Should we operate for an intra-abdominal emergency in the setting of disseminated cancer?

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Background. *Patients with advanced cancer and an abdominal surgical emergency pose a dilemma, because rescue surgery may be futile. This study defines morbidity and mortality rates and identifies preoperative risk factors that may predict outcome.*

Methods. *The National Surgical Quality Improvement Program database was queried for patients with disseminated cancer undergoing emergent abdominal surgery (2005–2012). Preoperative variables were used for prediction models for 30-day major morbidity and mortality. A tree model and logistic regression were used to find factors associated with outcomes. A training dataset was analyzed and then model performance was evaluated on a validation dataset.*

Results. *Study patients had an overall 30-day major morbidity and mortality rate of 48.8% and 26%, respectively. The classification tree model for prediction for a morbidity involved the following variables: sepsis, albumin, functional status, and transfusion (misclassification rate, 36%). The tree model for mortality showed that an American Society of Anesthesiologists (ASA) score of 4 or 5 with a dependent functional status to be predictive of mortality (misclassification rate, 24%). There was agreement between models for predictive variables.*

Conclusion. *The decision to operate for an abdominal emergency in the setting of disseminated cancer is difficult. Our study confirms the high risk for morbidity and mortality in this population. Preoperative factors including sepsis, increased ASA class, low serum albumin level, and patient functional dependence all predict poor outcomes. (Surgery 2015;158:636-45.)*

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Numerous predictive models have been developed utilizing the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database to try to assess the risk of mortality of an operative intervention for decision making by patients and physicians.[1-6] Most of these models use postoperative outcome variables in the model, which do not assist in preoperative decision making for physicians. In addition, given the data available in the NSQIP database, these models cannot include preoperative diagnosis or expected patient mortality related to other comorbidities.

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Patients with a diagnosis of advanced cancer who develop an intra-abdominal surgical emergency pose a unique and difficult dilemma when having to make a medical decision concerning many situations. For the patient with "end-stage" cancer who develops a related or unrelated surgical abdominal emergency, the decision of whether to invest the resources and costs of the health care to address the acute emergency, in a patient with a short expected overall survival is challenging, and few reliable data are available to guide the physician and patient or family in the medical decision making.

Patients, families, and medical providers need more accurate data to assist with these difficult treatment decisions. This study was designed to established morbidity and mortality rates in patients with advanced (disseminated) malignancies and to attempt to identify preoperative risk factors that may predict a poorer outcome.

MATERIAL AND METHODS

A multi-institutional, retrospective review was performed using the ACS-NSQIP database. This program has been well-validated as providing

risk-adjustment models for surgery patients and providing mechanisms for screening for adverse outcomes.[7,8] The database includes variables pertaining to preoperative, operative, and postoperative events for 30 days after the index operation. As a member site, we obtained data descriptions, variables, and the specific dataset via the ACS-NSQIP website (accessed March 2013).[9] This study was approved by the University of Utah Institutional Review Board.

Dataset acquisition and definitions. National participant data were obtained from 2005 to 2012, with cases being selected further based on meeting 2 preoperative NSQIP criteria—having met criteria for the definition of "disseminated cancer" and undergoing an "emergency" operation. The ACS-NSQIP specifically defines disseminated cancer as patients who have cancer that: (1) has spread to one site or more sites in addition to the primary site and (2) in whom the presence of multiple metastases indicated the cancer is widespread, fulminant, or near terminal. The following are reported as disseminated cancer: acute lymphocytic leukemia (ALL), acute myelogenous leukemia (AML), and stage IV lymphoma. The following are not reported as disseminated cancer: chronic lymphocytic leukemia (CLL), chronic myelogenous leukemia (CML), stages I through III lymphomas, or multiple myeloma." The NSQIP definition for emergency surgery can be determined by either the surgeon or the anesthesiologist and usually involves and operation performed within 12 hours after admission or onset of symptoms (ACS-NSQIP Operations Manual 2012).[10]

The dataset was refined to include only those cases that were listed as performed by surgical specialty classified by NSQIP as general surgery. The primary operative procedure for cases were limited to those involving the abdominal cavity (Table I) and reviewed by specific Current Procedural Terminology (CPT) codes for abdominal procedures (22999, 39561, 43113–49999, 50810–50820, 58140–58960). The dataset was also limited to patients having received a general anesthetic. Pregnant patients were also excluded.

The preoperative risk assessment variables collected by NSQIP over this review period (2005–2012) were changing based on numerous factors. In the dataset we used, there were 22 preoperative variables that were considered as optional for collection by participating sites (Table II; Supplementary Table) beginning in 2011. As a result of this disparity in the dataset, cases were categorized based on the variables collected, and this difference was considered within the statistical analyses. Models were created with and without those variables that were considered optional.

Preoperative laboratory data collected by NSQIP (within 90 days of operation) included the following 13 measurements: serum levels of sodium, creatinine, albumin, and total bilirubin, blood urea nitrogen (BUN), serum activities of glutamic oxaloacetic transaminase and alkaline phosphatase, white blood cell count, hematocrit, platelet count, prothrombin time, partial thromboplastin time, and International Normalized Ratio. In those models where values were categorized into groups, they were defined based on normal ranges from the laboratory appendix of *Harrison's Principles of Internal Medicine*.[11]

Data were reviewed for completion and inclusion. Those patient ages listed as ≥90 were designated as age equal to 91. Body mass index was calculated based on available data and when categorized into groups, and the international classification definition by the World Health Organization was used.[12]

Outcomes. The main outcomes measured in this study included both 30-day postoperative major morbidity and mortality as defined by the NSQIP, which is collected regardless of where the patient is located at 30 days after the principle operative procedure. Major morbidity was defined as occurrence of ≥1 the following 18 NSQIP postoperative variables: wound infection, organ space surgical site infection, wound dehiscence, pneumonia, unplanned intubation, pulmonary embolism, need for ventilator support for >48 hours, progressive renal insufficiency, acute renal failure, cerebrovascular accident/stroke with neurologic deficit, coma >24 hours duration, cardiac arrest requiring cardiopulmonary resuscitation, myocardial infarction, bleeding transfusions, sepsis, septic shock, return to the operating room, or an intraoperative major event (cardiac arrest, myocardial infarction, or unplanned intubation).

Outcomes from a set of local NSQIP data were reviewed over the same time period. Any additional data that were needed were obtained from patient's the medical record. Data were reviewed for inclusion criteria of a diagnosis of disseminated cancer and emergency surgery involving an abdominal operation. The prediction model created from the national dataset was used to evaluate the potential applicability of predictive variables for morbidity and mortality within the local dataset.