

Practice Patterns and Individual Variability of Surgeons Performing Radical Prostatectomy at a High Volume Academic Center

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Abbreviations and Acronyms

LE = life expectancy

LR = low risk

LR percent = percent of LR patients treated with RP in given year by given surgeon

PSA = prostate specific antigen

RP = radical prostatectomy

SPCG-4 = Scandinavian Prostate Cancer Group Study 4

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Purpose: Regional and local variation in radical prostatectomy rates contribute to overtreatment of low risk prostate cancer. We hypothesized that individual practice variability would be minimal among urologists practicing at a high volume academic center.

Materials and Methods: We assessed the percent of patients at low risk treated with radical prostatectomy in a given year and comorbidity adjusted life expectancy in an institutional database accounting for temporal trends and disease characteristics. Multivariable linear, spline and logistic models were applied with a hierarchical random effects model to estimate the proportion of variance due to surgeon and temporal effects.

Results: Of the 20,655 men included in study 11,873 (57.5%) had low risk disease. The Gleason score leading to radical prostatectomy increased with time. Overall the percent of patients at low risk treated with prostatectomy in a given year increased 3.49% yearly from 1991 to 2001 and then decreased by 1.73% yearly from 2001 to 2013. Greater surgeon experience was associated with a higher percent of patients at low risk treated with prostatectomy in a given year from 1991 to 2001 (0.46% per year of experience). High volume surgeons (total more than 1,000 radical prostatectomies) operated on a slightly greater percent of patients at low risk (3.54%). Substantial practice variation existed among surgeons for operating on men 65 years old or older at low risk (OR 3.15, 95% CI 1.62–6.11). There was similar variation when operating on older patients with a life expectancy of less than 15 years. Surgeon level and temporal effects explained 24% and 70%, respectively, of the variance in the percent of patients at low risk treated with radical prostatectomy in a given year.

Conclusions: At a high volume academic center substantial practice variation exists among surgeons when selecting patients with prostate cancer to undergo radical prostatectomy based on risk and life expectancy even among older patients. In addition to patient decision support tools, publicly reporting individual practice patterns at the provider level could decrease the overtreatment of low risk prostate cancer.

Key Words: prostatic neoplasms, prostatectomy, physician's practice patterns, elderly, risk

ALMOST half of the estimated 233,000 cases of prostate cancer diagnosed in 2013 were localized, low grade cancer leading to difficult decisions by patients and providers on the course of management.^{1,2} RP is the most commonly elected initial treatment for localized tumors (40% to 50% of cases) and in 2008 a total of 88,000 procedures were performed in the United States.^{3,4} Concern for overtreatment of low grade cancer and reports of excellent outcomes in well selected patients on active surveillance have led to the reconsideration of which patients benefit most from surgery.⁴⁻⁶

The D'Amico risk classification system is an approach to assess the recurrence risk after treatment of localized prostate cancer.⁷ AUA (American Urological Association) and NCCN (National Comprehensive Cancer Network®) guidelines advocate informed decision making with active surveillance as an option in men with LR disease (PSA 10 ng/ml or less, Gleason score 6 or less and clinical stage T2a or less), especially those with limited LE.^{8,9} The recent SPCG-4 update provided further evidence that men with LR disease are unlikely to benefit from curative intervention compared to noncurative treatment with watchful waiting through 23 years of followup.¹⁰

Practice patterns change with time due to the introduction of new evidence and guidelines. However, the interplay of other factors such as physician and patient preferences may also induce variation in the utilization of health care services. The practice site explains substantial variation in prostate cancer treatment selection.⁴ Furthermore, differences among urologists in initiating androgen deprivation therapy have been quantified.¹¹ Most recently Hoffman et al reported that the diagnosing urologist rather than patient and tumor characteristics accounted for greater variation in up front treatment vs observation.¹²

Thus, we analyzed the case mix of patients selected to undergo surgery by individual urological surgeons to determine the relative contribution of temporal and surgeon level factors to practice variability based on the D'Amico risk classification and LE. We hypothesized that variation would be minimal among urologists practicing at a high volume academic center.

METHODS

Study Cohort

The institutional review board approved Johns Hopkins radical prostatectomy database from 1982 to 2013 includes data on 22,242 men with biopsy proven prostate adenocarcinoma who were selected to undergo RP through October 2013. Our study inclusion criteria were men with available data on biopsy Gleason score

(180 excluded), clinical TNM stage (702 excluded) and preoperative PSA (559 excluded) to be assigned to the risk classification group (low, intermediate or high) for clinically localized prostate cancer previously described by D'Amico et al.⁷ The definition of LR disease was consistent with AUA guidelines (PSA 10 ng/ml or less, Gleason score 6 or less and clinical stage T2a or less).⁸ An additional 146 men were excluded from study due to insufficient comorbidity data. Thus, the final cohort comprised 20,655 men (92.9%).

Variables and Outcomes

Demographic and clinical variables included age, race, surgery type (open, laparoscopic or robotic), attending surgeon, PSA, biopsy Gleason score and TNM stage. Comorbidity was assessed using diagnosis codes for 1 year before the surgery date to calculate the Charlson comorbidity index as well as comorbidity adjusted LE for patients older than 65 years.^{13,14} Correlated American life tables were used to estimate the LE of patients 65 years or younger.¹⁵ Trends with time (yearly) were assessed for Gleason score at biopsy and the percent of patients of an individual surgeon who were classified at LR. Assessment of the LR percent by surgeon was limited to years in which surgeons performed 20 or more RPs and compared by stratifying surgeon volume with high volume defined as more than 1,000 operations. Individual surgeon practice variation was assessed for the binary case mix outcome of low risk prostatectomy vs intermediate or high risk and the categorized outcome of LE less than 15 years vs 15 years or greater.

Statistical Analysis

Multivariable linear regression was used to assess the change in biopsy Gleason score with time, and associated demographic and disease factors. A multivariable linear spline model was fitted for the outcome of LR percent to determine whether there was an identifiable temporal shift in overall practice patterns with subanalysis for surgeon experience, defined as years since residency. Multivariable logistic regression was used to assess factors associated with LR prostatectomy within these temporal periods. We determined adjusted ORs for 17 surgeons with a total of 150 cases or greater (20,345 or 98.5%) to find case mix practice variations at the surgeon level. Simple logistic regression was done to assess patient LE variation among surgeon practices. Results were also stratified by patient risk classification and age (65 years or greater) to assess variability among the groups least likely to benefit from surgery. Lastly we calculated an intraclass correlation coefficient from a random effects model to estimate the proportion of variation in LR percent surgeries due to differences among individual urologists compared to a temporal effect. Statistical analysis was done with STATA®, version 12.0.

RESULTS

Gleason Score

The 20,655 men undergoing RP had a mean \pm SD age of 58.3 years (median 59), of whom 11,873

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