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Nonhome discharge and prolonged length of stay after cytoreductive surgery and HIPEC

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ABSTRACT

Background: Predictive models for nonhome discharge (NHD) have been proposed in major surgical specialties. The rates and risk factors associated with NHD and prolonged length of stay (PLOS) after cytoreductive surgery and hyperthermic intraperitoneal chemotherapy (CRS/HIPEC) have not been evaluated. The aim of this study is to identify risk factors for NHD and PLOS after CRS/HIPEC in a national cohort of patients.

Materials and Methods: CRS/HIPEC cases were identified from the National Surgical Quality Improvement Program 2011-2012 data set. Patients with an NHD or PLOS (>30 d) were compared with a group of patients discharged to home within 30 d. Univariate analysis was used to compare patient characteristics, operative variables, and postoperative complications among both groups. Multivariate regression analysis was used to identify independent predictors of NHD and PLOS.

Results: Five hundred fifty-six patients undergoing CRS/HIPEC were identified, of which 44 (7.9%) were not discharged to home within 30 d. The rate of NHD and PLOS in this cohort was 4.1% and 3.7%, respectively. Multivariate analysis identified age ≥65 y, pre-op albumin <3.0 g/dL, and having a multivisceral resection as independent predictors of NHD/PLOS. If all three predictors are met preoperatively, the probability of NHD/PLOS was calculated to be 30.2%.

Conclusions: The main risk factors for NHD/PLOS after CRS/HIPEC were advanced age, hypoalbuminemia, and multivisceral resection. Adequate identification of these risk factors may facilitate preoperative discussion with patients, and improve discharge planning and resource utilization.

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Introduction

Historically, peritoneal carcinomatosis (PC) was only amenable to systemic chemotherapy, offering patients a median survival of 6 to 12 mo.[1-3] Today, cytoreductive surgery and hyperthermic intraperitoneal chemotherapy (CRS/HIPEC) is becoming the standard of care in selected patients with peritoneal malignancies, often associated with perioperative systemic chemotherapy. This aggressive surgical treatment offers patients a chance at long-term survival when performed at high-volume, experienced centers.[4,5] Several single-center studies and case-control studies of CRS/HIPEC in patients with PC of colorectal, gastric, and appendiceal origin have already demonstrated improved survival over systemic chemotherapy.[6-12] Despite the encouraging data, however, CRS/HIPEC continues to be associated with significant morbidity and mortality. Moreover, patients undergoing this procedure carry significant risk for experiencing a prolonged length of stay (PLOS, remaining hospitalized at 30 days) and/or discharge to an extended care facility (NHD, nonhome discharge).[13]

In the interest of promoting high-quality, patient-centered care and accountability, assessment of NHD and PLOS after CRS/HIPEC in a national cohort of patients is warranted. Predictive models for NHD have already been developed in other surgical specialties including orthopedics, gynecology, genitourinary, spinal, and cardiovascular surgery.[14-19] Their models have consistently demonstrated the ability to decrease postoperative length of stay, reduce costs, and improve patient expectations and satisfaction. However, there is paucity of data regarding risk factors and rates of NHD and PLOS after CRS/HIPEC.

The primary objective of this study is to identify risk factors for NHD and PLOS after CRS/HIPEC in a national cohort of patients. The secondary objectives of this study are to describe the national rates of NHD and PLOS after CRS/HIPEC and to obtain preliminary data to develop a predictive tool that may aid providers to preoperatively identify patients at risk for NHD or PLOS.

Material and methods

Database

The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) is the first nationally validated, risk-adjusted, outcomes-based program created to measure and improve the quality of surgical care across hospitals in the United States. The data set provides institutions with the ability to answer questions pertaining to complications that occur within 30 days of surgery. The prospectively collected database includes more than 500 participating hospitals with more than 130 pre-, intra-, and post-operative variables related to operations. A full description of data collection is available on the NSQIP website.[20] With approval of the University of Texas Southwestern Medical Center Institutional Review Board (STU 042016-038), the NSQIP database was used for this study. A waiver of consent was obtained given the deidentified data and retrospective nature of the study.

Patient selection

The NSQIP participant user files from 2011 to 2012 were used for this study, as previous years did not collect discharge disposition. After 2012, HIPEC procedures were placed in the exclusion criteria for NSQIP data collection. Patients who underwent cytoreductive surgery and were treated with hyperthermic intraperitoneal chemotherapy were queried using the following CPT codes: 77605, 96445, 96446, as described in previous reports.[4,13] Patients who died before discharge or were discharged to unknown destinations were excluded from the study.

Variables and outcomes

The following variables were extracted: patient demographics (age, sex, race, and body mass index), preoperative labs, comorbidities (diabetes, smoking status, hypertension, chronic obstructive pulmonary disease, steroid use, bleeding disorder, cardiac and vascular diseases), ASA class, Charlson Comorbidity Index, and cancer type. In addition, we extracted intraoperative and perioperative variables including resection type, wound class, operative time, and return to the operative room. Multivisceral resection was defined as the surgical removal of two or more organs or viscera during the same surgical intervention. We only included inpatient complications and defined major complications as having one or more of the following: deep or organ space surgical site infection, dehiscence, pneumonia, unplanned intubation, pulmonary embolism, ventilator for >48 h, bleeding, renal failure, cerebrovascular accident, cardiac arrest, myocardial infarction, deep vein thrombosis/thrombophlebitis, and sepsis/septic shock.

The primary outcome was discharge destination, which was categorized per the NSQIP dictionary as skilled care (e.g., a transitional care unit, subacute hospital, ventilator bed, skilled nursing home), an unskilled facility (e.g., nursing home or assisted facility), separate acute care (e.g., transfer to another acute care facility), rehab, a facility which was home (e.g., a return to chronic care, an unskilled facility, or assisted living, which was the patient's home preoperatively), or remaining hospitalized at 30 d. Patients discharged to home or a facility that was home were categorized as discharge to home. NHD comprised patients discharged to skilled care, unskilled care, rehabilitation facilities, or any facility that was not home, and PLOS was defined as patients remaining hospitalized at 30 d.

Statistical analysis

The statistical analyses in our study were performed using STATA, version 14.0. Descriptive statistics on continuous variables were presented as means with standard deviations and medians with interquartile ranges, whereas categorical variables were presented as counts and column percentages. A univariate analysis using χ^2 tests or two-sample t-tests were