

Prostate Biopsy Characteristics: A Comparison Between the Pre- and Post-2012 United States Preventive Services Task Force (USPSTF) Prostate Cancer Screening Guidelines

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To compare prostate cancer (PCa) characteristics diagnosed by prostate biopsy (Pbx) in the 3 years before and after the 2012 United States Preventive Services Task Force (USPSTF) recommendations for PCa screening, we completed a retrospective comparative analysis of 402 sequential PCa patients diagnosed from 2010 to 2012 (3 years) with 552 PCa patients diagnosed from 2015 to 2017 (3 years). Data was collected on patient age, race, total number of biopsies performed, prostate specific antigen (PSA), Gleason sum score (GSS), and digital rectal examination (DRE). The data was analyzed to determine whether the 2012 USPSTF screening recommendations affected PCa characteristics. Two study groups were defined, Group A and Group B, prior to and after the 2012 USPSTF screening recommendations, respectively. In Group A (pre- 2012 USPSTF recommendations), 567 patients/year underwent a Pbx versus Group B, 398 patients/year, a 30% reduction post-USPSTF. The annual positive Pbx rate for Group A is 134/year versus Group B 184/year, a 37.3% increase post-USPSTF. Group A had high-grade PCa (GSS 7-10) in 51.5% versus Group B in 60.1%, an 8.6% increase post-USPSTF. In Group B, the total number of positive biopsies was increased by 100%. This study shows that in Group B, the Pbx rate decreased by 30% but the annual PCa detection rate increased by 37%. High-grade GSS (7-10) PCa increased by 8.6%. Despite a reduction in the total number of prostate biopsies by 30%, there was a 100% increase in the total number of positive prostate biopsies.

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KEY WORDS

Prostate cancer • PSA screening • United States Preventive Services Task Force

In 2017, the American Cancer Society reported 161,360 new cases of prostate cancer (PCa) and 26,730 deaths due to PCa in the United States. PCa is the third leading cause of cancer-related deaths among American men. The incidence of PCa among all races is 123.2 (per 100,000 population) it is the highest, 198.4, in African American men, and 114.8 in Caucasian men. The incidence of PCa is the highest in men aged 65 years and older (66%).¹ In the 20 years prior to 2012, prostate-specific antigen (PSA)- and digital rectal examination (DRE)-based PCa screening reduced PCa mortality by 50%.² There are 3 million PCa survivors in the United States.³

In 2008, the United States Preventive Services Task Force (USPSTF) recommended against screening men aged 75 years and older, and, in 2012, the USPSTF recommended against PCa screening for all age groups.^{4,5} In 2013, the American Urological Association (AUA) recommended against screening men aged 70 years and older.⁶ Survey data indicate that subsequent to 2013, 50% of primary care doctors did not offer PCa screening to their patients.⁷ In 2013, national PCa screening decreased by 18%.⁸ Unfortunately, a 72% rise in metastatic PCa compared with that in 2004 has been reported.⁹ In 2015, 1400 additional cases of PCa-specific mortality have been documented.¹⁰ It is estimated that if the PCa screening is discontinued, 6000 additional deaths due to PCa will occur annually in the United States.¹¹

As the life expectancy for men aged 70 to 80 years is 14.1 to

8.1 years, respectively, an increasing number of men in this age group will be at risk for high-grade PCa.¹² A 10-year study of 230,081 American veterans found that 10.5% died from PCa and 77.4% of the PCa deaths occurred in men between the ages of 70 to 89 years.¹³

In this study, we sought to determine whether PCa diagnoses and cancer characteristics have changed in our community clinical practice after the publication of the 2012 USPSTF recommendations.

Methods and Materials

In 2014, we published a retrospective analysis of 402 PCa patients diagnosed by prostate biopsy (Pbx).¹⁴ The study examined the Pbx characteristics of PCa patients from 2010 to 2012 (3 years). To study the effects of decreased PCa screening, we analyzed an additional 552 PCa cases diagnosed by Pbx from 2015 to 2017 (3 years). Data was collected on patient age, race, number of biopsies, PSA, Gleason sum score (GSS), and DRE. In the current study, we updated Group B to include 3 years of post-USPSTF data. Our original published study contained 18 months of post-USPSTF data.¹⁵

All cases are collected from our community clinical practice, a group of 12 board-certified urologists located in Prince George's County, Maryland, in the Washington, DC metropolitan area. Prostate biopsies were performed on men with a PSA greater than 2.5 ng/mL, an abnormal DRE, or both. Most of the patients had a transrectal ultrasound-guided 12 core Pbx under intravenous

sedation on an outpatient basis (a few patients were biopsied under local anesthesia). All patients were cleared for the procedure by their primary care physician.

Patient age was stratified as ages under 55, 56 to 69, and 70 to 80 years. The charts of consecutive patients from our practice were reviewed and the information was entered in a database. The data were analyzed to determine whether the 2012 USPSTF screening recommendations affected PCa characteristics. Two study groups were defined: Group A, patients diagnosed prior to the USPSTF screening recommendations (2010-2012), and Group B, patients diagnosed after the USPSTF screening recommendations (2015-2017). We separated the GSS into two groups, GSS 6 and GSS 7 to 10. We defined the GSS 7 to 10 group as aggressive because it harbors a Gleason score 4 or higher component.

Chi-squared or Fisher's Exact Tests were used to compare frequencies. All analyses were conducted using the SAS software program. The study was approved by the Western Institutional Review Board (study number 1087891).

Results

Prostate Biopsy

In the pre-USPSTF period (Group A), 1703 total Pbx were performed over 3 years (Table 1). The Pbx rate was 567 biopsies/year. There were 402 positive Pbx over 3 years (23.6%). The annual positive biopsy rate is 134 positive biopsies/year. In the post-USPSTF period (Group B), there were 1194 total

TABLE 1**Biopsy Statistics in Group A Versus Group B**

	Group A (2010-2012)	Group B (2015-2017)	Note
Total biopsies	1703	1194	
Annual biopsy rate	567	398	30% reduction
Total positive biopsies	402 (23.6%)	552 (46.2%)	100% relative increase
Annual positive biopsy rate	134/year	184/year	37% increase

Pbx, an annual rate of 398 biopsies/year. There were 552 positive Pbx (46.2%), an annual rate of 184 positive biopsies/year. In Group B, there was a 100% increase of the total number of positive Pbx (23.6% in Group A vs 46.2% in Group B).

Age

The age was stratified as under 55, 55-69, and 70 -80 years (Table 2). A comparison was made with group A of 402 PCa patients and group B of 552 PCa patients. In group A, 8.9% were under age 55 years, 56.2% were age 55 to 69 years, and 34.8% were

age 70 to 80 years. In group B, 14.5% were under age 55 years, 63% were age 55 to 69 years, and 22% were age 70 to 80 years. The age groups were well matched in both groups.

PSA

The PSA in group A was under 4 ng/mL in 11.1%, 4 to 9.9 ng/mL in 63.4%, and 10 ng/mL and over in 25.4% (Table 2). In group B, the PSA was under 4 ng/mL in 4.4%, 4 to 9.9 ng/mL in 69.9%, and 10 ng/mL and over in 25.7%. In group B, there were less patients with a PSA under 4 ng/mL compared with group A.

Race

The study was conducted in Prince George's County (PGC), Maryland, a county with a three-fold higher prevalence of African Americans (AA) compared with the national average. According to the 2015 American Community Survey, PGC was 61.6% African American, 13.8% white, and 24.6% other races. Our study had an African-American representation of 59%, a white representation of 23%, and 18% other races, consistent with the census demographic data (Table 3). Although we were not able to

TABLE 2**Comparison of Prostate-specific Antigen (PSA) Levels by Age in Group A Versus Group B**

Age (years)	n	PSA <4 ng/mL	PSA 4-9.9 ng/mL	PSA 10 ng/mL and Over	P Value
Group A					
<55	36	5 (13.9%)	25 (66.7%)	6 (19.4%)	
56-69	226	23(10.2%)	150 (64.6%)	53 (25.2%)	
70-80	140	17 (12.1%)	80 (56.4%)	43 (31.4%)	
Total	402	45 (11.1%)	255 (63.4%)	102 (25.4%)	
Group B					
<55	80	8 (10%)	55 (68.8%)	17 (21.2%)	0.7409
56-69	349	12 (3.5%)	250 (71.6%)	87 (24.9%)	0.0043
70-80	125	4 (3.3%)	81 (65.9%)	38 (30.8%)	0.0261
Total	552	24 (4.4%)	386 (69.9%)	142 (25.7%)	

PSA, prostate-specific antigen.

TABLE 3

Race by Age in Group B Stratified by Prostate Cancer Positive Versus Negative Biopsy

Age	n	African American (%)	White (%)	Other (%)
PCa positive				
<55	80	58 (72.5)	13 (16.2)	9 (11.3)
56-69	349	236 (67.6)	59 (16.9)	54 (15.5)
70-80	123	72 (58.5)	33 (26.8)	18 (14.6)
Total	552	336 (66.3)	105 (19)	81 (14.7)
PCa negative				
<55	85	56 (65.9)	14 (16.5)	15 (17.6)
56-69	421	213 (50.6)	119 (28.3)	89 (21.1)
70-80	136	72 (52.9)	38 (27.9)	26(19.2)
Total	642	341 (53.1)	171 (26.6)	130 (10.3)
TOTAL	1194	707 (59)	276 (23)	211 (17.7)

PCa, prostate cancer.

extract the race from the data set for Group A because the study data consisted of patients in the same county and in the same urology practice, we assume that the demographics are consistent between Groups A and B.

Gleason Sum Score

In Group A, a GSS of 6 was found in 195 patients (48.5%) and in

220 patients in Group B (39.9%) (Table 4). In group A, a GSS of 7 to 10 was found in 207 patients (51.5%) and in 332 patients (60.1%) in Group B. GSS 7 to 10 was higher in Group B by 8.6% when compared with Group A.

Digital Rectal Examination

In Group A, a normal DRE was found in 151 patients and abnormal

DRE was found in 251 patients. In Group B, a normal DRE was found in 419 patients and abnormal DRE was found in 133 patients (Table 5)

Normal Digital Rectal Examination and Gleason Sum Score

In Group A, 78 patients with normal DRE (52%) had GSS of 6 and 73 (48%) had GSS 7 to 10. In

TABLE 4

Comparison of Gleason Sum Score (GSS) by Age in Group A Versus Group B

Age	n	GSS 6	GSS 7-10	P Value
Group A				
<55	36	18 (50.0%)	18 (50.0%)	
56-69	226	122 (54%)	104 (46.0%)	
70-80	140	55 (39.3%)	85 (60.7%)	
Total	402	195 (48.5%)	207 (51.5%)	
Group B				
<55	80	42 (52.5%)	38 (47.5%)	0.8031
56-69	349	130 (37.2%)	219 (62.8%)	≤0.0001*
70-80	123	48 (39.0%)	75 (61.0%)	0.9654
Total	552	220 (39.9%)	332 (60.1%)	

*Statistically significant higher GSS 7-10 in age group 56-69 for Group B vs Group A.

TABLE 5**Comparison of Gleason Sum Score (GSS) by Digital Rectal Exam (DRE) and Age in Group A Versus Group B**

Age	n	GSS 6	GSS 7-10	P Value
Group A				
<i>Abnormal DRE</i>				
<55	27	18 (66.7%)	9 (33.3%)	
56-69	139	69 (49.4%)	70 (50.6%)	
70-80	85	26 (30.9%)	59 (69.1%)	
Total	251	113 (45%)	138 (55%)	
<i>Normal DRE</i>				
<55	9	4 (44.4%)	5 (55.6%)	
56-69	87	49 (56.8%)	38 (43.2%)	
70-80	55	25 (44.7%)	30 (55.3%)	
Total	151	78 (52%)	73 (48%)	
Group B				
<i>Abnormal DRE</i>				
<55	15	8 (53.3%)	7 (46.7%)	0.3939
56-69	75	21 (28%)	54 (72.0%)	0.0022*
70-80	43	19 (44.2%)	24 (55.8%)	0.1280
Total	133	48 (36.1%)	92 (63.9%)	
<i>Normal DRE</i>				
<55	65	34 (52.3%)	31 (47.7%)	0.7325
56-69	274	109 (39.8%)	165 (60.2%)	0.0067*
70-80	80	29 (36.3%)	51 (63.7%)	0.2834
Total	419	172 (41.1%)	247 (58.9%)	

*Statistically significant difference in GSS 7-10 in Group B vs Group A in the age group 56-69 with a normal or abnormal DRE.

Group B, 172 patients with normal DRE (41.1%) had GSS of 6 and 247 (58.9%) had GSS 7 to 10. In patients with a normal DRE, there was a 10.9% increase in GSS 7 to 10 in group B versus group A (58.9% vs 48%, respectively).

Abnormal Digital Rectal Examination and Gleason Sum Score

In Group A, a GSS of 6 was found in 113 patients (45%) and a GSS of 7 to 10 was found in 138 patients (55%). In Group B, a GSS of 6 was found in 48 patients (36.1%) and a GSS

of 7 to 10 was found in 92 patients (63.9%). Patients with an abnormal DRE had an 8.9% increase in GSS 7 to 10 in Group B versus group A (63.9% vs 55%, respectively).

Discussion

The current study reviewed our community-based urologic practice and found that the Pbx rate decreased by 30% in the post-USPSTF period. Additionally, the PCa detection rate was 37% higher post-USPSTF. We also found an 8.6% higher rate of high-grade PCa

(GSS 7-10) in the post-USPSTF period. Despite a 30% reduction in the number of biopsies post-USPSTF guidelines, there was a 100% increase in the total number of positive biopsies.

The Prostate, Lung, Colorectal and Ovarian Cancer Screening Trial (PLCO) on which the USPSTF based their 2012 recommendation against PCa screening was found to be 90% contaminated and hence should not form the basis of national guidelines.¹⁶

Following the 2012 USPSTF recommendations, there was a 64%

decrease in both DRE screening and a 39% decrease in PSA testing.¹⁷ Additionally, other studies have shown that Pbx for cancer have decreased by 21.4% after the 2012 USPSTF recommendations were issued.¹⁸

Our study is unique because 59% of the study population were African American (AA), a documented high-risk group. This large percentage of AAs in our study population have certainly factored into our outcomes. This data shows that high-risk populations are disproportionately adversely affected by the 2012 USPSTF guidelines. The 2012 USPSTF guidelines were based on studies in which high-risk populations were underrepresented (only 4% were AA in the PLCO study).¹⁹⁻²¹ The USPSTF should make available PCa screening for men, especially to high-risk populations including African American men, men with a family history of PCa, and healthy men over age 70 years.²²

Since 2013, more locally advanced PCa, metastatic PCa, and PCa-specific deaths have been documented. Weiner and colleagues showed that the incidence of metastatic PCa increased by 72% from 2004 to 2013. The age group from age 55 to 69 years showed

the highest rate of increase (92% increase from 2004-2013).⁹ The 5-year survival rate in metastatic PCa is 28% and the cost of treating metastatic PCa is well over \$100,000.²³ More importantly, patients with metastatic PCa have more pain, a much lower quality of life, and almost certain death. The annual cost of the screening PSA test for PCa is \$25.

We noted that in our pre- and post- 2012 groups, men aged 70 to 80 years had a high GSS of 7 to 10 in 60.7% and 61%, respectively. In our prior study of 5100 US men aged 70 to 80 years with an average PCa risk, patients treated by radiation (external, brachytherapy, or both), 84% of which with a PSA level less than 10 ng/mL, 61% had high a GSS of 7 to 10.²⁴ As surgical series have found that 50% of GSS 6 patients on biopsy are upgraded to GSS 7 to 10 at the time of prostatectomy, it is likely that 80% of our patients aged 70 to 80 years had a GSS of 7 to 10.^{25,26} Unfortunately, in 2013 the AUA recommended against PCa screening in men aged 70 years and older despite many published studies that documented that these men have more prevalence of PCa, more locally advanced PCa, more metastatic PCa, and more deaths due to PCa.²⁷⁻²⁹ The current study shows

that limiting screening for high-risk men over the age of 70 years is highly counterproductive and harmful.

The 2017 USPSTF draft recommendation upgrades PCa screening in men aged 55 to 69 years from a D grade to a C grade, but still excludes men aged 70 years and older. We believe the aforementioned reports strongly indicate that PCa screening should also be made available to detect early PCa in healthy men aged 70 years and over.³⁰ Based on our published data and the peer-reviewed literature, we have testified against the 2017 USPSTF's draft PCa screening guidelines.³¹ PCa screening is vital for African American men, men with family history of PCa, men aged 70 to 80 years, and for men of lower socioeconomic status, who frequently do not seek medical help until symptoms arise—probably a sign of metastatic disease.

Over the past several years, more powerful tools to facilitate PCa detection have entered clinical practice. These include imaging technology such as the multi-parametric prostate MRI and novel genetic and chemical assays that allow clinicians to better focus biopsies at cancerous regions to determine which patients

MAIN POINTS

- The annual prostate biopsy (Pbx) rate decreased by 30% after the 2012 United States Preventive Services Task Force (USPSTF) prostate cancer (PCa) screening guidelines but the annual PCa detection rate increased by 37%.
- High-grade Gleason sum score (GSS) (7-10) PCa increased by 8.6% after the 2012 USPSTF recommendations.
- Despite a 30% reduction in the total number of biopsies there was a 100% increase in the total number of positive biopsies in the post- 2012 USPSTF guideline period.
- These findings suggest that the PCa screening recommendations should be quickly reevaluated to significantly decrease the rising trend of PCa morbidity, mortality, and the cost of prostate cancer treatment. The authors strongly believe that PSA- and DRE-based PCa screening should be made available, especially to African-American men, men with a family history of prostate cancer, and healthy men aged 70 years and older.

may harbor cancer despite negative initial biopsy results and which

especially to African-American men, men with a family history of prostate

PSA- and DRE-based PCa screening should be made available, especially to African-American men, men with a family history of prostate cancer, and healthy men aged 70 years and older.

patients are at high risk for aggressive disease.³²⁻³⁴ Moreover, these new diagnostic and risk stratification tools give clinicians guidance to counsel patients regarding active surveillance or treatment. Current prostate cancer research will further clarify which prostate cancers are indolent and thus safe for surveillance and which are aggressive and need to be treated. Diagnosis is the cornerstone of medical care but treatment should be individualized. Not all patients are treated with surgery or radiation as a growing number are actively monitored. The recent findings of increased metastatic prostate cancer is likely the result of decreased prostate cancer screening.

Conclusions

This study shows that the annual Pbx rate decreased by 30% after the 2012 USPSTF PCa screening guidelines but the annual PCa detection rate increased by 37%. High-grade GSS (7-10) PCa increased by 8.6% after the 2012 USPSTF recommendations. Despite a 30% reduction in the total number of biopsies there was a 100% increase in the total number of positive biopsies in the post- 2012 USPSTF guideline period. These findings suggest that the PCa screening recommendations should be quickly reevaluated to significantly decrease the rising trend of PCa morbidity, mortality, and the cost of prostate cancer treatment. We strongly believe that PSA- and DRE-based PCa screening should be made available,

cancer, and healthy men aged 70 years and older.

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