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The clinical quandary of counseling the moribund critical care patient—a registry analysis of postsurgical outcomes ☆

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Abstract

Purpose: To provide outcomes data to intensivists and surgeons for counseling patients and family members when considering a surgical intervention in a moribund patient.

Materials and Methods: Retrospective analysis of prospectively collected data from the American College of Surgeons National Surgical Quality Improvement Program database in moribund patients undergoing general surgical procedures.

Results: Out of 633,262 patients available in the national registry, 2063 (0.3%) were of moribund status. Post-operative mortality was 52.8% for moribund patients. Those who died had higher rates of compromised respiratory, renal and cognitive dysfunction, were older, less independent prior to surgery and had generally longer surgeries. 83% of patients experienced a major complication including mortality and 17 % of patients experienced minor complications.

Conclusion: The moribund patient is not as grave as once thought and surgery on these patients may not be futile given the 47% survival rate at 30 days. Postoperative complication rates are high. The data presented provide a meaningful tool for the clinicians in counseling patients and families on the expectations when considering a surgical intervention for moribund patients.

1. Introduction

In the critically ill patient for whom surgical intervention is being deliberated, the communication between caregivers, the patient, and family members is crucial. Although risks and benefits need to be addressed, managing realistic expectations about possible outcomes is also essential. A

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multidisciplinary approach of caring for critical ill patients improves patient outcomes but also attributes variation in the quality of communication with patients and families [1,2]. Frustration, dissatisfaction, and mistrust in the care process are possible reactions by the patient and family as a result of unrealistic expectations and inconsistent counsel [2-4]. A multisociety task force identified a "silo-ed" approach to critical care as a specific challenge, emphasizing suboptimal communication among professionals [5]. The surgical team leader needs to assimilate the opinions of the entire medical team and also have evidence to support the recommendations.

Studies investigating high-risk patients undergoing surgery report considerable variability in the incidence of mortality, ranging from 9% to 93% [6-11]. There is a paucity of studies that focus specifically on moribund patients, as most studies exclude them. In one of the few studies only including the most severely ill patients, Church [12] determines a 30-day mortality of 57% for colorectal surgical patients undergoing laparotomies. The broad range of reported mortality could be due to small sample sizes, variability in patient population, differences in types of surgical procedures, or the retrospective nature of the studies.

The absence of reliable outcomes data adds to the difficulty of the already ethically and emotionally taxing decision to operate on a moribund patient. Surgical intervention can sell false hope and expectation by denoting optimistic prospects to the patient and families. When a surgical intervention is considered for a moribund patient, critical care teams can find themselves in a difficult bind counseling families on the merits of undergoing an invasive procedure versus comfort measures only on their particular patient. The main aim of this study is to provide mortality and morbidity outcomes for the moribund patient using a national database and incorporating various surgical procedures. In addition, moribund patients who survived for at least 30 days postoperatively and those who died are compared using baseline demographic, morphometric, and surgical variables.

2. Methods

With approval of the institutional review board, we accessed prospectively collected data on 635 265 patients undergoing general surgical procedures between 2005 and 2008 at 1 of 243 hospitals participating in the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP). The ACS-NSQIP is a nationally validated, risk-adjusted, outcomes-based program, which incorporates a prospective, peer-controlled, externally validated data collection process to quantify 30-day outcomes. Each participating institution employs a trained full-time clinical nurse reviewer, responsible for collecting data on preoperative risk factors, procedures performed, and various 30-day outcomes on an 8-day cycle. Only the first operation associated with each patient during his or her hospital stay has been encoded into the database. Thirty-day outcomes, defined by National Surgical Quality Improvement Program criteria, were classified as major and minor complications. Major complications included systemic infections including systemic inflammatory response syndrome, sepsis, and septic shock; respiratory complications including pneumonia, failure to wean from ventilation at 48 hours postoperatively, and unplanned intubation; wound infection including superficial and deep wound infections, organ/space infections, and wound disruptions; progressive renal insufficiency and acute renal failure; central nervous system (CNS) complications including stroke, coma greater than 24 hours postoperatively, and peripheral nerve injury; thrombotic complications including pulmonary embolism, deep venous thrombosis, and thrombophlebitis; cardiovascular complications including acute myocardial infarction and cardiac arrest requiring resuscitation; and other complications including failure of a graft, prosthesis, or flap as well as bleeding requiring transfusion of at least 4 U of packed red blood cells. *Minor complications* were defined as either superficial surgical site infection or urinary tract infection.

All complications as well as mortality were analyzed as binary outcomes because complete follow-up was available. As such, we estimated the incidence and associated 95% confidence intervals (CIs) of each of these outcomes using normal approximation theory. The Clinical Classifications Software for Services and Procedures groups each individual *Current Procedural Terminology* code into 1 of 244 mutually exclusive, clinically appropriate categories. We summarized the number of moribund patients; designated American Society of Anesthesiologists Physical Status Class

Table 1 American Society of Anesthesiologists physical status and 30-day mortality

ASA class	ASA definition	No. (%) of patients	30-d mortality (n; % [95% CI])
I	A normal healthy patient	66 163 (10.4)	21; 0.03 (0.03-0.03)
II	A patient with mild systemic disease	289 580 (45.6)	486; 0.17 (0.17-0.17)
III	A patient with severe systemic disease	233 241 (36.7)	4088; 1.75 (1.75-1.76)
IV	A patient with severe systemic disease that is a constant threat to life	42 212 (6.6)	5332; 12.6 (12.5-12.7)
V	A moribund patient who is not expected to survive without the operation	2063 (0.3)	1089; 52.8 (51.7-53.9)
Unknown		2006 (0.3)	13; 0.65 (0.62-0.68)
Total		635 265 (100.0)	11 029; 1.74 (1.73-1.74)

ASA indicates American Society of Anesthesiologists.

Table 2 Associated incidence of mortality by primary procedure for ASA PS V

Primary procedure	Deaths/total (incidence)	
	Elective	Emergent
Colorectal resection (n = 395, 19.1% of all ASA V patients)	13/36 (36.1%)	183/359 (51.0%)
Aortic resection, replacement or anastomosis (n = 335, 16.2%)	9/19 (47.4%)	179/316 (56.6%)
Exploratory laparotomy (n = 318, 15.4%)	20/31 (64.5%)	224/287 (78.0%)
Other OR procedures on vessels other than head and neck (n = 190, 9.2%)	4/14 (28.6%)	86/176 (48.9%)
Small bowel resection (n = 133, 6.4%)	7/14 (50.0%)	65/119 (54.6%)
Other OR upper GI therapeutic procedures (n = 75, 3.6%)	4/6 (66.7%)	24/69 (34.8%)
Amputation of lower extremity (n = 60, 2.9%)	13/24 (54.2%)	19/36 (52.8%)
Other OR gastrointestinal therapeutic procedures (n = 54, 2.6%)	3/8 (37.5%)	24/46 (52.2%)
Other OR lower GI therapeutic procedures (n = 43, 2.1%)	2/4 (50.0%)	18/39 (46.2%)
Embolectomy and endarterectomy of lower limbs (n = 42, 2%)	0/4 (0.0%)	19/38 (50.0%)
Peripheral vascular bypass (n = 36, 1.7%)	5/13 (38.5%)	8/23 (34.8%)
Cholecystectomy and common duct exploration (n = 31, 1.5%)	1/6 (16.7%)	15/25 (60.0%)
Procedures on spleen (n = 29, 1.4%)	1/2 (50.0%)	12/27 (44.4%)
Excision, lysis peritoneal adhesions (n = 28, 1.4%)	1/2 (50.0%)	14/26 (53.8%)
Gastrectomy, partial and total (n = 26, 1.3%)	0/2 (0.0%)	11/24 (45.8%)
Incision and excision of CNS (n = 21, 1%)	1/2 (50.0%)	8/19 (42.1%)
Appendectomy (n = 18, 0.9%)	0/3 (0.0%)	3/15 (20.0%)
Debridement of wound, infection or burn (n = 18, 0.9%)	2/3 (66.7%)	3/15 (20.0%)
Other OR therapeutic procedures on respiratory system (n = 17, 0.8%)	2/5 (40.0%)	7/12 (58.3%)
(Other) (n = 194, 9.4%)	12/57 (21.1%)	67/137 (48.9%)
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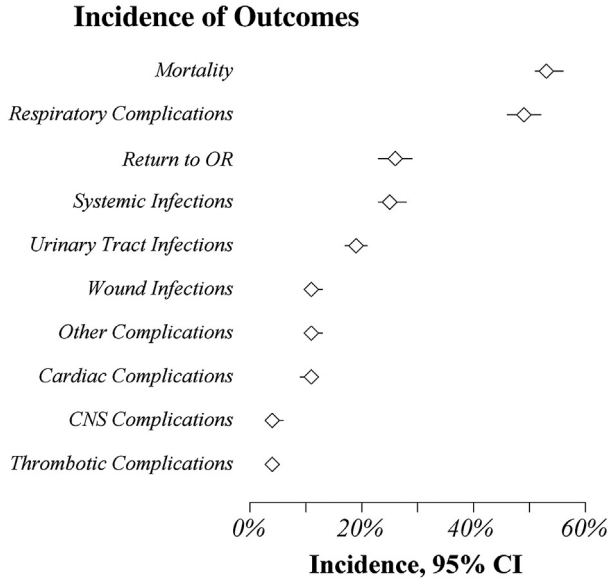

Fig. 1 Postoperative complications (incidence, 95% CI). OR indicates operating room.

V (ASA PS V), by Clinical Classifications Software procedure group; and, in addition, reported the associated incidence of mortality.

Those moribund patients who died within 30 days postoperatively were compared with those who survived on the available baseline variables using appropriate univariable tests, specifically Pearson χ^2 test for factors, the Student t test for symmetrically distributed continuous variables, and Wilcoxon rank sum test for asymmetrically distributed continuous variables. A nominal significance criterion of 0.05 was used for these tests. R software version 2.8.1 (The R Foundation for Statistical Computing, Vienna, Austria) was used for the statistical analysis.

3. Results

American Society of Anesthesiologists physical status was available for 633 262 patients (99.7%). Thirty-day mortality rates were increased with higher American Society of Anesthesiologists physical status class; 2063 patients

Table 3 Comparison of preoperative variables between moribund patients who survived for 30 days postoperatively and moribund patients who expired

Factor	Alive	Dead	*P*
Admitted directly from home	735 (75.5)	760 (69.8)	.005
Emergent case	819 (84.1)	989 (90.8)	<.001
Patient age (y)	65.1 ± 15.3	68.9 ± 14.1	<.001
Elderly patient (age ≥65 y)	552 (56.7)	701 (64.4)	<.001
Congestive heart failure (in 30 d before surgery)	112 (11.5)	170 (15.6)	.008
Dyspnea	322 (33.1)	449 (41.2)	<.001
Ventilator dependent	410 (42.1)	688 (63.2)	<.001
Ascites	120 (12.3)	200 (18.4)	<.001
Acute renal failure	110 (11.3)	204 (18.7)	<.001
Currently on dialysis (preoperative)	93 (9.5)	198 (18.2)	<.001
Impaired sensorium	193 (19.8)	346 (31.8)	<.001
Coma >24 h	39 (4)	113 (10.4)	<.001
Duration from anesthesia start to surgery start	31 (21, 45)	27 (18, 40)	<.001
Duration from surgery stop to anesthesia stop	25 (18, 35)	26 (18, 38)	.26
Duration of anesthesia	180 (130, 250)	155 (107, 225)	<.001
Functional health status before surgery			
Independent	345 (35.4)	194 (17.8)	<.001
Partially dependent	177 (18.2)	117 (10.7)	
Totally dependent	452 (46.4)	778 (71.4)	

(0.3%) were moribund, ASA PS V (Table 1). Among these moribund patients, the most frequent primary procedures were colorectal surgery (n = 395, 19.1%), aortic resection (replacement or anastomosis) (n = 335, 16.2%), and exploratory laparotomy (n = 318, 15.4%) with 30-day mortality (95% CI) of 50% (47%-52%), 56% (53%-59%), and 77% (75%-79%), respectively (Table 2). The lowest mortality rate in moribund patients was observed for appendectomy patients (n = 18, 0.9%; incidence, 17% [10%-23%]). Of these moribund patients, 52.8% (95% CI, 51.7%-53.9%) died within 30 days of surgery. The odds ratio (95% CI) for 30-day mortality comparing moribund patients to the rest of the patients was 70 (64-76). Major complications and/or mortality were observed for 83% (82%-85%) of the moribund patients, and 17% (16%-20%) of these patients experienced minor complications. The incidence of each of the analyzed 30-day complications is presented in Fig. 1; mortality is noted as an independent outcome, exclusive of other complications.

Table 3 compares various patient covariables in moribund patients who remained alive vs moribund patients who died within 30 days of surgery; those who died were older; had significantly higher rates of dyspnea, congestive heart failure, ventilator dependence, ascites, acute renal failure, and dialysis; had more incidence of impaired sensorium and coma; and had longer surgeries.

4. Discussion

Over the past years, much effort has been directed to establishing a patient- and family-centered care in critical care units. Informed decisions of patients and family members on often high-risk interventions require a good understanding of the care process, the available options, and the risks involved. Only with empathetic guidance and counseling the best decision respecting and incorporating the patient's preferences and beliefs can be found. Patients wish to receive as much information as possible, and uncertainty is an important source of mistrust and potential for conflict [4,13-15]. Abbott et al [16] found that many families perceived a conflict during end-of-life treatment discussions in the critical care unit. Not always are patients and families presented with all available options. To discuss available options, it is important to make outcomes data available and help caregivers in managing patients and families expectations.

Previous studies found considerable variability in the incidence of mortality among moribund patients. The lowest mortality of 9.4% was reported in a study up to 48 hours postsurgery [7]. Other studies reported mortality rates of 27.3% [17] and 57.8% [18] while in the hospital, and 50.7%, 7 days postoperative [19]. In yet another prospective observational study of 6301 patients at a university hospital, Wolters et al [9] found that 14 of 15 of moribund patients died in the hospital following surgery, but they were excluded from further analysis. Our study takes advantage of a much larger sample size, a national patient population, and a separation of mortality by surgical procedure. It is the latter attribute of our study that most elucidates the variation in documented mortalities. In our large retrospective study, the 30-day mortality ranged from 17% for appendectomy to 77% for exploratory laparotomy in the moribund patient.

The aggregate risk for an individual patient is a combination of patient fitness (American Society of

Anesthesiologists physical status) and risk of the specific surgical procedure; of course, these assumed independent risks are fundamentally linked. Conceptually:

ASA PS risk (all surgeries) AND specific surgery risk
$\times$ (all ASA PS) = aggregate individual risk.

Our results show an average of 53% mortality in moribund patients within 30 days of surgery. In this context, "patient fitness" is simply 1 parameter to help surgeons and intensivists guide the discussion with family members when deliberating surgery. The acuity of surgery (emergent vs nonemergent) has an impact on outcomes as evidenced by its inclusion in established surgical audit models [20]. There may be less time to optimize a patient before arrival in the operating room. There may less time to sufficiently prepare from both the anesthesia and surgical perspectives. In both patients who survived and those who died, most of the surgeries were emergent, 84% and 91%, respectively. It is possible that valuable time may be consumed during the deliberation process due to lack of evidence to counsel the patient and families, turning an urgent procedure into an emergent one. Future studies may help refine the individual mortality risk by evaluating the relative weight of patient fitness by surgical intervention. Our study begins this process by narrowing the individual risk for moribund patients in terms of 27 primary procedures, although actual individual aggregate risk cannot be determined for specific institutions or interventions given the data of this study are a national-level sample.

Mortality is not the only factor that a surgeon must consider when deciding to operate on a patient. Subsequent complications, availability or allocation of resources such as intensive care unit beds, morbidity, and end of life quality must also be considered [21]. In our study, the incidence of major complications was 83%, and the incidence of minor complications was 17%. The lower incidence of minor complications as compared with major adverse outcomes might partially be explained by major complications with subsequent mortality functioning as a competing risk to developing a minor adverse outcome. For example, a patient with acute renal failure on the second postoperative day and subsequent demise on the fifth postoperative day will not be exposed to the risk of a minor complication for the last 25 days of the 30-day follow-up.

These statistics may seem disheartening, but by definition, moribund patients are not expected to survive without surgery. It is not surprising that moribund patients who were older, dyspneic, ventilator dependent, had congestive heart failure, had ascites, were in acute renal failure, on dialysis, had impaired sensorium/coma, or had longer surgeries were less likely to survive. The specific impact of each of these individual parameters in overall mortality is difficult to ascertain. With the degree of variability in results exhibited by previous studies, counseling of patients and families by surgical teams about what to expect in perioperative period has been a problem. Our results reflect data collected prospectively, by trained personnel, from a very large patient population across the United States and provide broadly applicable guidance for caregivers in counseling family members. The average mortality of a moribund patient being 53% does still purport a fair chance of survival and this may influence the decision of the surgical team for planning an intervention given the expected mortality without surgery is, by definition, 100%, This is a far cry from the previous ideology that a moribund patient is expected not to live regardless of intervention [22]. Credit can be given to improved surgical technique, advancement of anesthesia practice, and enhanced postoperative intensive care. This embraces the one of the key research priorities identified by the 2010 critical care task force emphasizing "inter-professional team and team-family communication related [to] decision making" [5]. Furthermore, the families of moribund patients can be counseled more appropriately by a physician who can better quantify the incidence of mortality or the rate of perioperative complications in survivors.

There are several inherent limitations of retrospectively analyzing a national data set. The assumption is that all information is accurate, complete, and consistent for all institutions given that the ACS-NSQIP automatically collects data and a specifically trained clinical nurse reviewer is dedicated to each institution to internally validate the collected data. This minimizes the distortion of the data but cannot ensure complete validity. In addition, the specific protocols for diagnosing and treating diseases and complications may vary between institutions or even within an institution. The cumulative data may not reflect the practices on an individual institution or provider. The very large sample size though does limit the influence of a single provider or even institution from skewing the results. With increasing importance over the past years, surgeons and intensivists will not only focus on mortality and postoperative complications when discussing potential surgical interventions but also aspects of quality of life and activities of daily living. Quality-of-life measures and discharge destination are important considerations with when counseling a moribund patient because their incidences will likely vary with procedure. Unfortunately, the ACS-NSQIP data set does not record quality-of-life measures or discharge destination, which limits our ability to further explore and comment on this important aspect.

The moribund patient is critically ill with significant morbidity and mortality, but these patients are not as grave as once thought and surgery on these patients may not be futile. The decision to operate on a moribund patient is an ethically and emotionally taxing undertaking by the surgical team, patient, and family. Prospect of surgery denotes optimistic prospects in a grave situation. When a surgical intervention is considered for a moribund patient, critical care physicians often find themselves in a difficult bind counseling families on the merits of undergoing an invasive procedure vs comfort measures only. The data presented provide a meaningful tool

for clinicians in advising patients and families in the expectations for moribund patients and guide discussions.

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References

[1] Tulsky JA. Beyond advance directives: importance of communication skills at the end of life. JAMA 2005;294(3):359-65.
[2] Larochelle MR, Rodriguez KL, Arnold RM, Barnato AE. Hospital staff attributions of the causes of physician variation in end-of-life treatment intensity. Palliat Med 2009;23(5):460-70.
[3] Curtis JR, Patrick DL, Shannon SE, Treece PD, Engelberg RA, Rubenfeld GD. The family conference as a focus to improve communication about end-of-life care in the intensive care unit: opportunities for improvement. Crit Care Med 2001;29(2 Suppl):N26-33.
[4] Fisher M, Ridley S. Uncertainty in end-of-life care and shared decision making. Crit Care Resusc 2012;14(1):81-7.
[5] Deutschman CS, Ahrens T, Cairns CB, Sessler CN, Parsons PE. Multisociety Task Force for Critical Care Research: key issues and recommendations*. Crit Care Med 2012;40(1):254-60.
[6] Vacanti CJ, VanHouten RJ, Hill RC. A statistical analysis of the relationship of physical status to postoperative mortality in 68,388 cases. Anesth Analg 1970;49(4):564-6.
[7] Khuri S, Henderson W. The patient safety in surgery study. J Am Coll Surg 2007;204(6):1087-8.
[8] Menke H, Klein A, John KD, Junginger T. Predictive value of ASA classification for the assessment of the perioperative risk. Int Surg 1993;78(3):266-70.
[9] Wolters U, Wolf T, Stutzer H, Schroder T. ASA classification and perioperative variables as predictors of postoperative outcome. Br J Anaesth 1996;77(2):217-22.
[10] Voney G, Biro P, Roos M, Frielingsdorf B, Shafighi M, Wyss P. Interrelation of peri-operative morbidity and ASA class assignment in patients undergoing gynaecological surgery. Eur J Obstet Gynecol Reprod Biol 2007;132(2):220-5.
[11] Hosking MP, Warner MA, Lobdell CM, Offord KP, Melton III LJ. Outcomes of surgery in patients 90 years of age and older. JAMA 1989;261(13):1909-15.
[12] Church JM. Laparotomy for acute colorectal conditions in moribund patients: is it worthwhile? Dis Colon Rectum 2005;48(6):1147-52.
[13] Waljee JF, Hu ES, Newman LA, Alderman AK. Correlates of patient satisfaction and provider trust after breast-conserving surgery. Cancer 2008;112(8):1679-87.
[14] Butow PN, Dowsett S, Hagerty R, Tattersall MH. Communicating prognosis to patients with metastatic disease: what do they really want to know? Support Care Cancer 2002;10(2):161-8.
[15] Ende J, Kazis L, Ash A, Moskowitz MA. Measuring patients' desire for autonomy: decision making and information-seeking preferences among medical patients. J Gen Intern Med 1989;4(1): 23-30.
[16] Abbott KH, Sago JG, Breen CM, Abernethy AP, Tulsky JA. Families looking back: one year after discussion of withdrawal or withholding of life-sustaining support. Crit Care Med 2001;29(1):197-201.
[17] Lawler PG. The Do-Not-Attempt-Resuscitation ('DNAR') order: a lever to improve outcome and deliver preventative care. Anaesthesia 1999;54(10):923-5.
[18] Farrow SC, Fowkes FG, Lunn JN, Robertson IB, Samuel P. Epidemiology in anaesthesia. II: factors affecting mortality in hospital. Br J Anaesth 1982;54(8):811-7.
[19] Khuri SF. The NSQIP: a new frontier in surgery. Surgery 2005;138(5): 837-43.
[20] Copeland GP, Jones D, Walters M. POSSUM: a scoring system for surgical audit. Br J Surg 1991;78(3):355-60.
[21] Phipps EJ. The outcome of surgery in patients more than 90 years old. JAMA 1989;262(7):900.
[22] Thackray NM, Gibbs NM. American Society of Anesthesiologists P5: "with or without" definition? Anesthesiology 2011;114(2):467-8.