outcomes for Urgent Surgery

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IMPORTANCE Given the current climate of outcomes-driven quality reporting, it is critical to appropriately risk stratify patients using standardized metrics.

OBJECTIVE To elucidate the risk associated with urgent surgery on complications and mortality after general surgical procedures.

DESIGN, SETTING, AND PARTICIPANTS This retrospective review used the American College of Surgeons National Surgery Quality Improvement Program database to capture all general surgery cases performed at 435 hospitals nationwide between January 1, 2013, and December 31, 2013. Data analysis was performed from November 11, 2015, to February 16, 2017.

EXPOSURES Any operations coded as both nonelective and nonemergency were designated into a novel category titled *urgent*.

MAIN OUTCOMES AND MEASURES The primary outcome was 30-day mortality; secondary outcomes included 30-day rates of complications, reoperation, and readmission in urgent cases compared with both elective and emergency cases.

RESULTS Of 173 643 patients undergoing general surgery (101 632 females and 72 011 males), 130 235 (75.0%) were categorized as elective, 22 592 (13.0%) as emergency, and 20 816 (12.0%) as nonelective and nonemergency. When controlling for standard American College of Surgeons National Surgery Quality Improvement Program preoperative risk factors, with elective surgery as the reference value, the 3 groups had significantly distinct odds ratios (ORs) of experiencing any complication (urgent surgery: OR, 1.38; 95% CI, 1.30-1.45; $P < .001$; and emergency surgery: OR, 1.65; 95% CI, 1.55-1.76; $P < .001$) and of mortality (urgent surgery: OR, 2.32; 95% CI, 2.00-2.68; $P < .001$; and emergency surgery: OR, 2.91; 95% CI, 2.48-3.41; $P < .001$). Surgical procedures performed urgently had a 12.3% rate of morbidity (n = 2560) and a 2.3% rate of mortality (n = 471).

CONCLUSIONS AND RELEVANCE This study highlights the need for improved risk stratification on the basis of urgency because operations performed urgently have distinct rates of morbidity and mortality compared with procedures performed either electively or emergently. Because we tie quality outcomes to reimbursement, such a category should improve predictive models and more accurately reflect the quality and value of care provided by surgeons who do not have traditional elective practices.

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Defining "quality" health care has become a major focus of the medical community, health care payers, and US Centers for Medicare & Medicaid Services (CMS).[1,2] Postoperative outcome measures are increasingly being publicly reported, which has implications for hospital and physician reimbursement and reputation. In 2009, the CMS began publicly reporting 30-day rates of readmission for patients admitted to an acute care hospital for myocardial infarction, heart failure, and pneumonia.[3] The program has since broadened to include several other outcome measures in both medical and surgical patients.

Medicare's Physician Quality Reporting System is the largest US quality reporting program created by the CMS as part of the Affordable Care Act.[4,5] In July 2007, the program began reporting measures of process quality and physiological patient outcomes and rewarding physicians who self-reported outcomes. However, in 2015 the program started imposing penalties in Medicare Part B reimbursement to physicians who fail to self-monitor and submit designated quality measures.[6] Outcomes following many general surgical procedures, including colectomy, ventral hernia repair, appendectomy, and cholecystectomy, had previously been included, such as rates of anastomotic leak, surgical site infection, unplanned reoperation, and readmission, but are being excluded from the 2017 Medicare Value-Based Payment Modifier owing to inconsistent risk adjustment.[7] Risk adjustment is necessary to account for the presence of comorbidities that put patients at higher risk of postoperative complications. Most risk adjustment models consider whether operations are performed emergently because the expected complication rate is substantially higher than that with elective surgery.[8-12]

Patients with acute disease processes who undergo general surgery are frequently admitted for medical optimization before surgery or a trial of nonoperative conservative management. This plan commonly occurs in the management of cholecystitis, adhesive small-bowel obstruction, and acute diverticulitis. Many of these patients will undergo surgical intervention later in their hospitalization. These urgent, albeit nonemergency, operations are performed following a period of nonoperative management. Complication rates and mortality for this substantial population of patients have not been well described in the surgical literature. The purpose of this study was to elucidate the risk associated with urgent surgery on 30-day complications and mortality after general surgical procedures. We hypothesized that patients who undergo urgent surgery will have a complication and mortality profile different from those who undergo either elective or emergency surgery, which would hold important implications for quality reporting and pay-for-performance reimbursement penalties.

Key Points

Questions Does surgery performed urgently have distinct rates of morbidity and mortality from that performed either electively or emergently?

Findings In this nationwide cohort study of 173 643 patients who underwent general surgery, operations performed urgently had a 12.3% rate of morbidity and 2.3% rate of mortality, which were distinctly different from emergency and elective surgery.

Meaning Because many quality metrics currently in use only distinguish emergency operations from nonemergency operations, the addition of an *urgent* category may improve predictive models and allow a more accurate determination of quality and value.

Methods

Data Set

Patient data for this study were obtained from the 2013 American College of Surgeons National Quality Improvement Program Participant Use File (ACS NSQIP PUF). The ACS NSQIP PUF is a nationwide, comprehensive data set designed to improve the quality of surgical care. The 2013 ACS NSQIP PUF included data for patients who underwent surgery at 435 participating hospitals between January 1, 2013, and December 31, 2013. The ACS NSQIP PUF has been designated by the University of Virginia Institutional Review Board for Health Sciences Research as a public data set; as such, this study is considered exempt from formal institutional review board review.

Patients and Variables

Emergency surgery in the ACS NSQIP is captured as part of the American Society of Anesthesiologists (ASA) Physical Status classification system, which is designated by the surgeon or anesthesiologist immediately prior to each operation. Elective surgery is defined only as procedures performed on patients who are brought to a medical facility for a scheduled (elective) surgery on the day of their operation. It specifically does not include patients who are inpatients at an acute care hospital, are transferred from an emergency department or clinic, or undergo emergency or urgent surgery. As described in the ACS NSQIP protocols, surgical clinical reviewers are specifically instructed to code "urgent" operations as nonemergency and nonelective because these cases are not true emergencies.[13] In this article, urgent status implies that an operation was coded as nonelective and nonemergency. Cases were excluded from analysis if either variable was not known or was omitted.

Variables were selected a priori. We included all preoperative variables used by the ACS NSQIP Risk Calculator to estimate a patient's probability of morbidity and mortality. Variables included patient age, sex, functional status, ASA class, corticosteroid use, smoking status, body mass index class, presence of ascites, sepsis, ventilator dependence, disseminated cancer, type 1 or 2 diabetes, hypertension, congestive heart failure, chronic obstructive pulmonary disease, dialysis dependence, and acute renal failure. In addition to emergency surgery, which is included in the ACS NSQIP Risk Calculator, urgent status was also included in the present multivariate analysis. The primary end point was patient mortality within 30 days of surgery. Secondary end points examined included 30-day rates of complications, hospital readmissions, and unplanned reoperations.

Table 1. Univariate Analysis of Preoperative Patient Variables

Preoperative Variable	Surgery, No. (%)			P Value
	Elective (n = 130 235)	Urgent (n = 20 816)[a]	Emergency (n = 22 592)	
Age group, y				
<65	91 732 (70.4)	14 281 (68.6)	16 911 (74.9)	<.001
65-75	24 829 (19.1)	3323 (16.0)	2904 (12.9)	<.001
75-85	11 524 (8.9)[b]	2432 (11.7)	2085 (9.2)[b]	<.001
≥85	2150 (1.7)	780 (3.8)	692 (3.1)	<.001
Female sex	78 522 (60.3)	11 371 (54.6)	11 739 (52.0)	<.001
BMI classification				
Underweight (<18.5)	2834 (2.2)	1407 (6.8)	2335 (10.3)	<.001
Normal weight (18.5-24.9)	31 325 (24.1)	5824 (28.0)	6673 (29.5)	<.001
Overweight (25.0-29.9)	37 537 (28.8)[b]	5930 (28.5)[b]	6451 (28.6)[b]	.48
Obese				
I (30.0-34.9)	25 069 (19.3)	3859 (18.5)	3735 (16.5)	<.001
II (35.0-39.9)	14 422 (11.1)	2025 (9.7)	1793 (7.9)	<.001
III (≥40.0)	19 048 (14.6)	1771 (8.5)	1605 (7.1)	<.001
Independent functional status	128 475 (98.7)	19 488 (93.6)	21 546 (95.4)	<.001
ASA classification				
Class 1	9461 (7.3)	1681 (8.1)	4329 (19.2)	<.001
Class 2	63 870 (49.0)	8306 (39.9)[b]	9075 (40.2)[b]	<.001
Class 3	53 475 (41.1)	8887 (42.7)	6314 (28.0)	<.001
Class 4	3429 (2.6)	1942 (9.3)	2874 (12.7)	<.001
Class 5	0	0	0	NA
Chronic corticosteroid use	5338 (4.1)	1365 (6.6)	1064 (4.7)	<.001
Ascites	314 (0.2)	315 (1.5)	462 (2.0)	<.001
Presence of sepsis				
SIRS	802 (0.6)	2481 (11.9)	3848 (17.0)	<.001
Sepsis	290 (0.2)	1587 (7.6)	3449 (15.3)	<.001
Septic shock	46 (0.04)	163 (0.8)	962 (4.3)	<.001
Ventilator dependence	35 (0.03)	174 (0.8)	473 (2.1)	<.001
Disseminated cancer	3843 (3.0)	982 (4.7)	589 (2.6)	<.001
Diabetes				
Type 1	6979 (5.4)[b]	1644 (7.9)	1198 (5.3)[b]	<.001
Type 2	12 419 (9.5)	1727 (8.3)	1390 (6.2)	<.001
Hypertension	56 683 (43.5)	8702 (41.8)	7498 (33.2)	<.001
Cardiovascular event	0	0	0	NA
Congestive heart failure	341 (0.3)	346 (1.7)	267 (1.2)	<.001
Dyspnea	8664 (6.7)[b]	1335 (6.4)[b]	1189 (5.3)	<.001
Current smoker	20 901 (16.1)	4349 (20.9)[b]	4627 (20.5)[b]	<.001
COPD	4284 (3.3)	1169 (5.6)	1055 (4.7)	<.001
Hemodialysis dependent	1344 (1.0)	512 (2.5)	353 (1.6)	<.001
Acute renal failure	158 (0.1)	142 (0.7)	288 (1.3)	<.001

Abbreviations: ASA, American Society of Anesthesiologists; BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); COPD, chronic obstructive pulmonary disease; NA, not applicable; SIRS, systemic inflammatory response syndrome.

[a] *Urgent surgery* is defined in the Patients and Variables subsection of the Methods section.

[b] Denotes no significant difference among identified groups on multiple comparison ($P > .05$).

Statistical Analysis

Statistical analysis was performed from November 11, 2015, to February 16, 2017. Comparisons were made as a function of the urgency with which an operation was performed. Unadjusted comparisons stratified by urgency classification were performed using Pearson χ^2 test for categorical variables and the Mann-Whitney test for nonnormally distributed continuous data. Multivariate logistic regression analysis was performed, with mortality within 30 days of an index operation as the primary outcome. Secondary outcomes included the occurrence of any complication recorded in the ACS NSQIP PUF, need for reoperation, or readmission within 30 days. All tests were 2-sided, with $P < .05$ considered significant. Statistical analyses were performed with SAS software, version 9.3 (SAS Institute Inc).

Results

A total of 173 643 general surgery cases met criteria for inclusion and were analyzed in this study. When operations were stratified according to urgency status, 130 235 (75.0%) were

considered elective, 20 816 (12.0%) urgent, and 22 592 (13.0%) emergency. Demographic characteristics for all patients included are given in **Table 1**. Comparisons of preoperative variables and preoperative characteristics showed that patients who underwent elective, urgent, and emergency surgery differed for most variables with few exceptions. **Table 2** provides the most common operations performed electively (laparoscopic cholecystectomy; 8420 cases [6.5%]), urgently (laparoscopic cholecystectomy; 4666 [22.4%]), and emergently (laparoscopic appendectomy; 10 305 [45.6%]). Length of stay before the operation was significantly longer for patients undergoing urgent operations (1 day [interquartile range, 0-3 days]) than for those undergoing elective surgery (0 days [interquartile range, 0-0 days]; $P < .001$) and those undergoing emergency surgery (0 days [interquartile range, 0-1 day]; $P < .001$).

Unadjusted 30-day patient outcomes examined included the occurrence of any complication recorded in the ACS NSQIP PUF, mortality, unplanned reoperation, and readmission (**Table 3**). Surgical procedures performed urgently had a 12.3% rate of morbidity (n = 2560) and a 2.3% rate of mortality (n = 471) compared with a 13.8% rate of morbidity (n = 3114) and 3.7% rate of mortality for emergency surgery and a 6.7% rate of morbidity (n = 8718) and 0.4% rate of mortality (n = 516) for elective surgery. Multivariate logistic regression analysis was performed to determine the independent contribution of urgency status on 30-day mortality and postoperative morbidity (**Table 4**). When we controlled for standard ACS NSQIP preoperative risk factors, with elective surgery as the reference value, the 3 groups had significantly distinct odds ratios (ORs) of experiencing any complication (urgent surgery: OR, 1.38; 95% CI, 1.30-1.45; $P < .001$; and emergency surgery: OR, 1.65; 95% CI, 1.55-1.76; $P < .001$) and of mortality (urgent surgery: OR, 2.32; 95% CI, 2.00-2.68; $P < .001$; and emergency surgery: OR, 2.91; 95% CI, 2.48-3.41; $P < .001$).

Table 2. Most Common Operations for Each Category of Urgency

Surgical Procedure	No. (%)
Elective surgery (n = 130 235)	
Laparoscopic cholecystectomy	8420 (6.5)
Inguinal hernia repair	6291 (4.8)
Sleeve gastrectomy	6232 (4.8)
Roux-en-Y gastric bypass	5453 (4.2)
Partial mastectomy	4860 (3.7)
Urgent surgery (n = 20 816)[a]	
Laparoscopic cholecystectomy	4666 (22.4)
Laparoscopic appendectomy	3675 (17.7)
Partial colectomy	2829 (13.6)
Small-bowel resection	679 (3.3)
Lysis of adhesions	571 (2.7)
Emergency surgery (n = 22 592)	
Laparoscopic appendectomy	10 305 (45.6)
Laparoscopic cholecystectomy	1388 (6.1)
Small-bowel resection	1093 (4.8)
Partial colectomy	1454 (6.4)
Lysis of adhesions	555 (2.5)

[a] *Urgent surgery* is defined in the Patients and Variables subsection of the Methods section.

Discussion

This study found that general surgical procedures performed urgently had a 12.3% rate of morbidity and a 2.3% rate of mortality, which are rates distinctly different from both emergency (morbidity, 13.8%; mortality, 3.7%) and elective (morbidity, 6.7%; mortality, 0.4%) surgery. To our knowledge, no prior study has elucidated rates of morbidity and mortality associated with urgent general surgery. This finding reveals important insight that the urgency of surgery is not binary, but rather that there are 3 categories, each with a distinct morbidity and mortality profile, and that surgical urgency can help predict postoperative complications independent of a patient's preoperative comorbidities. Ultimately, urgency is a crucial consideration when performing patient risk stratification, reporting surgical outcomes, and establishing benchmarks for quality and performance under the Affordable Care Act.

The goal of pay-for-performance models is to account for quality of care and clinical outcomes in the compensation of physicians, rather than to solely reimburse for services provided. The findings in this study hold important implications for pay-for performance reimbursement, value-based programs, and surgical outcome reporting. Currently, risk stratification for the ACS NSQIP and the Physician Quality Reporting System considers preoperative comorbidities, functional status, ASA classification, and whether surgery was performed emergently. These programs do not account for urgent, nonelective operations that are not determined to be emergencies by the surgeon or anesthesiologist at the time of surgery. In this study, we found that these urgent operations are associated with substantially higher rates of complications and mortality when compared with elective surgery. Surgeons who commonly operate on an urgent basis, including many acute care and emergency general surgeons, are at risk

Table 3. Unadjusted Incidence of 30-Day Postoperative Outcomes Stratified by Urgency Status

30-d Outcome	Urgency Status, No. (%)			*P* Value
	Elective (n = 130 235)	Urgent (n = 20 816)[a]	Emergency (n = 22 592)	
Mortality	516 (0.4)	471 (2.3)	846 (3.7)	<.001
Morbidity	8718 (6.7)	2560 (12.3)	3114 (13.8)	<.001
Hospital readmission	4818 (3.7)	1140 (5.5)	1435 (6.4)	<.001
Unplanned reoperation	1146 (0.9)	322 (1.6)	314 (1.4)	<.001

[a] *Urgent surgery* is defined in the Patients and Variables subsection of the Methods section.

Table 4. Risk-Adjusted Odds Ratios for Factors Associated With Postoperative Mortality and Morbidity

	30-d Mortality[a]			Morbidity[b]		
Variable	Wald χ^2	Odds Ratio (95% CI)	*P* Value	Wald χ^2	Odds Ratio (95% CI)	*P* Value
Urgency	189.00	NA	<.001	271.35	NA	<.001
Elective	NA	1 [Reference]	NA	NA	1 [Reference]	NA
Urgent[c]	124.57	2.32 (2.00-2.68)	<.001	128.26	1.38 (1.30-1.45)	<.001
Emergency	172.72	2.91 (2.48-3.41)	<.001	243.26	1.65 (1.55-1.76)	<.001
Age group, y	190.56	NA	<.001	116.73	NA	<.001
<65	NA	1 [Reference]	NA	NA	1 [Reference]	NA
65-75	72.08	1.76 (1.54-2.01)	<.001	74.70	1.23 (1.17-1.30)	<.001
75-85	135.51	2.31 (2.01-2.66)	<.001	68.98	1.29 (1.21-1.37)	<.001
≥85	122.82	3.06 (2.51-3.73)	<.001	28.68	1.34 (1.20-1.49)	<.001
Female sex	8.09	0.86 (0.78-0.96)	.004	25.76	0.91 (0.87-0.92)	<.001
BMI classification	74.35	NA	<.001	38.34	NA	<.001
Underweight (<18.5)	25.37	1.59 (1.33-1.90)	<.001	3.08	1.08 (0.99-1.19)	.08
Normal weight (18.5-24.9)	NA	1 [Reference]	NA	NA	1 [Reference]	NA
Overweight (25.0-29.9)	5.22	0.86 (0.75-0.98)	.02	0.22	0.99 (0.94-1.04)	.64
Obese						
I (30.0-34.9)	10.78	0.77 (0.65-0.90)	.001	4.03	1.06 (1.00-1.12)	.04
II (35.0-39.9)	13.27	0.67 (0.55-0.83)	<.001	21.95	1.176 (1.10-1.26)	<.001
III (≥40.0)	10.88	0.71 (0.58-0.87)	.001	0.78	0.97 (0.91-1.04)	.38
Independent functional status	56.75	0.57 (0.50-0.66)	<.001	112.79	0.63 (0.58-0.69)	<.001
ASA classification	595.24	NA	<.001	1116.32	NA	<.001
1	NA	1 [Reference]	NA	NA	1 [Reference]	NA
2	9.22	5.96 (1.88-18.85)	.002	161.95	2.34 (2.05-2.67)	<.001
3	35.36	31.85 (10.18-99.66)	<.001	423.17	4.04 (3.53-4.61)	<.001
4	58.80	87.79 (27.97-275.52)	<.001	632.75	6.44 (5.57-7.45)	<.001
Wound classification	21.63	NA	<.001	687.18	NA	<.001
Clean	NA	1 [Reference]	NA	NA	1 [Reference]	NA
Clean-contaminated	14.53	1.37 (1.17-1.62)	.001	533.02	1.89 (1.79-1.99)	<.001
Contaminated	17.15	1.50 (1.24-1.82)	<.001	465.30	2.14 (2.00-2.30)	<.001
Dirty or infected	16.98	1.51 (1.24-1.83)	<.001	426.19	2.29 (2.12-2.48)	<.001
Diabetes	14.24	NA	<.001	21.49	NA	<.001
None	NA	1 [Reference]	NA	NA	1 [Reference]	NA
Type 2	8.18	0.78 (0.66-0.93)	.004	0.32	1.02 (0.96-1.08)	.57
Type 1	3.61	1.16 (0.99-1.35)	.06	21.42	1.17 (1.10-1.25)	<.001
Sepsis	208.87	NA	<.001	196.70	NA	<.001
None	NA	1 [Reference]	NA	NA	1 [Reference]	NA
SIRS	60.95	2.01 (1.68-2.39)	<.001	73.18	1.43 (1.31-1.55)	<.001
Sepsis	57.83	2.00 (1.67-2.39)	<.001	55.91	1.41 (1.29-1.54)	<.001
Septic shock	190.25	4.45 (3.60-5.50)	<.001	134.02	2.44 (2.10-2.84)	<.001
Chronic corticosteroid use	12.29	1.33 (1.13-1.55)	<.001	114.05	1.45 (1.36-1.56)	<.001
Ascites	82.36	2.71 (2.19-3.37)	<.001	35.28	1.59 (1.37-1.86)	<.001
Ventilator dependence	10.38	1.45 (1.16-1.81)	.001	3.81	0.83 (0.68-1.00)	.05
Disseminated cancer	257.59	3.32 (2.870-3.85)	<.001	41.43	1.28 (1.19-1.38)	<.001
Hypertension	24.41	1.35 (1.20-1.52)	<.001	23.08	1.11 (1.06-1.16)	<.001
Congestive heart failure	8.51	1.43 (1.12-1.81)	.003	4.89	1.20 (1.02-1.42)	.03
Dyspnea	14.88	1.33 (1.15-1.54)	<.001	13.58	1.13 (1.06-1.21)	<.001
Current smoker	1.46	0.92 (0.80-1.05)	.23	112.34	1.29 (1.23-1.35)	<.001
COPD	19.89	1.41 (1.21-1.64)	<.001	52.48	1.32 (1.23-1.42)	<.001
Hemodialysis dependent	17.27	1.57 (1.27-1.94)	<.001	1.23	0.92 (0.80-1.06)	.27
Acute renal failure	10.02	1.55 (1.18-2.03)	.002	47.42	2.02 (1.65-2.47)	<.001
Relative value unit	100.51	1.02 (1.02-1.03)	<.001	3482.98	1.05 (1.05-1.05)	<.001

Abbreviations: ASA, American Society of Anesthesiologists; BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); COPD, chronic obstructive pulmonary disease; NA, not applicable; SIRS, systemic inflammatory response syndrome.

[a] For 30-day mortality, the C statistic is 0.93; Hosmer-Lemeshow test, 0.002; and Brier score, 0.01.

[b] For morbidity, the C statistic is 0.79; Hosmer-Lemeshow test, <0.0001; and Brier score, 0.07.

[c] *Urgent surgery* is defined in the Patients and Variables subsection of the Methods section.

of being penalized by the CMS in Medicare Part B value-based reimbursement. These surgeons may even unfairly be labeled as poor performers by current outcome reporting guidelines.

Several prior investigators have demonstrated increased rates of complications and mortality after emergency surgery.[8,9,14-16] Mortality following emergency gastrointestinal surgery has been found to be as much as 5 times greater than for elective gastrointestinal surgery.[17] This difference has previously been attributed to patient comorbidities and physiological derangements associated with acute disease processes.[16] However, Havens et al[14] recently demonstrated that increased morbidity and mortality following emergency general surgery is independent of preoperative comorbidities and physiological status. Our multivariate analysis demonstrated similar results: complication rates were higher in patients who underwent urgent surgery compared with those who underwent elective surgery, independent of other preoperative risk factors. Consistent with prior studies, we found that patients with preoperative comorbidities, obesity, rising ASA classification, age greater than 65 years, and contaminated surgical wounds are at an increased risk of morbidity and mortality. Current smokers were not found to be at greater risk of mortality following surgery, but smoking was predictive of postoperative complications.

Patients undergoing urgent surgery had the highest rates in our cohort of congestive heart failure, chronic obstructive pulmonary disease, diabetes, preoperative hemodialysis, chronic corticosteroid use, and disseminated cancer. Coupled with the fact that patients undergoing urgent operations have a longer preoperative length of stay, this finding suggests that patients with serious preoperative comorbidities who present with acute surgical issues may be having operative care delayed, presumably for medical optimization or following a failed trial of nonoperative management. A delay in surgical intervention could be contributing to the observed increase in morbidity and mortality. For instance, cholecystitis initially treated with antibiotics and medical optimization can progress, leading to perforation, or a small-bowel obstruction that is initially managed nonoperatively may develop ischemia. Delay in surgery for both of these conditions may result in worse pathologic conditions and the need for a more extensive operation. The prevalence of systemic inflammatory response syndrome, sepsis, and septic shock were greatest in patients undergoing emergency surgery, which would tip the risk to benefit ratio toward more expeditious surgery.

Limitations

This study has some notable limitations. First, these analyses are limited by the retrospective study design. Although the ACS NSQIP is a large national data set, its data are limited to participating hospitals, which are primarily academic medical centers. Next, surgical urgency was determined based on variables recorded in the ACS NSQIP, which is subject to anesthesiologist and surgeon discretion at the time of an operation, as well as to documentation error. Cardiac risk factors, including the presence of coronary artery disease, and history of cardiac events were not recorded in the 2013 ACS NSQIP PUF. We sought to identify trends among a large population of patients, so all general surgical procedures were included for this study; therefore, there is a lack of granularity that may make generalization of these findings to specific procedures difficult.

Conclusions

At a time when reimbursement is contingent on value-based outcomes reporting and performance, it is imperative to ensure that appropriate risk adjustment is performed. We have identified operative urgency as a key consideration for patient risk stratification. If this issue is not recognized, quality outcome reporting and value-based reimbursement will continue to incentivize operating on an elective basis and will make surgeons more reluctant to operate on patients who urgently require care.

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