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The Impact of Gender on Use of Pelvic Lymphadenectomy at the Time of Radical Cystectomy

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Abstract

Introduction: Although women are less likely to be diagnosed with bladder cancer than men, they experience a disproportionally high rate of cancer specific mortality. Underuse of evidence-based processes of care may contribute to this mortality difference. We explored variation in the use of pelvic lymphadenectomy at the time of radical cystectomy between men and women, and determined if this was impacted by surgeon or hospital volume.

Methods: We identified all patients with bladder cancer who underwent radical cystectomy from 1996 to 2009 in the New York, Maryland and Florida State Inpatient Databases. The effect of gender on the use of pelvic lymphadenectomy was analyzed using multivariate logistic regression models.

Results: Approximately 25% of our cohort was female. Compared to men, women were less likely to be treated with pelvic lymphadenectomy (54% vs 60%, $p < 0.001$), and tended to be treated by lower volume surgeons and at lower volume hospitals. Women had 21% lower odds (95% CI 5−35) of undergoing pelvic lymphadenectomy compared to men when adjusting for patient characteristics, even when treated by high volume surgeons and at high volume hospitals.

Conclusions: At radical cystectomy women were less likely to undergo pelvic lymphadenectomy even when treated by high volume providers. Since pelvic lymphadenectomy is an evidence-based process of care that is associated with improved survival in patients with bladder cancer, lower use of pelvic lymphadenectomy may contribute to the lower bladder cancer survival rate observed in women. Our findings identify an opportunity to improve quality of care in women with bladder cancer.

Key Words: cystectomy, healthcare disparities, sex, urinary bladder neoplasms

Abbreviations and Acronyms

AHRQ = Agency for Healthcare Research and Quality

CSM = cancer specific mortality

HV = hospital volume

PLND = pelvic lymphadenectomy

RC = radical cystectomy

SID = State Inpatient Database

SV = surgeon volume

Of the 73,000 Americans diagnosed with bladder cancer each year approximately three-quarters are men.[1] While men have a higher incidence of urothelial carcinoma of the bladder, some studies suggest that women experience an unexpectedly high rate of bladder cancer specific mortality.[2−8] Given their lower risk of death for most other cancers, the increased risk of

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bladder cancer specific mortality in women remains to be explained.[9]

Some have posited biological causes, such as hormonal[10] or anatomical[2] differences, that enable tumors to behave more aggressively or invade more easily in women. Others have pointed to variations in referral patterns which may delay urological evaluation for women with hematuria,[11] possibly leading to more advanced disease at presentation.[6] However, even after adjusting for disease severity at presentation[2,6] and pathological stage after RC,[3–5] women continue to have a higher rate of bladder cancer specific mortality, raising questions as to whether women receive inferior quality of care compared to men.

Pelvic lymph node dissection during RC is an evidence-based process of care associated with higher surgical quality and improved disease outcomes.[12–14] Prior findings suggest that women are less likely to undergo PLND at radical cystectomy, which may contribute to their higher CSM.[12,15,16] With the strong associations between provider volume and survival after RC,[17,18] higher volume providers may have greater adherence to evidence-based processes of care such as PLND. We hypothesized that women were less likely to undergo PLND compared to men, but this difference was attenuated when women were treated by high volume surgeons and at high volume hospitals.

Methods

Before study initiation we obtained a waiver from the institutional review board at Vanderbilt University and signed a data use agreement with the AHRQ for the use of the public access versions of the State Inpatient Databases.

Data Set

We obtained encounter level administrative data from the Florida, New York and Maryland SIDs for the years 1996 to 2009. These states are part of the AHRQ disparities file, and have uniform coding on race and surgeon identifier. The SIDs are compiled through the AHRQ HCUP (Healthcare Cost and Utilization Project) and contain more than 100 uniformly recorded data elements, including principal and secondary discharge diagnoses and procedures, patient demographics and expected payment source on all patients discharged from nonfederal hospitals in HCUP participating states. The SIDs do not contain clinical data on cancer severity, presenting symptoms or patient outcomes.

Cohort

We identified all patients who underwent RC using ICD-9-CM procedure codes (RC 57.7, 57.71, 57.79 and 68.8). We restricted the cohort to patients with a diagnosis of bladder cancer (ICD-9-CM diagnosis codes 188, 233.7, 237.6, 236.7 and 239.4) and included all patients 19 to 94 years old. We excluded cases performed during urgent or emergent admission, cases missing data for race, surgeon identifier and hospital identifier (3% of cohort), and hospitals with suspect race coding (2% of cohort).[19]

Exposure and Outcome

The primary outcome was the use of PLND (ICD-9-CM procedure code 403) and the primary exposure was gender. Covariates included patient race, age, expected payer, number of comorbidities,[20] state in which the procedure was performed, year of surgery, surgeon volume and hospital volume. Patient race was classified as white, black, Hispanic, Asian/Pacific Islander, Native American or other. As the number of patients in the latter 4 categories was small, they were combined and designated all other. We calculated SV based on the total number of RCs performed per surgeon in a particular state in each calendar year using the surgeon identifier. HV was similarly calculated based on the total number of RCs performed at a particular hospital each calendar year.

Statistical Analysis

Patient demographic variables were summarized using frequencies, proportions, medians and IQR. We used the Pearson chi-square and Wilcoxon rank sum tests to compare differences in PLND use by provider volume and gender. To simplify the presentation of univariate statistics we categorized SV and HV into low, intermediate and high. However, SV and HV were entered into the multivariate models as continuous variables. The high volume group represented a weighted average of the top volume decile (SV 5 or greater and HV 11 or greater) for all states and all years.

We examined the relationship between gender and PLND using logistic regression models. We used restricted cubic splines for age and year of surgery to allow for nonlinear relationships with the outcome, and we used a robust sandwich estimator (Huber) to account for correlation between observations within the same hospital.[21] To evaluate modification of the effect of gender on pelvic lymphadenectomy by SV and HV, we refit the base regression model with terms for interaction among gender and surgeon and hospital volume.

To determine if any of the covariates modified the effect of gender on PLND we included interaction terms for gender and each independent variable in the models. The use of interaction terms allows the effect of gender on PLND to vary by stratum of other independent variables, which more accurately reflects the complex relationships between the covariates and the use of PLND. For example, the interaction between gender and race allows the estimated effect of gender on PLND to vary by racial group. We planned an a priori subanalysis to evaluate race-gender interactions since black women with bladder cancer are known to have particularly poor oncologic outcomes.[6] As the models generate unique estimates of the effect of gender on PLND for each combination of independent variables, we presented the specific scenario with each independent variable set to its median value.

We then examined the overall effect of gender on PLND by testing the null hypothesis that all regression terms involving