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Original article

Patterns of care for readmission after radical cystectomy in New York State and the effect of care fragmentation

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Abstract

Objective: To determine if readmission after radical cystectomy (RC) to the original hospital of the procedure (OrH) vs. readmission to a different hospital (DiffH) has an effect on outcomes.

Methods: The New York Statewide Planning and Research Cooperative System database was queried for discharges between January 1, 2009 and November 31, 2012 after RC in New York State. Primary outcome was mortality within 30 and 90 days. Secondary outcomes included length of stay for readmission, rate of transfers/subsequent readmissions, hospital charges per readmission, and, if applicable, length of intensive care unit stays. Multivariate linear regression analyses were performed to adjust for confounding factors in predicting mortality.

Results: During the study period, 2,338 patients were discharged from 100 New York State hospitals after RC. Overall rate of readmission was 28.5% and 39.7% within 30 and 90 days, respectively. Of all readmitted patients, 80.4% and 77.1% were first readmitted to OrH within 30 and 90 days, respectively. Patients readmitted to OrH were younger ($P < 0.0005$) and had a lower All Patient Refined Severity of Illness ($P = 0.004$). Patients readmitted to DiffH had shorter length of stay ($P < 0.0005$) and lower hospital charges per readmission ($P < 0.0005$), but higher rates of transfers/subsequent readmissions ($P = 0.007$) and intensive care unit stays ($P = 0.002$) at 90 days. Patients initially readmitted to DiffH also had a higher rate of mortality (30 d, 7.8% vs. 2.3%, $P = 0.002$; 90 d, 5.2% vs. 2.5%, $P = 0.05$), but initial readmission status was not significant for mortality when controlling for other variables of interest.

Conclusion: Initial readmission to DiffH vs. OrH after RC was associated with higher rates of mortality, likely owing to underlying differences in the populations.

Keywords: Cystectomy; Patient readmission; Postoperative care; continuity of patient care; Mortality

1. Introduction

Though radical cystectomy (RC) with lymph node dissection is the standard of care for surgical treatment of muscle-invasive bladder cancer [1], it is associated with significant perioperative morbidity and mortality. Rates of 90-day complications range from 28% to 64% and inpatient hospital mortality rates range from 1.5% to 3% [2–5]. Multiple studies have confirmed an inverse relationship between provider volume and in-hospital mortality after RC [6–11]. In addition, both surgeon and hospital volumes are associated with cancer-specific and overall survival after RC, modestly mediated by the quality of lymph node dissection performed [10].

Similar findings in other cancers have led to initiatives to centralize specialized services to high-volume providers [12–14]. At the same time, recent policy efforts, such as accountable care organizations and the Bundled Payments for Care Improvement Initiative, aim to improve the coordination of care after hospital discharge. These undertakings stem from evidence that early postdischarge follow-up, particularly with the physician who treated the patient before admission, leads to fewer unplanned readmissions and deaths [15–17]. Specifically in the postoperative

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setting, patients readmitted to the same hospital of the original procedure have lower odds of mortality than those readmitted to a different hospital after major surgery, with RC not explored [18]. This suggests that care fragmentation —that is, the use of different healthcare provider entities without integration of clinical information—may be a major driver of worse outcomes after discharge.

The objectives of this study were to describe the patterns of care for 30- and 90-day readmissions after RC in New York State (NYS) and to determine if readmission to the original hospital of the procedure (OrH) vs. readmission to a different hospital (DiffH) has an effect on readmission outcomes.

2. Materials and methods

2.1. Data source and patient selection

The source of the data in this analysis was the NY Statewide Planning and Research Cooperative System (SPARCS) database. Established in 1979, the SPARCS database contains patient-level information on all hospital discharges in NYS, including information on diagnoses, procedures performed, accommodation and ancillary charges, source of admission, and status at time of discharge. Access to the database was granted by the NYS Department of Bioinformatics after review of a comprehensive proposal. Though the data set does not contain identifying information, the NYS Department of Health granted permission to use a version that includes an encrypted patient identifier (based on a combination of name, sex, month and year of birth, and social security number). This makes it possible to track patients within and across years of the SPARCS data and examine readmissions to any NYS hospital. However, primary analysis was performed on a hospital-level basis to preserve the confidentiality of the data. Patients included in this study were those discharged between January 1, 2009 and November 31, 2012 after undergoing RC (International Classification of Diseases, Ninth Revision procedure code 57.71) at a NYS hospital.

2.2. Independent variables

Patient-level covariates included age, gender, race, and primary payer. Administrative and clinical data at the patient level included International Classification of Diseases, Ninth Revision diagnosis code for readmission, All Patient Refined Severity of Illness (APRSI) and APR Risk of Mortality (APRRM) at readmission, hospital charges, source of readmission, and discharge disposition.

APR Diagnosis Related Groups (APR-DRGs) were created by 3M Health Information Systems to stratify patients according to reason for admission, severity of illness, and risk of mortality [19]. The APRSI, defined as "the extent of physiologic decomposition or organ system loss of function," incorporates the interaction among the patient's age, APR-DRG, principal diagnosis, secondary diagnoses, and non–operating room procedures into 4 categorical subclasses: 1 = minor, 2 = moderate, 3 = major, and 4 = extreme. The APRRM, defined as "the likelihood of dying," also incorporates these factors and contains 4 categorical subclasses. Both disease-specific classifications have been validated in intensive care unit (ICU) and inpatient surgical settings [20–22].

2.3. Outcomes

The primary outcome assessed was mortality within 30 and 90 days of RC. Secondary outcomes included time to readmission, source of readmission, length of stay for readmission, rate of transfers/subsequent readmissions, hospital charges per readmission, and, if applicable, length of ICU stay. For patients with multiple readmissions, either owing to hospital-to-hospital transfers or subsequent separate readmissions, the outcomes of mortality and rate of transfers/subsequent readmissions were attributed to the hospital of each patient's first readmission. All other secondary outcomes were attributed to the hospital of each readmission separately, and not just the hospital of the patient's first readmission. For example, if a patient was first readmitted to Hospital A, subsequently transferred to Hospital B, and expired at Hospital B, the patient's death was attributed to Hospital A but lengths of stay were reported for both the patient's stays at both Hospitals A and B.

2.4. Statistical analysis

Continuous variables were reported as the average of median values of each hospital weighted by the hospital's respective RC volume during the study period (WAMV). Chi-square analyses and *t* test were used to compare patient characteristics and outcomes of interest between patients readmitted to OrH vs. DiffH.

To perform linear regression analyses for risk of mortality, data were stratified by hospital of the procedure and whether first readmission was to DiffH vs. to OrH. Median values and proportions were weighted by the number of readmitted patients for continuous and categorical variables, respectively. Multiple linear regression analysis was used to study the effect of readmission to DiffH vs. OrH on 30- and 90-day mortality rates, while controlling for the following factors: patient age (WAMV), gender (proportion of males), race (proportion of whites), primary payer (proportion of Medicare/Medicaid), APRSI (1, 2, 3, and 4), APRRM (1, 2, 3, and 4), and RC volume of the hospital during the study period. *P* values of 0.05 or less were considered significant, and all analyses were performed with SPSS 22 (IBM, Armonk, NY).

3. Results

During the study period, there were 2,338 patients who were discharged between January 1, 2009 and November 31,