Original Study

Patient Frailty and Discharge Disposition Following Radical Cystectomy

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Abstract

Among 4330 patients undergoing radical cystectomy in the National Surgical Quality Improvement Program from 2011 through 2014, frail patients, as determined by the modified Frailty Index, were more likely to be discharged to a location other than home (odds ratio, 2.33; 95% confidence interval, 1.34-4.03). Predicting non-home discharge may assist providers in setting expectations and allocating postoperative resources.

Background: Patients with bladder cancer who are treated with cystectomy are at high risk for complications and prolonged length of stay. This population tends to be of advanced age with underlying comorbidities, and thus more likely to have decreased physiologic reserve (ie, frailty). Our objective was to evaluate the relationship between frailty and discharge disposition for patients with bladder cancer treated with cystectomy. **Materials and Methods:** Using data from the National Surgical Quality Improvement Program, we identified patients with bladder cancer undergoing cystectomy (2011-2014). Our exposure of interest was frailty, based on the 11-point modified Frailty Index (mFI). Patients were deemed robust (mFI = 0), pre-frail (mFI = 0.09-0.18), or frail (mFI $\geq$ 0.27). Our outcome of interest was discharge disposition defined as home, skilled nursing facility, and rehabilitation dichotomized as home versus non-home for multivariable logistic regression analysis. We then generated predicted probabilities of non-home discharge based on frailty and in-hospital complications. **Results:** Among 4330 patients treated with radical cystectomy, 32.8% were robust, 65.1% were pre-frail, and 2.2% were frail. Overall, 86.2% were discharged home, 4.4% to a rehabilitation facility, and 9.4% to a skilled nursing facility. Frail patients were more likely to be discharged to non-home care (vs. robust, odds ratio, 2.33; 95% confidence interval, 1.34-4.03), which was independent of whether they experienced a major complication prior to discharge. **Conclusion:** Frailty is a significant predictor of non-home discharge following radical cystectomy. This finding was independent of inpatient complications. These data will assist providers in setting patient expectations and have important implications for allocating postoperative resources.

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Introduction

Patients with bladder cancer who are treated with radical cystectomy are at considerable risk for postoperative complications and morbidity.[1-3] Institutional studies have shown that cystectomy patients who suffer from frailty—a syndrome defined by decreased physiologic reserve distinct from disability or comorbidity[4-6]—may be at particular risk of postoperative complications and mortality. These undesired outcomes often result in discharge to a location other than home.[7-11] Receipt of non—home-based care increases the chance of readmission and additional complications after discharge, and can significantly impact requirements for preoperative counseling, informed decision making, and discharge planning prior to surgery.[12-15]

Recent population-based analyses have supported the association between frailty and postoperative complications and mortality after cystectomy, as well as many other urologic procedures.[16,17] Furthermore, though institutional studies suggest that frail patients are more likely to be discharged to locations other than home, this has not been validated across larger, diverse populations.[3,10,18] Finally, it is unclear whether frailty itself is a risk factor for discharge to nursing facilities, independent of perioperative complications that develop during the hospital stay.

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Thus, we hypothesized that frail patients treated with cystectomy would be more likely to be discharged to skilled nursing or rehabilitation facilities, as opposed to home. Furthermore, we predict that this association would persist even among patients who did not experience a postoperative complication. Findings from this analysis would help guide preoperative decision-making between urologists and patients. In addition, results from this study would contribute to efforts to reduce patient morbidity, decrease hospital readmission, and allay health care costs linked to radical cystectomy.

Methods

Data Set and Study Population

To evaluate our hypothesis, we used data from the American College of Surgeons' National Surgical Quality Improvement Project (ACS-NSQIP). ACS-NSQIP is a prospectively collected database with clinical and surgical information for all major inpatient and outpatient surgical procedures performed at almost 700 hospitals in the United States and Canada.[19] A designated clinical reviewer collects the ACS-NSQIP data at each participating hospital, and the database has been shown to have high reliability.[9] Patient information in ACS-NSQIP includes age, race/ethnicity, gender, body mass index (BMI), American Society of Anesthesiologists (ASA) classification, comorbidities, functional status, and laboratory values. Operative variables include anesthesia technique, work relative value unit, operative time, and wound classification. Regarding perioperative outcomes, the database explicitly catalogues length of stay, complications, and patient mortality (both in-hospital and within 30 days of discharge). Discharge disposition is documented as home, skilled nursing facility, rehabilitation facility, or death. We identified patients treated with radical cystectomy for bladder cancer from 2011 through 2014. This was performed by utilizing Current Procedure Terminology codes for radical cystectomy, in addition to International Classification of Diseases diagnosis codes for bladder cancer, a method that has previously been described using ACS-NSQIP data.[16] We then excluded all patients who died prior to discharge and those who considered a nursing facility to be home prior to surgery.

Primary Exposure and Covariates of Interest

Our primary exposure of interest was frailty, measured using the modified Frailty Index (mFI), an 11-point scale based on the Canadian Study of Health and Aging Frailty Index (CSHA-FI) adapted to the available data points in the ACS-NSQIP.[20] The 11 points included impaired functional status, impaired sensorium, history of diabetes, history of chronic obstructive pulmonary disease or pneumonia, history of congestive heart failure, history of myocardial infarction within 6 months of surgery, history of angina or prior cardiac surgery or prior percutaneous coronary intervention, history of hypertension requiring medication, history of peripheral vascular disease or rest pain, history of transient ischemic attack or cerebrovascular accident without residual neurologic deficit, and history of cerebrovascular accident with residual deficit.

The mFI was calculated as the number of present factors divided by the total number of index factors mentioned above. For the statistical analysis, mFI was used as an ordinal variable with stepwise increase. Based on modification of the CSHA-FI, patients with a score of 0, 0.09 to 0.18, and 0.27 or greater were designated as "robust," "pre-frail," and "frail," respectively.[4,21] This mechanism has shown strong correlation in predicting morbidity and mortality across all surgical specialties when applied to the ACS-NSQIP.[4,5,20]

As potential patient-level confounders, we included age, gender, BMI, race/ethnicity, smoking status, and ASA classification in our analysis. We considered wound classification, operative time, and work relative value units (as a proxy for case complexity) as potential procedure-level confounders. Finally, we identified development of major in-hospital complications (as dichotomous yes/no) as a covariate of interest.

Outcome of Interest

Our primary outcome of interest was discharge disposition, defined by ACS-NSQIP as home, skilled nursing care, or rehabilitation. The ACS-NSQIP includes ventilator-assisted beds, sub-acute hospital care, transitional care units, and skilled nursing homes in the skilled nursing care categorization. For analytic purposes, we collapsed skilling nursing and rehabilitation into "non−home-based care" to create a dichotomous primary outcome variable. As a secondary outcome of interest, we examined the relationship between non-home discharge and 30-day readmission and mortality.

Statistical Analysis

Bivariate statistics were employed to test the association between covariates of interest and (1) our primary exposure and (2) our primary outcome. The generalized χ^2 test and the Wilcoxon sum rank test were used for categorical and continuous variables, respectively. We then fit multivariable logistic regression models to estimate adjusted odds ratios (ORs) for discharge disposition (ie, home vs. non-home based care) based on a patient frailty, set as a 3-level ordinal variable (ie, robust, pre-frail, frail). Our models initially included variables with $P < .05$ on bivariate analyses and then excluded collinear variables based on a variance inflation factor of 1. A stepwise backward selection multivariable logistic regression model was then fit to identify the association between frailty and discharge disposition.

Our primary model included the following covariates: gender, age, race, ethnicity, BMI, smoking status, year of operation, anesthesia technique, wound classification, length of operation, ASA classification, chemotherapy within 30 days of surgery, radiotherapy within 90 days of surgery, prior operation within 30 days of surgery, postoperative complication, work relative value unit, and length of hospital stay. We then generated predicted probabilities of discharge to non-home based on patient frailty and presence of major in-hospital complications. To do so, we generated post-estimation marginal probabilities from our initial model by (1) fixing frailty as either frail, pre-frail, or robust; (2) fixing presence of major complications as yes/no; and (3) fixing the remaining covariates at the respective marginal means. Major complications as described by the ACS-NSQIP included coma greater than 24 hours, stroke with residual deficits, unplanned intubation, ventilator requirement longer than 48 hours, deep incisional surgical site infection, organ space surgical site infection, wound disruption, sepsis, septic shock, acute renal failure, progressive renal insufficiency, myocardial infarction, cardiac arrest requiring cardiopulmonary resuscitation, deep venous thrombosis, and pulmonary embolism. All statistical analyses were conducted in SAS 9.3 (Cary, NC) using 2-sided