Variation in Use of Prostate Biopsy Following Changes in Prostate Cancer Screening Guidelines

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Abbreviations and Acronyms

ASC = ambulatory surgical center

CMS = Centers for Medicare and Medicaid Services

HCC = Hierarchical Condition Category

mpMRI = multiparametric magnetic resonance imaging

PSA = prostate specific antigen

USPSTF = United States Preventive Services Task Force

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Purpose: Prostate biopsy rates have paralleled decreasing prostate specific antigen screening rates since 2012. We hypothesized that biopsy rates and the change in rates since 2012 would vary considerably across hospital referral regions.

Materials and Methods: Using Medicare data from 2012 through 2014 we identified prostate biopsies performed by physicians who performed 11 or more biopsies annually. We calculated annual biopsy rates and changes in rates from 2012 to 2014 across 306 hospital referral regions. We performed multivariable regression adjusting for factors associated with annual biopsy rates (eg percent of patients older than 75 who were screened with prostate specific antigen and percent of the population that was African American). We also estimated adjusted prostate biopsy rates and changes with time across regions.

Results: We identified 395,993 biopsies. The overall rates decreased from 11.68 biopsies per 1,000 men in 2012 to 10.23 per 1,000 in 2014 (−12.4%, p = 0.11). Biopsy rates were higher in regions in which a greater percentage of the population was African American (β = 0.810, 95% CI 0.235−1.384, p = 0.006), ambulatory surgical centers were available where biopsy could be performed (β = 0.892, 95% CI 0.108−1.676, p = 0.026) and prostate specific antigen testing occurred more frequently (β = 2.462, 95% CI 1.153−3.771, p <0.001). There was marked geographic variation in the adjusted average biopsy rate (median adjusted rate 9.08 biopsies per 1,000 men, IQR 7.65−10.76) and in the change in biopsy rates with time (median adjusted rate change −1.49 biopsies per 1,000 men, IQR −1.94−−1.22 per 1,000).

Conclusions: Since 2012 there has been considerable geographic variation in the performance of prostate biopsies as well as changes with time after prostate specific antigen recommendations changed. Characterizing the role of unmeasured patient and physician level factors is crucial to optimize the use and minimize the harms of prostate biopsy.

Key Words: prostatic neoplasms, biopsy, mass screening, Medicaid, African Americans

In 2012 the USPSTF recommended against routine prostate cancer screening with PSA testing[1] and screening decreased significantly following this decision.[2] Furthermore, the incidence of localized prostate cancer also decreased since 2012[3] and urologists are performing fewer prostatectomies.[4]

Trends in prostate biopsy use have paralleled the decreases seen in screening, cancer incidence and

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performance of prostatectomy. Recent reports highlighted a decrease in biopsies in New York State[5] and among privately insured individuals.[6] However, to our knowledge broader national trends have not been reported among Medicare beneficiaries. Decreasing the number of biopsies could alleviate morbidity related to hospitalization and infection.[5–7] However, decreased use may also miss diagnoses of clinically significant cancer and subsequently increase the incidence of metastatic and lethal prostate cancer. In addition, existing guidelines[8] and prospective trials[9,10] include vague recommendations and variable PSA thresholds to be used by patients and physicians considering prostate biopsies.

In a setting of decreasing demand combined with opaque biopsy indications we hypothesized that there would be marked geographic variation in rates and temporal changes in rates after adjusting for pertinent regional factors. To test this hypothesis we used publicly available provider reimbursement data from CMS to evaluate trends and variation in the use of prostate biopsies across hospital referral regions from 2012 through 2014. The results of this work will inform efforts to understand the downstream impact of guidelines on the performance of prostate biopsy and identify regional factors that may shield or accelerate de-implementation of these procedures.

METHODS

Data Set

We used all available data from the Provider Utilization and Payment Data File from 2012 to 2014 provided by CMS. This data set is based on the 100% Medicare fee-for-service claims data and it comprises use, charges and payments for outpatient care for Part B covered services. The data are based on NPIs (National Provider Identifiers) and procedures are aggregated at the provider level. Eligible providers include physicians, advanced practice providers (eg physician assistants) and ASCs.

To protect the privacy of beneficiaries aggregated records with fewer than 11 procedures per year in a specific practice setting (ie facility or office) are excluded. In cases in which a physician billed for fewer than 11 procedures per year the Provider Utilization and Payment Data File automatically recodes the procedure count to show it as missing. This feature of the data could bias trends if as a result of decreasing biopsy volumes with time, more physicians fall below the volume threshold of 11 procedures. Therefore, we recoded missing values as 10. For example, if a physician performed 15 biopsies in 2012 and 2013, and had a missing value for 2014, we assumed that 10 biopsies were performed in 2014 (supplementary table 1, http://jurology.com/). This approach is conservative in that it reduces variation regionally and with time.

Provider specific covariates include demographics (name, gender and practice address), provider degree and specialty or type (physician, advanced practice provider or ASC). For each procedure the data set captures the aggregate number of services and averages for the payment allowed, the submitted charge and the payment amount at the provider level. We excluded services aggregated under ASCs since this would have resulted in double counting for procedures that were performed there.

Outcomes of Interest

Our primary outcome of interest was the average annual prostate biopsy rate. This was defined as the number of prostate biopsies (HCPCS [Healthcare Common Procedure Coding System] 55700) divided by the number of eligible beneficiaries each year and averaged for 3 years. Our secondary outcome of interest was the change in biopsy rates from 2012 to 2014.

Primary Exposure

Based on ZIP Code™ the providers were assigned to 1 of 306 hospital referral regions defined in the Dartmouth Atlas,[11] representing areas defined by tertiary medical care markets.

Other Regional Covariates of Interest

Demographic data on each region were imported from the CMS Geographic Variation PUF (Public Use File). Regional factors for each year were averaged for the 3 years included in our data set. These factors included the number of male Medicare fee-for-service beneficiaries, the percent of the population that was African American, the percent of the population eligible for Medicaid and the average HCC index with the latter used for risk adjustment. Data related to regional health care delivery were linked from the Dartmouth Atlas.[11] Those data included the average percent of men older than 75 years who underwent PSA screening in 2012 and 2014, the average End-of-Life Intensity of Care Index and the average per beneficiary physician and/or facility reimbursement. We calculated average urologist density based on the number of urologists who received any Medicare fee-for-service payments per 10,000 eligible beneficiaries. Finally, we determined whether each region had an ASC that received payments for prostate biopsies.

Statistical Analysis

We aggregated provider level data at the hospital referral region level to determine the total number of biopsies performed annually. Biopsy rates were calculated for each region for each year and averaged for 3 years. We also calculated the change in biopsy rates from 2012 to 2014. We aggregated all regions to calculate grand totals of biopsies and beneficiaries overall for each year. The overall trend in biopsy rates with time was assessed using linear regression.

We generated multivariable linear regression models based on covariates that were determined a priori. The first model analyzed average biopsy rates at the hospital referral regional level. The second model estimated change in biopsy rates at the same level. Models adjusted for regional demographics (percent of the population that was African American, percent of Medicaid eligible men, average HCC index and total beneficiaries), resources (ASCs where