Carbone Cancer Center
UNIVERSITY OF WISCONSIN
SCHOOL OF MEDICINE AND PUBLIC HEALTH

December 15, 2014

National Quality Forum
Appeals Process
Re: 30-day operative mortality

To Whom It May Concern:

In research and quality benchmarking choosing the right measurement tool is imperative. The 30-day mortality metric is a poor indicator of quality and, even worse, is one people can manipulate to make it appear as though quality is better. It occurs to me to first ask what we want to happen? What is true quality? For that we need a tangible outcome, like a patient who was discharged home for a routine recovery period and ultimately resuming an active life. In contrast, most people would not want a prolonged recovery period in an LTAC and then transitioning to live in a nursing home while bouncing back and forth from the hospital before dying months down the road. Both of those outcomes, from a 30-day mortality perspective, are equivalent but we can all recognize they are drastically different. Thus, measuring a 30-day mortality figure is merely an indicator of failure while not helping anyone improve their practice or identify quality surgeons and hospitals. 30-day mortality is not even a very good indicator of failure. After all, a patient whose operative course is complicated and who is certain not to have a good recovery could be transitioned to comfort care on POD 10 and allowed to die peacefully on POD 11 with their family at their side. I would submit this recognition would be a marker of good quality on the part of the surgical team.

In addition, a 30-day survival benchmark is absolutely a metric which smart clinicians can manipulate (e.g. keep a patient alive and transition to comfort care on day 31 or 33) and does nothing to reflect quality. I would strongly urge movement away from negative markers towards aspirational benchmarks. Could you find a measure which reflects the desired outcome? Like returning to work? Or able to play in the park with their grandchildren? But one that also rewards good decision making in the immediate post operative period in the event the patient is not likely to meet their outcome expectations? For example, a palliative care consultation and death after a decision to limit therapy rather than despite therapy, perhaps with even a limited number of ICU days suggesting the team realized reality relatively quickly to avoid causing additional suffering?

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Thank you for your consideration. Please do not hesitate to contact me with any questions, 608-263-3962.

Regards,

Toby C. Campbell, M.D, MSCI
Associate Professor of Medicine
Thoracic Oncology
Chief of Palliative Care Medicine
Fellowship Director, Hospice and Palliative Care Medicine

Appeal Submitter
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Summary of Appeal:
Please reconsider addition of a 30-day risk-adjusted operative mortality for as a quality metric for CABG. It will incentivize surgeons to delay appropriate care for cases in which perioperative complications result in a disease burden, treatment burden, or quality of life that is unacceptable to affected patients. Not only does this metric not accurately capture quality care, it is not patient and family-centered. While it may satisfy our apparent need to have a simple, easy, capturable metric, it will undoubtedly result in delay in access to, or even lack of access to, the best care possible for the subset of patients who the odds tell us will, despite all attempts at rigorous patient selection, experience life-limiting complications. Unfortunately quality of care cannot be captured with such an unsophisticated metric.

Article I. Beyond 30-Day Mortality Aligning Surgical Quality With Outcomes That Patients Value

Margaret L. Schwarze, MD, MPP[1,2]; Karen J. Brasel, MD, MPH[3]; Anne C. Mosenthal, MD[4]

Appeal Submitter

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Summary of Appeal:

As a surgeon, I urge the NQF to reconsider 30-day mortality for CABG as a quality metric due to the potential unintended consequences of it use. While operative mortality is important, the overemphasis of 30-day outcomes may alter surgeons’ treatment decisions in ways that are not in the best interest of patients. Despite being “risk-adjusted,” this metric cannot account for the preop wishes of patients who desire surgery, but who place reasonable limitations on their postop care. This creates a disincentive for surgeons to offer surgery, despite its potential benefits. In addition, when patients wish to limit ongoing heroic care required to sustain life for 30 postop days, this metric puts surgeons in a double bind between honoring patients’ preferences and optimizing their reportable “quality” outcomes. In the interest of true quality, the NQF should champion the efforts of surgeons to act as patient advocates, as opposed to placing ethical barriers to patient-centered behavior.

VIEWPOINT

Beyond 30-Day Mortality
Aligning Surgical Quality With Outcomes That Patients Value

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Because of their strong sense of responsibility for the lives of patients, surgeons frequently struggle to withdraw postoperative life-supporting treatments when patients or their families request it.[1] Although surgeons experience this as therapeutic optimism or the emotional pull of error and responsibility, these forces are accentuated by the increasing emphasis on 30-day mortality reporting. The recent expansion of outcomes profiling imposes an unconscious bias in these critical decisions: surgeons who report concern about physician profiling are more likely to decline to operate on a patient who prefers to limit life support, or are more likely to refuse to withdraw life support postoperatively, than surgeons who perceive less pressure from outcomes reporting.[2,3]

Public reporting of 30-day mortality may motivate surgeons and hospitals to improve outcomes and theoretically empowers patients to make informed choices.[4] However, use of this single metric unintentionally fails to accommodate patients who might benefit from palliative surgery, or patients who would prefer death to prolonged postoperative treatment in the intensive care unit or long-term chronic care after a major complication. Surgeons should be able to offer informed patients a risky but potentially beneficial surgical option and then allow patients to refuse aggressive treatments if they have become overly burdensome or when patients' goals for surgery are no longer possible.

Reconciling the effects of an approach designed to ensure high-quality surgical care with the needs of vulnerable patients is challenging, particularly for high-risk operations in which hard outcomes, such as mortality, are easily observed and other important outcomes are more difficult to assess. Strategies to mitigate the impact of 30-day mortality reporting through consideration of alternative quality metrics are required to protect the needs of surgical patients and the practices of surgeons who could make a valuable contribution to their patients' quality of life.

Alternative Outcomes to 30-Day Mortality

A system that prioritizes one metric, 30-day mortality, above all others is unlikely to produce outcomes that are desirable for all stakeholders. The purpose of reporting 30-day mortality is to assess surgical safety, but patients desire surgical safety only to the degree that it predicts efficacy (longer-term survival and quality of life). Although most patients wish to survive for 30 days after their operation, the notion that surgery has intrinsic value to patients if they could live just 30 days is outdated, as if additional survival time is an unexpected luxury. Reporting mortality statistics at other time points, including 60 days and 6 months, would help align patients' and surgeons' goals at concordantly valuable touch points and would de-emphasize the singular importance of 30-day survival. By broadening the time horizon, this strategy could reduce the external pressure to achieve a specific target with limited impact on safety assessment as postoperative complications are tightly linked to longer-term postoperative survival.[5]

Other safety metrics that matter to patients should be elevated to the current status of mortality: intensive care unit days, prolonged mechanical ventilation (longer than 96 hours), and discharge destination. There is a clear distinction between the patient who has an extended hepatectomy, spends 24 hours in the intensive care unit and 5 days in the hospital, and is discharged to home with physical therapy and the patient who has the same operation, spends 14 days in the intensive care unit on a ventilator and 33 days in the hospital, and is discharged to a long-term acute care hospital with a tracheostomy. Although the differences between these 2 outcomes are striking, this distinction is not well captured by the equivalent 30-day survival assigned to both episodes.

Report Patient-Centered Outcomes

The collection of data on patient-centered outcomes in quality improvement programs and surgical registries for all operations would help both patients and surgeons. In addition to procedure-specific morbidity, reported outcomes should match the goals of surgery. For example, a 3-month measurement of fatigue and bone pain after parathyroidectomy or the ability to eat solid food after gastrectomy should be reported along with surgical site infection and postoperative readmission. Although these additional metrics focus on efficacy, rather than safety, surgical quality should be judged by both. Patients will undertake significant risk in pursuit of a specific goal; measuring and reporting these outcomes will improve their ability to evaluate the trade-offs inherent in surgical treatment and will provide clarity about what is a realistic postoperative goal.

Emphasize Process Measures for Palliative Operations

For patients who have operations with palliative intent, quality of care should not be judged by mortality but by robust reporting of outcomes that reflect high-quality palliative care. This would include clear delineation and postoperative measurement of the symptoms the operation is intended to address. For example, re-

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porting for an enteric bypass for obstructing cancer should measure relief of nausea and vomiting. Other metrics of high-quality palliative care include documentation of a preoperative goals-of-care conversation, pain scores, family meetings, and even time between a do-not-resuscitate order and death. Although the collection of survival rates after palliative operations might help inform future patients about the value of an operation, the 30-day mortality rates for these operations should not be interpreted or publicly reported as a quality metric.

Attend to the Needs of Poor-Risk Patients

Targeting surgical mortality likely decreases the number of operations on poor-risk candidates, as it has for percutaneous coronary interventions.[6] However, when 30-day mortality reporting influences the decision making for poor-risk patients, this can result in mistrust, inconsistency, and discriminatory practices. To promote quality and reduce ineffective or marginally beneficial care, it is necessary to delineate both upper and lower boundaries around the patients who are appropriate operative candidates. Expansion of guidelines, such as those for lung volume reduction surgery, that define indications for the performance of surgery, including a clear description of patients who are not surgical candidates because of unlikely long-term survival and prohibitive morbidity, would lead to consistent practices about who should be refused surgery based on defined prognostic features and would reduce concern that the decision was influenced by performance metrics.

Patients frequently proceed with surgery because they perceive no other option, even though surgery is unlikely to meet their needs. Preoperative conversations typically stress risks and benefits, rather than a detailed discussion of patient preferences and goals. Often, the postoperative care required is not consistent with patients' desires, even if all goes well. Although penalties for high 30-day mortality would reduce the number of operations on high-risk patients, such penalties do not consider whether the treatment received was aligned with the patient's values.[7] Although difficult to operationalize, incentives that reward patient engagement rather than a specific outcome would credit surgeons for identifying both the patients who are unlikely to value risky surgery and the patients who would value surgical intervention and be accepting of the necessary postoperative life support.

The benefits of detailed reporting of surgical outcomes, specifically highly visible mortality statistics, will be limited unless we focus on results that are valuable to patients. It is time for surgical quality metrics to evolve because there is much at stake for both patients and surgeons. The way forward requires (1) an alignment of the goals of surgery with the outcomes that are measured and (2) a more sophisticated and nuanced approach in order to value the full range of outcomes that surgeons have to offer patients beyond 30-day survival.

ARTICLE INFORMATION

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Appeal Submitter

Palliative Care Network of Wisconsin
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Summary of Appeal:
We are deeply concerned about the 30-day post CABG all-cause mortality as a quality metric. This should be reconsidered.
As palliative medicine clinicians, we see the detrimental effects of the delay of palliative care for our most vulnerable and sick patients.We routinely see how patient care can be dictated not by a patient's wishes but rather by a doctor trying to satisfy quality and number expectations. Using quality measures is important but not if the specific measuring tool leads to increased suffering.
Higher risk surgery may be indicated in certain situations. If a patient or family consents to such a risky surgery, should they be penalized by having to continue with aggresive care for up to 30 days even after poor outcomes? A patient's option to switch to a comfort approach or less aggressive care should not be influenced by a clinician's fear to maintain arbitrary quality measures.

Appeal Submitter

Ministry Health Care
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Summary of Appeal:

Please reconsider addition of 30-day post CABG all-cause mortality as a quality metric. Surgeons often struggle to withdraw life supporting treatments on postoperative patients despite patient or family preferences. While this conflict genuinely stems from deep notions of responsibility our data demonstrate that surgeons who report concern about profiling are more likely to refuse to withdraw life support before POD 30. This game-able metric harms patients and families, the surgeon patient relationship and fails to capture important safety information. Consider the patient who spends 24 hours in ICU and is discharged to home post-operative day 5 versus the patient who has the same operation, spends 20 days in ICU, is transferred to an LTAC and then palliative care on POD 32. These vastly different outcomes are not captured by the equivalent 30-day survival assigned to both episodes: it fails to capture what is truly valuable to patients who don’t want to live to just 30 days.

Failure-to-Pursue Rescue

Explaining Excess Mortality in Elderly Emergency General Surgical Patients with Preexisting "Do-Not-Resuscitate" Orders

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Objective: To describe the outcomes of elderly patients with do-not-resuscitate (DNR) status who undergo emergency general surgery and to improve understanding of the relationship between preoperative DNR status and postoperative mortality.

Background: Preoperative DNR status has previously been shown to predict increased postoperative mortality, although the reasons for this association are not well understood.

Methods: Patients 65 years or older undergoing emergency operation for 1 of 10 common general surgical diagnoses were extracted from the 2005–2010 National Surgical Quality Improvement database. Propensity score techniques were used to match patients with and without preoperative DNR orders on indication for procedure, patient demographics, comorbid disease burden, acute physical status at the time of operation, and procedure complexity. The postoperative outcomes of this matched cohort were then compared.

Results: A total of 25,558 patients were included for analysis (DNR, n =1061; non-DNR, n =24,497). DNR patients seemed to be more acutely and chronically ill than non-DNR patients in the overall study sample but did not seem to be treated less aggressively before or during their operations. Propensity-matching techniques resulted in the creation of a cohort of DNR and non-DNR patients who were well matched for all preoperative and intraoperative variables. DNR patients from the matched cohort had a significantly higher postoperative mortality rate than non-DNR patients (36.9% vs 22.3%, $P <$ 0.0001) despite having a similar rate of major postoperative complications (42.1% vs 40.2%, $P = 0.38$). DNR patients in the propensity-matched cohort were much less likely to undergo reoperation (8.3% vs 12.0%, $P = 0.006$) than non-DNR patients and were significantly more likely to die in the setting of a major postoperative complication (56.7% vs 41.4%, $P = 0.001$).

Conclusions: Emergency general surgery in elderly patients with preoperative DNR orders is associated with significant rates of postoperative morbidity and mortality. One reason for the excess mortality in these patients, relative to otherwise similar patients who do not have preoperative DNR orders, may be their greater reluctance to pursue aggressive management of major complications in the postoperative period.

Keywords: acute care surgery, do not resuscitate, failure to rescue, geriatrics, general surgery, geriatrics, failure to rescue do not resuscitate palliative surgery general surgery

(*Ann Surg* 2012;256: 453–461)

General surgeons increasingly care for elderly patients who develop acute surgical disease in the setting of a preexisting do-not-resuscitate (DNR) order or other advanced directive.[1,2] In the emergency setting, there is little time for these patients to weigh their previously asserted preference against aggressive medical intervention against an assuredly grim prognosis should such intervention be declined. The surgical literature currently lacks a comprehensive description of what these patients might expect should they opt to pursue emergency general surgery. Instead, patients must rely on the anecdotal experience of their surgeon when deciding whether the potential outcomes associated with emergency operation are consistent with their overall goals of care. A clearer understanding of the likely postoperative outcomes in this growing population of patients would not only enable surgeons to provide patients with more informed counsel but might also influence patient preference regarding the desirability of aggressive surgical intervention.[3–5]

The presence of a preoperative DNR order has previously been shown to have an independent association with postoperative mortality among adults undergoing surgical procedures.[6,7] Although the underlying reason for this association is not clear, several potential explanations exist. DNR status may simply serve as a marker of overall health, with patients who have preoperative DNR orders being more prone to postoperative morbidity and mortality because of more extensive and severe comorbid disease relative to patients without such orders.[7,8] Alternatively, there is some concern based on published evidence that patients with DNR orders may receive less aggressive care due to a false perception among health care providers that a patient's DNR status reflects his or her attitude toward medical care in general.[1,9,10] Finally, it is also possible that the patients themselves may opt against aggressive management in the postoperative period despite having given their consent to the index operation, either because they have had more time to consider their goals of care or because an unexpected or unwanted event has occurred in the postoperative period.[3]

The objectives of our study were (1) to provide a description of anticipated postoperative outcomes following emergency general surgical procedures in patients with and without DNR orders and (2) to improve understanding of the relationship between preoperative DNR status and postoperative mortality. We hope that these data can be used to better inform the decisions of elderly DNR patients who must decide whether or not to accept emergency operative intervention for acute surgical disease.

METHODS

Patients from the 2005 to 2010 American College of Surgeons National Surgical Quality Improvement Program Participant User Files were included for analysis if they were 65 years or older and underwent an emergency operation for 1 of 10 common general surgical conditions (as determined by the postoperative *International Classification of Diseases, Ninth Revision, Clinical Modification*, code). These diagnoses included acute appendicitis, intestinal obstruction, gallbladder disease, intestinal ischemia, ventral hernia, intestinal perforation, diverticular disease, groin hernia, gastroduodenal ulcer, and colorectal malignancy. Patients with missing data for any of the data variables (except for preoperative serum albumin level) that were used in the analysis were excluded from the study. Patients without recorded albumin levels in our analysis were

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assumed to not have serum albumin levels checked, as opposed to levels checked but not recorded. We therefore considered preoperative serum albumin as a 3-level categorical variable (*normal*, *low*, or *not checked*).

The primary predictor variable for our analysis was patient preoperative DNR status (DNR vs non-DNR). The American College of Surgeons National Surgical Quality Improvement Program defines DNR as the presence of an order signed or cosigned by an attending physician in the 30 days before surgery (regardless of whether the DNR order was subsequently rescinded immediately before the index operation).[11] Patients with whom a DNR order had been discussed but not formally ordered and signed by an attending physician were not considered to belong to the DNR group. Numerous other predictor variables were also included in our analysis to adequately account for patient demographics, chronic comorbid conditions (including the presence of physical debilitation), acute preoperative patient condition, and complexity of the index emergency operation (Tables 1–4). Continuous predictor variables such as patient age, body mass index, operative time, and total work relative value units associated with the index operation were transformed into multilevel categorical variables whenever possible to facilitate statistical analyses and presentation of results. Total work relative value units were included in our analysis as an indicator of the complexity of the index operation received by each patient in our sample.[12] Preoperative blood transfusion and preoperative mechanical ventilation, which were included as variables reflective of acute preoperative patient condition, were also considered to represent potential markers of aggressiveness of preoperative care. Similarly, operative time and total work relative value units, which were included as variables reflective of intraoperative conduct, were considered to represent potential markers of aggressiveness of intraoperative care.

The primary outcome variable for our analysis was overall 30-day postoperative mortality. Secondary outcome variables included 30-day major postoperative complication rate, failure-to-rescue rate (defined as postoperative mortality in the setting of 1 or more major complications), reoperation within 30 days of the index procedure, and length of postoperative hospitalization (assuming postoperative survival).[13,14] For the purpose of our analysis, patients were considered to have a major complication if they developed 1 or more of the following specific complications within 30 days of their index operation: organ/space surgical site infection, wound dehiscence, pneumonia, pulmonary embolism, mechanical ventilatory requirement greater than 48 hours, unplanned reintubation, cardiac arrest requiring cardiopulmonary resuscitation, myocardial infarction, progressive renal insufficiency, acute renal failure requiring dialysis, stroke, coma length greater than 24 hours, failure of graft/prosthesis requiring intervention, bleeding requiring more than 3 units of packed red blood cells within 72 hours after index operation, systemic sepsis, and/or septic shock. Other complications that are tracked by the American College of Surgeons National Surgical Quality Improvement Program but that were not considered to be major complications in our analysis included superficial surgical site infection, deep incisional surgical site infection, urinary tract infection, deep venous thrombosis, and peripheral nerve injury.

Using the entire American College of Surgeons National Surgical Quality Improvement Program sample of elderly emergency general surgical patients, univariate comparison of preoperative/intraoperative variables for the DNR versus non-DNR groups was performed using Pearson χ^2 tests for categorical variables and Wilcoxon rank sum tests for continuous variables. Propensity score-matching techniques were then used in an attempt to draw from the overall American College of Surgeons National Surgical Quality Improvement Program study sample a well-matched cohort of non-DNR and DNR patients for comparison of postoperative outcomes. In brief, a multivariate logistic regression model was used to identify predictors of a patient's chances of having a preoperative DNR order. Potential predictor variables in this regression model included all patient- and procedure-related characteristics (Tables 1–4) that had a significant association with preoperative DNR status at the $P <$ 0.1 level. A propensity score for having a preoperative DNR order was then calculated for each patient in the overall study sample using logit coefficients for the predictors that were derived from the regression model. These propensity scores were then applied to create an evenly matched cohort of DNR and non-DNR patients, using a caliper-matching algorithm (with caliper distance of 0.005), with controls being used only once in the matching. The desired result of this process was for each DNR patient included in the cohort to have a non-DNR counterpart who was well matched with respect to preoperative and intraoperative characteristics. Comparisons of the perioperative characteristics and postoperative outcomes of the DNR versus non-DNR members of this matched cohort of patients were then performed using McNemar χ^2 tests for binary categorical variables, conditional logistic regression for multilevel categorical variables, and the Wilcoxon signed rank sum test for the length of postoperative hospitalization. Comparison of the complication-specific postoperative mortality rates of the DNR versus non-DNR members of the matched cohort was also performed using Pearson χ^2 tests. All statistical analyses were performed using Stata Version 11.0 (College Station, TX).

RESULTS

A total of 25,558 patients who met our inclusion criteria and had complete information for all variables were included for analysis. Of these, 1061 patients (4.2%) had preoperative DNR orders in place before their index operation (DNR group) whereas 24,497 (95.9%) did not have such orders (non-DNR group). Tables 1 to 4 show the preoperative and operative characteristics for the overall American College of Surgeons National Surgical Quality Improvement Program study sample, stratified by preoperative DNR status. In general, DNR patients were older, more likely to be female, and more likely to be underweight or normal in weight than non-DNR patients. DNR patients were also more likely than non-DNR patients to be admitted to the hospital preoperatively rather than taken to the operating room from the emergency department (66.5% vs 45.2%).

Table 2 shows variables reflective of functional status and chronic comorbid illness for all patients in our study. DNR patients were significantly more likely than non-DNR patients to show evidence of functional impairment (as seen by a higher incidence of nonindependent baseline functional status and decreased physical mobility due to neurological conditions). DNR patients were also more likely to be chronically ill, having a significantly higher incidence than non-DNR patients in 7 of the 9 comorbid conditions that were included in our analysis. Similarly, DNR patients also seemed to be more acutely ill upon presentation to the hospital than non-DNR patients as suggested by a comparison of markers of acute patient physiological status (Table 3). For example, DNR patients were twice as likely as non-DNR patients (52.6% vs 26.7%) to be assigned an American Society of Anesthesiologists' Physical Status Classification of 4 or more (American Society of Anesthesiologists' class 4 corresponds to having a severe systemic disease that presents a constant threat to life). DNR patients were also less likely to have a normal preoperative serum albumin level than non-DNR patients and more likely to present with sepsis or septic shock. DNR patients were also more likely to receive significant preoperative transfusion (define by the American College of Surgeons National Surgical

TABLE 1. Demographic Characteristics of All Elderly NSQIP Patients Undergoing Emergency General Surgery, Stratified by Preoperative DNR Status

	DNR (N = 1,061)	Non-DNR (N = 24,497)	*P*
Patient age, yr			<0.0001
65–69	70 (6.6%)	6,096 (24.9%)	
70–74	86 (8.1%)	5,002 (20.4%)	
75–79	153 (14.4%)	4,914 (20.1%)	
80–84	250 (23.6%)	4,381 (17.9%)	
85–89	272 (25.6%)	2,823 (11.5%)	
≥90	230 (21.7%)	1,281 (5.2%)	
Female	701 (66.1%)	13,596 (55.5%)	<0.0001
Body mass index			<0.0001
Underweight (<20 kg/m^2)	222 (20.9%)	3,676 (15.0%)	
Normal (20–24 kg/m^2)	360 (33.9%)	7,289 (29.8%)	
Overweight (25–29 kg/m^2)	291 (27.4%)	7,342 (30.0%)	
Obese (≥ 30 kg/m^2)	188 (17.7%)	6,190 (25.3%)	
Preoperative admission status			<0.0001
Not admitted	356 (33.6%)	13,428 (54.8%)	
Admitted to surgical service	340 (32.1%)	5,913 (24.1%)	
Admitted to nonsurgical service	365 (34.4%)	5,156 (21.1%)	
Intraoperative surgical trainee participation	604 (56.9%)	14,847 (60.6%)	0.02

NSQIP indicates National Surgical Quality Improvement Program; kg, kilogram; m, meter.

TABLE 2. Cognitive/Functional Status and Chronic Comorbid Conditions for All Elderly NSQIP Patients Undergoing Emergency General Surgery, Stratified by Preoperative DNR Status

	DNR (N = 1,061)	Non-DNR (N = 24,497)	*P*
Nonindependent functional status	335 (31.6%)	2,017 (8.2%)	<0.0001
Decreased physical mobility	62 (5.8%)	513 (2.1%)	<0.0001
Diabetes mellitus	212 (20.0%)	4,557 (18.6%)	0.26
Chronic obstructive pulmonary disease	207 (19.5%)	3,008 (12.3%)	<0.0001
Congestive heart failure	95 (9.0%)	829 (3.4%)	<0.0001
Coronary artery disease	234 (22.1%)	4,920 (20.1%)	0.12
Renal dysfunction	91 (8.6%)	1,285 (5.3%)	<0.0001
Chronic steroid use	94 (8.9%)	1,535 (6.3%)	0.001
Bleeding disorder	247 (23.3%)	4,063 (16.6%)	<0.0001
Known malignancy	88 (8.3%)	1,125 (4.6%)	<0.0001
Cerebrovascular disease	266 (25.1%)	2,959 (12.1%)	<0.0001

NSQIP indicates National Surgical Quality Improvement Program.

Quality Improvement Program as >4 units of packed red blood cells in the 72 hours before operation) but were not more likely to require preoperative mechanical ventilation.

Table 4 shows the intraoperative characteristics of all patients included in the study. Although there is no indication in the American College of Surgeons National Surgical Quality Improvement Program about the extent to which a patient's ultimate surgical diagnosis might be known preoperatively, DNR patients were more likely than non-DNR patients to receive a postoperative diagnosis of intestinal obstruction, intestinal ischemia, gastroduodenal ulcer disease, or complications of colorectal malignancy. Overall, operative time and total work relative value units (which we considered a marker of procedure complexity) were significantly greater in DNR patients than in non-DNR patients. When compared individually for each of the 10 postoperative diagnosis classifications included in our analysis, median operative time differed between the 2 groups only in patients with colorectal malignancy (with DNR patients having a shorter median operative time than non-DNR patients; data not shown). Conversely, the median total work relative value units associated with index operation did not differ between the 2 groups for 7 of the diagnoses and was greater in the DNR group for 3 of the diagnoses (intestinal obstruction, acute appendicitis, and gallbladder disease; data not shown). Finally, DNR patients were significantly more likely than non-DNR patients to require intraoperative transfusion of blood products.

Table 5 shows the primary and secondary postoperative outcomes for all elderly DNR patients from the overall American College of Surgeons National Surgical Quality Improvement Program study sample. Thirty-day postoperative mortality rate ranged from 9.4% (for operations related to a ventral hernia complication) to 55.6% (for operations related to intestinal perforation), whereas the major complication rate ranged from 26.0% (for operations related to gallbladder disease) to 60.0% (for operations related to gastroduodenal ulcer disease). The overall failure-to-rescue rate (defined as mortality in the setting of 1 or more major postoperative complications) was 57.0%, with diagnosis-specific rates ranging from 22.7% (for operations related to a ventral hernia complication) to 65.8% (for operations related to diverticular disease).

Propensity score matching was performed to adjust as much as possible for known and potentially unknown differences between DNR and non-DNR patients when comparing the outcomes of these

TABLE 3. Acute Physiological Characteristics for All Elderly NSQIP Patients Undergoing Emergency General Surgery, Stratified by Preoperative DNR Status

	DNR (N = 1,061)	Non-DNR (N = 24,497)	*P*
Acute coma or impaired sensorium	130 (12.3%)	1,271 (5.2%)	<0.0001
ASA physical status class ≥4	558 (52.6%)	6,546 (26.7%)	<0.0001
Preoperative mechanical ventilation	68 (6.4%)	1,264 (5.2%)	0.07
Preoperative infected wound	78 (7.4%)	973 (4.0%)	<0.0001
Preoperative transfusion	49 (4.6%)	622 (2.5%)	<0.0001
Prior operation within 30 d	49 (4.6%)	1,334 (5.5%)	0.24
Preoperative albumin			<0.0001
Normal (≥3.5 mg/dL)	259 (24.4%)	10,310 (42.1%)	
Low (<3.5 mg/dL)	626 (59.0%)	8,574 (35.0%)	
Not checked	176 (16.6%)	5,613 (22.9%)	
Preoperative sepsis classification			<0.0001
None	482 (45.4%)	13,699 (55.9%)	
SIRS	297 (28.0%)	6,268 (25.6%)	
Sepsis	148 (14.0%)	2,779 (11.3%)	
Septic shock	134 (12.6%)	1,751 (7.2%)	

NSQIP indicates National Surgical Quality Improvement Program; ASA, American Society of Anesthesiologists; SIRS, systemic inflammatory response syndrome.

TABLE 4. Intraoperative Characteristics for All Elderly NSQIP Patients Undergoing Emergency General Surgery, Stratified by Preoperative DNR Status

	DNR (N = 1,061)	Non-DNR (N = 24,497)	*P*
Diagnosis			<0.0001
Intestinal obstruction	310 (29.2%)	5,380 (22.0%)	
Acute appendicitis	50 (4.7%)	4,736 (19.3%)	
Gallbladder disease	104 (9.8%)	2,510 (10.3%)	
Intestinal ischemia	144 (13.6%)	2,196 (9.0%)	
Ventral hernia	53 (5.0%)	1,930 (7.9%)	
Intestinal perforation	72 (6.8%)	1,796 (7.3%)	
Diverticular disease	77 (7.3%)	1,751 (7.2%)	
Groin hernia	65 (6.1%)	1,597 (6.5%)	
Gastroduodenal ulcer	90 (8.5%)	1,420 (5.8%)	
Colorectal malignancy	96 (9.1%)	1,181 (4.8%)	
Operative time			<0.0001
<50 min	187 (17.6%)	5,726 (23.4%)	
50–79 min	302 (28.5%)	7,052 (28.8%)	
80–119 min	319 (30.1%)	6,132 (25.0%)	
≥120 min	253 (23.9%)	5,587 (22.8%)	
Contaminated/dirty incisional wound	535 (50.4%)	12,920 (52.7%)	0.14
Intraoperative transfusion	139 (13.1%)	2,168 (8.9%)	<0.0001
Total work relative value units			<0.0001
<12	118 (11.1%)	6,003 (24.5%)	
12–22	272 (25.6%)	6,295 (25.7%)	
23–36	304 (28.7%)	6,122 (25.0%)	
≥37	367 (34.6%)	6,077 (24.8%)	

NSQIP indicates National Surgical Quality Improvement Program.

2 groups. Such adjustment seemed particularly necessary, given the many aforementioned differences that resulted between these groups upon analysis of the overall study sample. As shown in Table 6, the propensity-matching algorithm that we used resulted in a smaller cohort of non-DNR patients that seemed to be very well matched to DNR patients for all of the patient- and operation-related variables that were available for risk adjustment. A comparison of the postoperative outcomes of this matched cohort is shown in Table 7. Although 30-day postoperative mortality was significantly greater in DNR patients [36.9% vs 22.3%, odds ratio for mortality in DNR group = 2.07 (95% confidence interval, 1.69–2.55)], there was no significant difference between the 2 groups in the incidence of major postoperative complications [42.1% for DNR patients vs 40.2% for non-DNR patients, odds ratio for major postoperative complication in DNR patients = 1.08 (95% confidence interval, 0.91–1.29)]. Among those patients who did sustain 1 or more complications, subsequent mortality (ie, failure-to-rescue) was significantly higher in the DNR group than in the non-DNR group. Furthermore, DNR patients were significantly less likely than non-DNR patients to undergo reoperation within 30 days after index operation. Preoperative DNR status did not have a significant effect on postoperative length of hospitalization.

Figure 1 shows the mortality rates of patients from the propensity-matched cohort who suffered specific postoperative complications. Several complications (such as stroke, coma, or

TABLE 5. Postoperative Outcomes After Emergency General Surgery for All Elderly NSQIP Patients With a Preoperative DNR Order, Stratified by Postoperative Diagnosis

Postoperative Diagnosis (No. Patients in "DNR" Group)	30-Day Mortality	30-Day Major Complication	Failure –to Rescue	Reoperation	Postoperative LOS (Among Survivors), d
Intestinal obstruction (n = 310)	100 (32.3%)	127 (41.0%)	9 (54.3%)	24 (7.7%)	9 (6–14)
Acute appendicitis (n = 50)	9 (18.0%)	18 (36.0%)	8 (44.4%)	3 (6.0%)	5 (3–8)
Gallbladder disease (n = 104)	24 (23.1%)	27 (26.0%)	17 (63.0%)	4 (3.9%)	5 (3–8)
Intestinal ischemia (n = 144)	89 (61.8%)	72 (50.0%)	49 (68.1%)	18 (12.5%)	12 (8–16)
Ventral hernia (n = 53)	5 (9.4%)	22 (41.5%)	5 (22.7%)	8 (15.1%)	8 (5–14.5)
Intestinal perforation (n = 72)	40 (55.6%)	39 (54.2%)	23 (59.0%)	5 (6.9%)	10.5 (8–17)
Diverticular disease (n = 30)	30 (39.0%)	38 (49.4%)	25 (65.8%)	7 (9.1%)	9 (7–13)
Groin hernia (n = 65)	18 (27.7%)	19 (29.2%)	11 (57.9%)	6 (9.2%)	5 (3–8)
Gastroduodenal ulcer (n = 90)	48 (53.3%)	54 (60.0%)	30 (55.6%)	5 (5.6%)	13 (9–17)
Colorectal malignancy (n = 32)	32 (33.3%)	30 (31.3%)	17 (56.7%)	7 (7.3%)	8 (6.5–10)
Total (N = 1061)	395 (37.2%)	446 (42.0%)	254 (57.0%)	87 (8.2%)	8 (6–13)

NSQIP indicates National Surgical Quality Improvement Program; LOS, length of stay.

cardiac arrest) were associated with high mortality rates in both the DNR and non-DNR groups. Other complications (such as renal insufficiency, myocardial infarction, organ/space surgical site infection, or pneumonia) were associated with significantly higher mortality rates for DNR patients than for non-DNR patients.

DISCUSSION

Our analysis of more than 25,000 patients in the American College of Surgeons National Surgical Quality Improvement Program database shows that elderly patients who undergo emergency general surgical procedures suffer very high mortality and morbidity and that they are more likely to die within 30 days of the operation if they carried DNR orders preoperatively. Although the alternative for many of these patients should they have refused operation would have been likely death, the findings of our study nevertheless serve to underscore the ominous outcomes associated with emergency general surgical intervention in the elderly population. To our knowledge, this is the most detailed description of early postoperative outcomes among elderly DNR patients requiring emergency general surgery to be published. Our specification of diagnosis-specific postoperative mortality and morbidity rates will enable general and acute care surgeons to use objective data rather than anecdotal observation when advising elderly DNR patients about the anticipated risks of emergency operation. Although a better understanding of these outcomes may not alter a patient's decision to undergo operation, it will nevertheless provide surgeons with greater confidence in their ability to provide unbiased counsel to patients and/or their health care proxies. Alternatively, receiving a more objective presentation of potential postoperative outcomes may dissuade some patients from pursuing emergency operation, depending on their particular goals of care.[3] Either way, studies drawn from the oncology literature clearly demonstrate that the quality of prognostic information can have a significant effect on patient treatment decisions.[4,5] Therefore, any resource that adds to the ability of surgeons to predict postoperative outcomes in the elderly population must necessarily be viewed as useful.

In addition to its practical utility, the findings of our study may also help to elucidate potential causes for the independent association between preoperative DNR status and postoperative mortality that we and others have demonstrated.[6,7] Specifically, we believe that the major contributing factor for the higher mortality among DNR patients in our propensity-matched cohort was their greater likelihood (compared with non-DNR patients) of succumbing to major postoperative complications. Although "failure to rescue" is the traditional term that is used to describe death in the setting of postoperative complications, such a moniker is potentially misleading when used to describe mortality among patients who undergo emergency operation.[13,14] "Failure to rescue" implies that patient death due to postoperative complications has occurred despite every and all attempts to prevent such death. A close examination of the findings of our analysis suggests "failure-to-pursue rescue" as a more accurate descriptor of the excess mortality suffered by elderly DNR patients who experience major postoperative complications, as this term better reflects the possible disinclination among such patients to accept aggressive management of these complications.

The results of our analysis do not suggest that increased presence and/or severity of comorbid illnesses are responsible for the greater postoperative mortality rates experienced by DNR patients. Although DNR patients in our overall study sample did seem to be more acutely and chronically ill than non-DNR patients, our use of propensity matching seemed to adequately adjust for this baseline difference in health status. Specifically, the non-DNR patients who were included in our smaller, propensity-matched cohort were uniformly well matched to DNR patients with respect to incidence and severity (when severity is known) of all of the preoperative variables included in our analysis. In addition, preoperative DNR status did not seem to influence the incidence of major postoperative complications in our matched cohort (40.2% for non-DNR patients vs 42.1% for DNR patients, $P = 0.38$). We would have expected to find a higher rate of major postoperative complications in DNR patients if they were in some way "sicker" than the non-DNR patients who were included in our matched cohort. In the absence of such a finding, we cannot conclude that disparate degrees of comorbid illness explain the discrepancy in surgical mortality that we describe.

Similarly, our findings do not support the existence of an overt bias among physicians against aggressive preoperative or intraoperative management of elderly DNR patients. Our inclusion of markers of aggressiveness of preoperative/intraoperative care in our propensity-matching algorithm theoretically adjusts for such differences. Even before this adjustment, however, a comparison of the unmatched study sample suggests that DNR patients were managed just as aggressively as non-DNR patients in the preoperative period. For example, DNR patients were as likely or more likely to receive packed red blood cell transfusion and/or mechanical ventilation before operation. Similarly, a review of diagnosis-specific operative times and total work relative value units suggests that the operations performed in DNR patients were just as complex as those performed in non-DNR patients. Taken together, these findings argue against less aggressive preoperative or

TABLE 6. Perioperative Characteristics of Propensity-Matched Cohort of Elderly Patients Undergoing Emergency General Surgery, Stratified by Preoperative DNR Status

	DNR (N = 1053)	Non-DNR (N = 1053)	P
Female	693 (65.8%)	690 (65.5%)	0.89
Body mass index			0.38
Underweight (<20 kg/m^2)	357 (33.9%)	376 (35.7%)	
Normal (20–24 kg/m^2)	220 (20.9%)	220 (20.9%)	
Overweight (25–29 kg/m^2)	290 (27.5%)	289 (27.5%)	
Obese (≥ 30 kg/m^2)	186 (17.7%)	168 (16.0%)	
Patient age, yr			0.14
65–69	70 (6.7%)	56 (5.3%)	
70–74	86 (8.2%)	88 (8.4%)	
75–79	153 (14.5%)	172 (16.3%)	
80–84	250 (23.7%)	255 (24.2%)	
85–89	269 (25.6%)	273 (25.9%)	
≥90	225 (21.4%)	209 (19.9%)	
Nonindependent functional status	328 (31.2%)	321 (30.5%)	0.71
Decreased physical mobility	60 (5.7%)	57 (5.4%)	0.77
Chronic obstructive pulmonary disease	204 (19.4%)	206 (19.6%)	0.91
Congestive heart failure	92 (8.7%)	98 (9.3%)	0.65
Renal dysfunction	91 (8.6%)	95 (9.0%)	0.76
Chronic steroid use	94 (8.9%)	81 (7.7%)	0.30
Bleeding disorder	246 (23.4%)	250 (23.7%)	0.84
Known malignancy	87 (8.3%)	93 (8.8%)	0.64
Cerebrovascular disease	261 (24.8%)	270 (25.6%)	0.65
Acute coma or impaired sensorium	126 (12.0%)	114 (10.8%)	0.40
ASA physical status class ≥4	550 (52.2%)	575 (54.6%)	0.24
Preoperative mechanical ventilation	68 (6.5%)	82 (7.8%)	0.24
Preoperative infected wound	77 (7.3%)	70 (6.7%)	0.54
Preoperative transfusion	49 (4.7%)	50 (4.8%)	0.92
Preoperative albumin			0.88
Normal (≥ 3.5 mg/dL)	259 (24.6%)	257 (24.4%)	
Low (< 3.5 mg/dL)	618 (58.7%)	627 (59.5%)	
Not checked	176 (16.7%)	169 (16.1%)	
Preoperative sepsis classification			0.74
None	480 (45.6%)	482 (45.8%)	
SIRS	294 (27.9%)	278 (26.4%)	
Sepsis	148 (14.1%)	148 (14.1%)	
Septic shock	131 (12.4%)	145 (13.8%)	
Operative time			0.60
<50 min	187 (17.8%)	204 (19.4%)	
50–79 min	298 (28.3%)	291 (27.6%)	
80–119 min	317 (30.1%)	305 (29.0%)	
≥120 min	251 (23.8%)	253 (24.0%)	
Intraoperative transfusion	139 (13.2%)	145 (13.8%)	0.92
Total work relative value units			0.97
<12	118 (11.2%)	112 (10.6%)	
12–22	270 (25.6%)	271 (25.7%)	
23–36	302 (28.7%)	308 (29.3%)	
≥37	363 (34.5%)	362 (34.4%)	
Diagnosis			0.98
Intestinal obstruction	308 (29.3%)	313 (29.7%)	
Acute appendicitis	50 (4.8%)	42 (4.0%)	
Gallbladder disease	103 (9.8%)	109 (10.4%)	
Intestinal ischemia	143 (13.6%)	155 (14.7%)	
Ventral hernia	53 (5.0%)	46 (4.4%)	
Intestinal perforation	72 (6.8%)	74 (7.0%)	
Diverticular disease	76 (7.2%)	77 (7.3%)	
Groin hernia	65 (6.2%)	60 (5.7%)	
Gastroduodenal ulcer	90 (8.6%)	84 (8.0%)	
Colorectal malignancy	93 (8.8%)	93 (8.8%)	
Preoperative admission status			0.95
Not admitted	355 (33.7%)	351 (33.3%)	
Admitted to surgical service	336 (31.9%)	333 (31.6%)	
Admitted to Nonsurgical service	362 (34.4%)	369 (35.0%)	
Intraoperative resident participation	602 (57.2%)	621 (59.0%)	0.39

ASA indicates American Society of Anesthesiologists; SIRS, systemic inflammatory release syndrome.

TABLE 7. Postoperative Outcomes of Propensity-Matched Cohort of Elderly Patients Undergoing Emergency General Surgery, Stratified by Preoperative DNR Status

	DNR (N = 1053)	Non-DNR (N = 1053)	Odds Ratio (95% CI)
30-d mortality	388 (36.9%)	235 (22.3%)	2.07 (1.69–2.55), $P < 0.0001$
Major complication	443 (42.1%)	423 (40.2%)	1.08 (0.91–1.29), $P = 0.38$
Failure-to-rescue	251 (56.7%)	175 (41.4%)	2.07 (1.30–3.38), $P = 0.001$
Reoperation	87 (8.3%)	126 (12.0%)	0.67 (0.50–0.90), $P = 0.006$
Postoperative length of stay	8 (6–13)	9 (6–15)	0.12

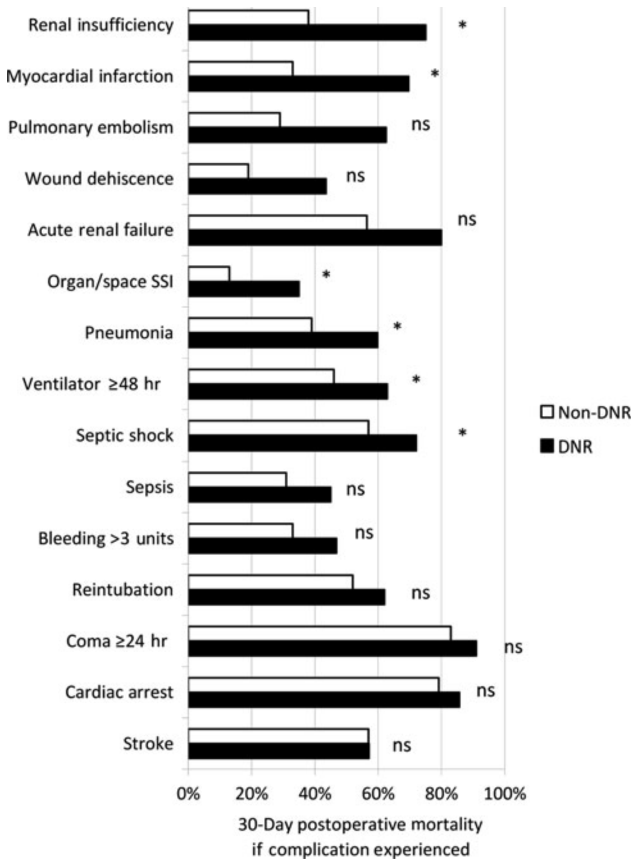

FIGURE 1. Postoperative mortality rates associated with specific complications for propensity-matched cohort, stratified by preoperative DNR status. Asterisk (*) indicates $P < 0.05$ in univariate comparison of complication-specific mortality rates of DNR versus non-DNR patients from propensity-matched cohort; "ns," $P > 0.05$.

intraoperative care as a reason for the higher postoperative mortality experienced by elderly DNR patients.[12,15,16]

The reason for increased mortality among DNR patients that is best supported by the findings of our study is that such patients are less likely than non-DNR patients to receive aggressive therapy for major postoperative complications. Approximately 57% of DNR patients from our matched cohort died after developing a major postoperative complication compared with 41% of non-DNR patients, despite the fact that the 2 groups had no detectable difference in their physiological ability to withstand such complications. Further evidence of failure-to-pursue rescue as the primary reason for the association between preoperative DNR status and postoperative mortality is the finding that DNR patients from the matched cohort were significantly less likely than non-DNR patients to undergo reoperation in the postoperative period. Although the American College of Surgeons National Surgical Quality Improvement Program does not provide information on the indication for reoperation, we have no reason to expect this indication to differ between the 2 groups of our matched cohort. Therefore, we believe that the lower reoperation rate among DNR patients from our matched cohort reflects the fact that they are less likely to consent to such intervention when it is indicated.

An elderly patient's decision to undergo emergency operation is time sensitive and often made in the setting of severe physical discomfort. Our findings suggest that although many such patients will consent to emergency surgery, they will be more likely to decline aggressive medical intervention in the postoperative period if they had established DNR directives in place before the procedure. Although such behavior may seem paradoxical (accepting maximally invasive treatment in the form of emergency operation but declining less invasive treatment in the form of management of major complications), it seems more logical when viewed within the framework of "patient's goals of care."[3] Patients may be willing to undergo emergency operation for a life-threatening disease process knowing that they will be provided general anesthesia during the operation and that there is a reasonable chance that surgery will immediately improve their pain and definitively treat the cause of that pain. Upon further reflection in the postoperative period (especially in the setting of a major complication), they may discover that the procedure has left them more debilitated or that the postoperative discomfort is worse than they had hoped. As a result, their willingness to undergo continued aggressive management becomes more closely aligned with the reality of their postoperative course. Support for the impact of complications of medical care on patient preference for such care comes from a multicenter study by Nathens et al[17] of predictors of patient DNR status after severe traumatic injury. These authors found that the development of postinjury complications that resulted in end-organ dysfunction was independently associated with a patient being designated as DNR during his or her postinjury hospitalization.

Our analysis does indicate certain specific postoperative complications for which the discrepancy in subsequent mortality between non-DNR and DNR patients is relatively large. For example, we found DNR patients to be significantly more likely than non-DNR to die in the setting of postoperative renal insufficiency, myocardial infarction, organ/space surgical site infection, and pneumonia. If these discrepancies in complication-specific mortality are in fact due to a higher rate of failure-to-pursue rescue among DNR patients, then such patients may benefit from knowing that there is a possibility of improved survival should they accept aggressive management of these specific complications. Whether this improved understanding will alter the decision to forego such management will ultimately depend on a variety of factors, including individual goals of care and the perceived invasiveness of the management needed to treat the complication.

Our analysis has several important limitations. First, we lack the necessary patient-level information to conclusively determine context in which patient deaths occurred Prospective survey analysis will ultimately be required to confirm the extent to which failure-to-pursue rescue explains the excess mortality that elderly DNR patients experience after emergency general surgery. Second, the contribution that attending surgeon input has on a patient's decision to reject aggressive management of postoperative complications also cannot be assessed using information from data sources such as the American College of Surgeons National Surgical Quality Improvement Program. Third, the results of our analysis do not necessarily extend to nonelderly patients or to patients who undergo elective surgical intervention. Fourth, because the American College of Surgeons National Surgical Quality Improvement Program includes only patients who underwent an operation, we do not know the outcomes of elderly DNR patients who present with acute surgical disease but who do not receive an operation. It may be that less invasive interventions (such as percutaneous cholecystostomy drain placement or intravenous antibiotics) may adequately alleviate the symptoms of such patients while enabling their short-term survival. However, a comparison of outcomes for the full spectrum of treatment options (operation intervention vs nonoperative intervention vs comfort care) is not possible using the American College of Surgeons National Surgical Quality Improvement Program.

Despite these limitations, our study demonstrates that emergency general surgery is associated with significant morbidity and mortality in elderly patients. Furthermore, our findings suggest that one reason for the excess mortality experienced by that subgroup of elderly patients who have preoperative DNR orders is their failure-to-pursue rescue when major postoperative complications occur. Although confirmation of this finding will require prospective survey analysis, it is nevertheless reasonable to expect that the results of our study will enable general surgeons to provide more accurate and therefore more useful prognostic information to elderly patients who develop emergency general surgical conditions.

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DISCUSSANT

DR. RONNIE ROSENTHAL (West Haven, CT): The population of the United States is clearly aging, and the most rapidly growing segment is those over age 85. It is estimated that by 2050, 20 million Americans will be 85 years old or older. How we as a nation will be able to provide cost-effective care to our oldest patients as they approach the end of life, within the context of the individual's goals and preferences, is a central issue in the current, contentious healthcare reform debate.

Recently, attention has focused on the large geographic variation in the rates of utilization of aggressive medical and surgical interventions at the end of life. This variability indicates that healthcare decisions at the end of life are complex and not likely governed by patient preference alone, but rather by a combination of factors, including availability of services and physician/surgeon practice patterns and attitudes.

I want to congratulate Dr. Scarborough and his colleagues on their efforts to shed some light on the surgical decision making process at the end of life by examining the factors that contribute to poor outcomes of emergency general surgery in DNR (Do-Not-Resuscitate) patients. This is a well-done study, using data from the ACS-NSQIP, which is a reliable, well-defined database with a large number of patients.

Dr. Scarborough, you demonstrated that patients with the clinical characteristics of DNR patients (that is, older and sicker than others) have a high complication rate whether or not they have a DNR. Both groups also had very high mortality and "failure to rescue from a complication" rates, although these rates were clearly significantly higher in the DNR patients.

In your conclusions, you state that the increase in mortality and "failure to rescue" in DNR patients is attributable to the patient (or, more likely, the surrogate) declining further intervention once a complication occurs.

If that is the case, how do suggest we use these data on "failure to rescue" to counsel the individual patient and his or her family who come to the ER in the middle of the night with an acute abdominal emergency? Do you think that this counseling should be substantively different in similarly ill patients who do not have a DNR order?

CLOSING DISCUSSANT

DR. JOHN E. SCARBOROUGH: You asked how we use this data to counsel patients prior to their operations. We hope that our findings will provide general and acute care surgeons and their elderly emergency surgical patients with an objective resource for determining anticipated postoperative outcomes. These patients need to know that their expected incidence of major postoperative complications will be as high as 50%, and if they sustain one or more such complications their mortality will also approximate 50%. Whether this prognostic information will influence a patient's decision to proceed with emergency surgical intervention cannot be known.

There is evidence from the oncology literature that a better understanding of a patient's prognosis will affect his or her treatment decisions, particularly with regard to aggressive treatments, or treatment options that are associated with high morbidity or serious morbidity. Whether this extends to emergency surgery is unclear, since in most cases the alternative to operative management is a high likelihood of death.

Your second question was whether this discussion should differ between DNR patients and non DNR patients. DNR patients and their surrogates should be informed that they may develop postoperative complications that require aggressive or invasive management. Our findings suggest that many such patients decline aggressive management in the postoperative period, and this does need to be discussed preoperatively with DNR patients. However, a similar "failure-to-pursue-rescue" scenario is also probably likely to occur among elderly emergency surgery patients who do not have a preoperative DNR order. These patients also carry relatively high morbidity and mortality. Therefore, I do not think that the discussion should differ too much between DNR patients and non-DNR patients.

DISCUSSANT

DR. NORMAN ESTES (Peoria, IL): In the early 1990s, the JCHO required hospitals to include an advance directive on the chart of all patients being admitted. To accomplish this, most hospitals elected to have a nurse talk with the patient and create the advance directive or place it if it had previously been completed. I do not know that surgeons are doing this in many hospitals.

At our last M&M, we saw three patients, aged 90 or older, who died, and it appeared that most of the care was withdrawn from them because of the advanced directives. Do you think that surgeons should be more involved in the decision for advanced directive, and discuss this with patients prior to admission? The surgeon signs it, but does not have the discussion with the patient most frequently.

CLOSING DISCUSSANT

DR. JOHN E. SCARBOROUGH: Of note, NSQIP defines the DNR order, it requires the order to be signed or cosigned by the attending physician, with regards to your first comment.

As far as whether a surgeon should be more involved in conversations about advanced directives with patients, we do not know from NSQIP who has the conversation with the patient, but you are certainly correct that it is probably not the attending surgeon. Ideally, the surgeon should be more engaged in that conversation, although it does depend on the surgeon. It is a very delicate conversation that requires a fair amount of time. Conveying an accurate portrayal of likely postoperative outcomes is the most important contribution that the surgeon can provide to the conversation, though whether the surgeon or a geriatrician or palliative care physician leads the conversation is subject to debate. It is certainly important that the surgeon know a patient's intent in signing a DNR order, since as we know from the number of DNR patients in our study who received emergency surgery, DNR does certainly not mean "do not treat."

DISCUSSANT

DR. ANNA M. LEDGERWOOD (Detroit, MI): I think what you miss getting out of the NSQIP data is the little old lady who comes in with a back problem, has her operation, and postoperatively the family sees her and says, no, grandma would not want this, and recommends care be terminated., and that is what is happening, would be my interpretation of your data. I do not know how you get that out of the NSQIP data.

CLOSING DISCUSSANT

DR. JOHN E. SCARBOROUGH: That is a very important point, and our inability to define the context of patient deaths in our study is just one of its many limitations. We could actually spend ten minutes alone on the limitations of our study, but I do not think that particular abstract was accepted by the Program Committee. Further prospective evaluation of the effect of preoperative DNR status on surgical outcomes should clarify the context of patients' deaths, specifically whether they occurred before or after complications and whether "failure-to-pursue rescue" was the patient's decision or the surrogate's. I will say that a majority of patients who died postoperatively in the absence of identifiable major complications did so within the first few days of their operation. Some of these patients are likely the ones to which you refer, Dr. Ledgerwood.

DISCUSSANT

DR. MICHAEL ZENILMAN (Bethesda, MD): Your data is very similar to a recent paper published in *Annals of Surgery* eight months ago about abdominal surgery in nursing home patients (Finlayson et al, 254:921-6 2011). The authors noted very similar death and complication rates. I wonder if your cohort is similar-DNR patients and nursing home patients who undergo surgery- and whether DNR status can be used as a marker for risk.

Regarding Dr. Estes' question, there was an article in *Annals of Surgery* three months ago (Redmann et al 255:418–423, 2012) which showed that surgeons talk about advanced directives only 50% of the time. So, we really are not very good at talking about this with the patients in real time.

Lastly, the American College of Surgeons has a position statement on DNR in the OR, and they state that advanced directives should be suspended in the perioperative period. We all know that most complications that happen in the perioperative period are reversible. Were you able to isolate when the complications occurred in the postoperative period? Specifically, those that occur within two or three days of surgery are likely reversible and the ones that occur a week or so later are likely not; this could help explain your observations.

CLOSING DISCUSSANT

DR. JOHN E. SCARBOROUGH: We do know the date for diagnosis of complications, but did not look specifically at that data. We only looked at the date on death for those patients who suffered no complications and found that it tended to be very early postoperatively.