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## Original Article

# Impact of United States Preventive Services Task Force recommendations on prostate biopsy characteristics and disease presentation at a tertiary-care medical center

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## ABSTRACT

**Background:** To evaluate early consequences of 2012 United States Preventive Services Task Force (USPSTF) recommendations for decreased prostate-specific antigen (PSA) screening on prostate biopsy characteristics and prostate cancer presentation.

**Materials and methods:** A single tertiary-care institution, multisurgeon, prospectively maintained database was queried for patients undergoing prostate biopsy from October 2005 to September 2016. Patient demographics, biopsy characteristics, and extent of disease were reported. Patient cohorts before and after USPSTF recommendations were compared using two-sample *t* test, Chi-square test, and Wilcoxon rank sum test with significance at  $P < 0.05$ .

**Results:** A total of 2,000 patients were analyzed, including 1,440 patients before and 560 patients after USPSTF recommendations. Following the recommendations, patients had higher prebiopsy PSA (5.90 vs. 6.70,  $P < 0.001$ ). Overall, 817 (40.9%) patients had prostate cancer detected at biopsy with an increase from 37.0% before to 50.8% after ( $P < 0.001$ ). Biopsies detected less low-risk Gleason  $\leq 6$  prostate cancer (47.4% vs. 41.1%) and more intermediate-risk Gleason 7 cancer (30.9% vs. 39.7%), with comparable findings of high-risk Gleason  $\geq 8$  cancer (21.7% vs. 19.2%),  $P = 0.042$ . In addition, greater percentage of core involvement ( $P < 0.001$ ) was seen. At the time of diagnosis, extraprostatic extension identified by pelvic imaging increased from 12.6% to 18.9%,  $P = 0.039$ , with a trend toward lymph node positivity (1.1% vs. 2.2%,  $P = 0.078$ ). Of those with metastatic disease, bony involvement occurred more often (1.7% vs. 3.2%,  $P = 0.041$ ).

**Conclusions:** After 2012 USPSTF guidelines, patients presented with higher PSA with prostate cancer were detected more frequently. More adverse, pathologic prostate cancer features were found on biopsy with the extent of disease implicating locally advanced/metastatic disease. These findings should be considered when counseling patients about prostate cancer screening importance.

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## 1. Introduction

Prostate cancer is the most commonly diagnosed non-dermatologic malignancy and third leading cause of cancer-related death in men in the United States. The American Cancer Society in 2017 estimated that 161,360 new cases would be diagnosed with

26,730 deaths directly attributable to prostate cancer.<sup>1,2</sup> Screening for prostate cancer through prostate-specific antigen (PSA) and digital rectal examination (DRE) has reduced prostate cancer mortality by 50% over the past 20 years.<sup>3</sup> However, PSA screening for the early diagnosis and treatment of prostate cancer has recently been called into question.

The efficacy of PSA screening was examined through two large-scale randomized control trials, namely the European Randomized Study of Screening for Prostate Cancer and the U.S. Prostate, Lung, Colorectal, and Ovarian trial.<sup>4,5</sup> Largely based on these two studies, the United States Preventive Services Task Force (USPSTF) in May

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2012 formally recommended against the use of population-based PSA screening for prostate cancer, issuing a Grade D recommendation discouraging the practice altogether.<sup>6</sup> In the years since the 2012 USPSTF recommendation against PSA screening, PSA testing and DRE have decreased substantially leading to a decline in the incidence of prostate cancer.<sup>7–9</sup> The unintended consequence of this pendulous decision away from prostate cancer screening is the possibility for increases in prostate cancer mortality and an excess of adverse cancer-specific outcomes.<sup>10–12</sup>

Reductions in the detection of early-stage prostate cancer incidence and PSA-based prostate cancer screening rates in men aged 50 years and older have been reported in the literature, coinciding with the 2012 USPSTF recommendations.<sup>8</sup> It remains speculative, however, whether this decrease will ultimately affect the overall course of disease and if patients will present with more advanced or metastatic prostate cancer. In this study, we evaluated the early consequences of decreased PSA screening on prostate biopsy characteristics and presentation of prostate cancer. Our aim was to determine if in our clinical practice patients presented with more advanced prostate cancer at the time of diagnosis and with higher rates of metastatic disease since widespread implementation of the 2012 USPSTF guidelines.

## 2. Methods

Institutional review board approval was obtained for a retrospective review of a single tertiary-care institution, multisurgeon, prospectively maintained database for all patients undergoing prostate needle biopsy (PNB) between October 2005 and September 2016. Patients were excluded if complete records were not available for analysis. Those with evidence of prostate cancer on PNB were defined as having histologic evidence of prostatic adenocarcinoma on at least one core of tissue. Prostatic intraepithelial neoplasia and atypical small acinar proliferation (ASAP) in the absence of any prostatic adenocarcinoma were considered premalignant and thus benign. Rare nonadenocarcinoma histologies arising from the prostate were excluded.

Prostate biopsies were performed using the BK Medical Falcon 2101 and the BK Flex Focus 300 from BK Ultrasound. No MRI (magnetic resonance imaging)/US fusion biopsies were included in these data as this technology was not available at our institution during the time period of the study. A Prostate Biplane 8808e simultaneous biplane transducer was used for real-time imaging during biopsy. An average of 13 prostate biopsy cores were obtained for each patient in our study population.

The population was subdivided into two cohorts. Patients comprising the pre-2012 USPSTF recommendation cohort were analyzed from October 2005 to May 2012, and patients post-2012 USPSTF recommendation were analyzed from June 2012 to September 2016. Patient demographics (age, ethnicity, DRE, and prebiopsy PSA), biopsy characteristics (prostate volume determined by transrectal ultrasound, number of biopsy cores, presence of prostate cancer, Gleason score, and percentage core involvement), and extent of disease (extraprostatic extension on either MRI or computed tomography imaging of the pelvis, lymph node positivity on imaging, and presence of bony metastatic disease) were reported. Gleason scores of each patient were further categorized as low-risk (Gleason  $\leq 6$ ), intermediate-risk (Gleason 7), and high-risk (Gleason  $\geq 8$ ) prostate cancer.

Patient cohorts before and after USPSTF recommendations were compared using two-sample *t* test, Chi-square test, and Wilcoxon rank sum test, where appropriate, with significance set at  $P < 0.05$ . All analyses were performed using SAS 9.4 (SAS Institute Inc., NC, USA).

## 3. Results

A total of 2,000 patients were analyzed, including 1,440 patients before and 560 patients after the 2012 USPSTF recommendations were published. Average age between the two groups was nearly equivalent (64.0 years vs. 64.1 years,  $P = 0.712$ ). Most patients were Caucasian, 89.8% and 85.2% between the prerecommendation and postrecommendation cohorts, respectively, with African American, Hispanic/Latino, Asian, and Native American ethnicities also represented. There was statistical significance seen in patients having abnormal DRE (49.5% vs. 42.5%,  $P = 0.007$ ) although these abnormalities were not further stratified to determine if this was merely prostatic enlargement or examination findings concerning malignancy. Following the recommendations, patients presented with a higher prebiopsy PSA of 6.70 [95% confidence interval (CI): 4.73–10.00] than that reported before recommendations were published, which was 5.90 (95% CI: 4.13–8.70),  $P < 0.001$  (Table 1).

Prostate size was similar between both the groups, 40.1 cc vs. 39.7 cc, with a median of 13 biopsy cores taken in each group. Overall, 817 (40.9%) patients had prostate cancer detected at biopsy with an increase from 37.0% before to 50.8% after USPSTF recommendations were published ( $P < 0.001$ ). Biopsies detected less low-risk Gleason  $\leq 6$  prostate cancer (47.4% vs. 41.1%) and more intermediate-risk Gleason 7 cancer (30.9% vs. 39.7%), with comparable findings of high-risk Gleason  $\geq 8$  cancer (21.7% vs. 19.2%),  $P = 0.042$ . In addition, greater percentage of core involvement ( $P < 0.001$ ) was seen (Table 2).

At the time of diagnosis, extraprostatic cancer extension identified by either computed tomography or MRI pelvic imaging increased from 12.6% to 18.9%,  $P = 0.039$ . Pelvic imaging also detected a trend toward lymph node positivity defined as lymph nodes  $>1$  cm in size within the pelvis (1.1% vs. 2.2%,  $P = 0.078$ ). Of those with metastatic disease at the time of diagnosis, bony involvement occurred more often (1.7% vs. 3.2%,  $P = 0.041$ ) (Table 3).

A total of 363 patients were elected to undergo radical prostatectomy for treatment of prostate cancer. Radical prostatectomy comprised 42.0% ( $n = 139$ ) in the earlier cohort compared with 48.9% ( $n = 224$ ) in the later cohort,  $P = 0.065$ . Alternative therapies included patients undergoing active surveillance (17.4% vs. 19.0%,  $n = 147$  patients;  $P = 0.633$ ), external beam radiation therapy alone (16.1% vs. 11.3%,  $n = 118$  patients;  $P = 0.061$ ), androgen deprivation therapy alone (6.2% vs. 5.6%,  $n = 49$  patients;  $P = 0.877$ ), and external beam radiation therapy plus androgen deprivation therapy (12.2% vs. 7.4%,  $n = 85$  patients;  $P = 0.041$ ) (Table 4). For patients who underwent radical prostatectomy, final pathology comparing the two groups showed Gleason  $\leq 6$  prostate cancer in 22.8% vs. 19.4% ( $P = 0.512$ ), Gleason 7 prostate cancer in 52.7% vs. 60.4% ( $P = 0.159$ ), and Gleason  $\geq 8$  prostate cancer in 8.9% vs. 16.5% ( $P = 0.044$ ) (Table 5).

## 4. Discussion

The USPSTF in 2008 changed the recommendation for PSA screening to a D grade (recommending against screening) in men  $\geq 75$  years of age, stating that there was not enough evidence that screening in this age group and ultimately active treatment for prostate cancer resulted in greater benefit than watchful waiting alone.<sup>13</sup> This statement was then further expanded in May 2012, when the USPSTF updated their recommendation to a D grade for PSA screening in all men regardless of age citing that the benefits of PSA screening do not outweigh the harms, including the high false-positive rate, negative psychological effects, complications of PNB, and the risk for overdiagnosis and overtreatment of the patient.<sup>6</sup> The effects of these recommendations have been widespread,

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