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How does a concurrent diagnosis of cancer influence outcomes in emergency general surgery patients?



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Abstract

BACKGROUND: A significant proportion of hospital admissions in the US are secondary to emergency general surgery (EGS). The aim of this study is to quantify outcomes for EGS patients with cancer.

METHODS: The Nationwide Inpatient Sample (2007 to 2011) was queried for patients with a diagnosis of an EGS condition as determined by the American Association for the Surgery of Trauma. Of these, patients with a diagnosis of malignant cancers (ICD-9-CM diagnosis codes; 140-208.9, 238.4, 289.8) were identified. Patients with and without cancer were matched across baseline characteristics using propensity-scores. Outcome measures included all-cause mortality, complications, failure-to-rescue, length of stay, and cost. Multivariable logistic regression analyses further adjusted for hospital characteristics and volume.

RESULTS: Analysis of 3,625,906 EGS patients revealed an 8.9% prevalence of concurrent malignancies. The most common EGS conditions in cancer patients included gastro-intestinal bleeding (24.8%), intestinal obstruction (13.5%), and peritonitis (10.7%). EGS patients with cancer universally had higher odds of complications (odds ratio [OR] 95% confidence interval [CI]: 1.20 [1.19 to 1.21]), mortality (OR [95% CI]: 2.00 [1.96 to 2.04]), failure-to-rescue (OR [95% CI]: 1.52 [1.48 to 1.56]), and prolonged hospital stay (OR [95% CI]: 1.69 [1.67 to 1.70]).

CONCLUSIONS: EGS patients with concurrent cancer have worse outcomes compared with patients without cancer after risk-adjustment.

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Emergency general surgery (EGS) has proven to be a distinct surgical specialty and patients with EGS conditions have unique medical and surgical needs.¹⁻³ Four million patients present to US hospitals every year for one or more EGS conditions.³ The incidence of EGS outstrips the incidence of many major noncommunicable diseases.^{3,4} These also represent the bulk of the case load of general surgeons across the country, often affecting elective operative times at institutions without a dedicated and robust acute care surgery service.² EGS conditions can occur as a solitary surgical problem or in conjunction with other surgical diseases.

Operative needs of cancer patients are an area of significant interest among physicians due to the significant morbidity, mortality, and the deleterious impact on overall life expectancy from surgical intervention.⁵ Based on recent estimates by the Center for Disease Control,⁶ more than 1.5 million patients are diagnosed with cancer annually in the United States. With greater than 575,000 deaths per year, it also remains the second most common cause of death in the US patient population. Given its increasing prevalence, cancer patients represent a population at risk of developing an EGS condition.

Emergency surgery has been demonstrated to be an independent risk factor for poor outcomes. Together with their compromised physiology, either from the primary disease process or the ensuing treatment,^{2,7,8} cancer patients are often at a higher risk of poor medical and surgical outcomes.⁹ Surgical emergencies in cancer patients are commonplace and often require complex surgical decision-making.^{5,10,11} Given the variability in-patient characteristics and influencing factors, the concept of acute oncology teams have been instituted at certain health care facilities treating a large number of oncologic emergencies.

However, aggressive medical and surgical management has been shown to negatively impact the quality of life among cancer patients. Despite the collective burden of emergency general surgery and cancer in the United States, little work has gone into elucidating the impact of EGS in cancer patients and the spectrum of surgical diseases associated with a cancer diagnosis. Understanding risk factors associated with poor outcomes in cancer patients with EGS needs can help in perioperative risk stratification by health care providers and facilitate the delineation of goals of care in concert with patients' care-givers. This study aims to bridge this gap in knowledge of determinants of outcomes for EGS patients with cancer and seeks to determine characteristics of these patients at risk of poor outcomes.

Methods

A retrospective analysis was performed using discharge data from the 2007 to 2011 Nationwide Inpatient Sample (NIS). The NIS is part of the Healthcare Cost and Utilization Project sponsored by the Agency for Healthcare Research and Quality.¹² It represents the largest all-payer

inpatient care database publicly available in the United States. Available data represent a 20% stratified sample of discharges from hospitals across the United States, comprising 95% of the population. The database is primarily administrative in nature and consists of billing data for patients treated at US hospitals. Available descriptors include demographic parameters, hospital characteristics, mortality, length of stay (LOS), cost of index hospitalization, and up to 25 *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) diagnosis and 15 ICD-9-CM procedure codes.^{12,13}

Patients aged 16 years and older were included in the study if they had a primary diagnosis consistent with an EGS condition as defined by the American Association for the Surgery of Trauma.⁴ Included EGS conditions represent an agreed-on set of 621 diagnostic codes.^{1-4,14-19} Of these, patients with a diagnosis of malignant cancers (ICD-9-CM diagnosis codes; 140-208.9, 238.4, 289.8) were identified and the study population was divided into (i) cancer patients and (ii) cancer-free patients. NIS-provided design weights were used to obtain nationally representative frequencies and account for clustering within hospitals. Patients transferred from or to another acute care facility were excluded.

Abstracted data on patient variables consisted of age, sex, race/ethnicity, income quartile, insurance status, diagnostic condition, surgical intervention, and disease severity. Race/ethnicity was classified as non-Hispanic White, non-Hispanic Black, Hispanic, non-Hispanic Asian, non-Hispanic "other", and missing. Median household income quartile for a patient's residential zip code was classified by NIS (specific values varied each year). Primary insurance payer was categorized as private insurance, government insurance, uninsured, and unknown. The proportion of cancer patients with EGS seen by a given hospital among all patients presenting to that hospital with a primary EGS diagnosis was also considered and used to calculate hospital-level volume of cancer patients with an EGS condition (categorized by quartiles into 1st [lowest], 2nd, 3rd, and 4th [highest] volume centers). Additional hospital variables included geographic region (categorized as Northeast, Midwest, South, and West), urban vs rural location determined based on Core-Based Statistical Area, teaching status, and NIS-determined bed-size tertile (varied by geographic region).

Considered outcome measures included: in-hospital mortality, major complications, failure to rescue (defined as death after a major complication), LOS, prolonged LOS (defined as LOS greater than the 75th percentile), and total cost of hospital stay. Major complications included: pneumonia, pulmonary emboli, renal failure, urinary tract infections, cerebrovascular accidents, myocardial infarction or cardiac arrest, sepsis, and septic shock. Cost was calculated by multiplying NIS-provided total hospital charges with hospital specific cost-to-charge ratios for the corresponding year. Costs were adjusted for inflation using annual hospital consumer price indices and converted to 2015 US dollars (USD).

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