

Original Research

# Prostate Specific Antigen (PSA) testing practices in an academic healthcare organization

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## Abstract

**Background:** It is estimated that one out of nine men will be diagnosed with prostate cancer in their lives. However, there is so much debate about the impact of guidelines in prostate specific antigen (PSA) screening for early detection of prostate cancer. Although some studies have examined variation in PSA-based screening for prostate cancer, they have not considered the impact that the type of health insurance and clinician specialty may have in PSA-screening practices. **Methods:** Retrospective medical chart review of 500 male patients (40–69 years old). ANOVAS and logistic regression tested for significant differences in the variables of interest. **Results:** The majority (83%) of patients did not receive any type of PSA-testing during the study period. Patients of older age and those having private insurance were more likely to have a PSA-test. Of those patients who had PSA testing ( $n = 83$ ), half received it for prostate cancer screening. The majority of the PSA-tests performed ( $n = 214$ ) were ordered by urologists, received by White patients, and covered by private insurance. **Conclusions:** In this study, type of health insurance and age were associated with receipt of a PSA test, as opposed to race. Considering that male patients usually go to the urologists only when they have prostate symptoms, primary care clinicians may benefit from continued education on counseling patients, especially those who may be at elevated risk, regarding the importance of prostate health and PSA exams in general.

**Keywords:** prostate-specific antigen; prostate-related conditions; African Americans; health insurance; primary care physician; urologist

## 1. Introduction

Race/ethnicity and age are associated with risk of prostate cancer and benign prostatic-related conditions. Overall, men age 50 years and older are at higher risk of prostate-related problems (urinary infection, prostatitis, benign prostatic hyperplasia and tumors), and prostate cancer [1,2]. Compared to white men, African American men have a higher prostate cancer incidence rate; earlier age of onset; more advanced disease at diagnosis; and higher age-adjusted mortality rates from prostate cancer [3,4]. Although results are mixed, there is some evidence that African American men are also at higher risk of benign prostatic hyperplasia (BPH) compared to white men [5–7]. Additionally, Black men with BPH have a much greater risk of developing prostate cancer than White men [8].

Although the prostate-specific antigen (PSA) test is more commonly used for early detection of prostate cancer, it is also used for diagnosis and follow-up of prostate-related conditions such as benign prostatic hyperplasia (BPH), prostatitis, and urinary tract infections that can raise PSA levels [1,9,10]. Because some drugs (dutasteride, finasteride, and also chemotherapy) may lower PSA levels, routine PSA testing (PSA velocity, free PSA and PSA density) is recommended for those patients receiving treatment for BPH, urinary conditions, and prostate cancer [2,11,12].

In 2012, the U.S. Preventive Services Task Force (USPSTF) review regarding PSA-based screening for prostate cancer concluded that although there are potential benefits of screening, these benefits do not outweigh the expected harms enough to recommend routine screening (D recommendation) [13]. Based in part on additional evidence of decreased mortality and incidence of prostate cancer, in 2018, the USPSTF upgraded the D recommendation to a C recommendation for PSA-based screening for prostate cancer for men aged 55 to 69 years [14]. Along with this determination, the USPSTF called for shared decision making about the benefits and harms of PSA-based prostate cancer screening among clinicians and all men between the ages of 55 and 69 years old, and especially among high-risk groups, such as African American men and those with a family history of prostate cancer [14]. Similarly, the updated American Urological Association (AUA) guidelines stress a shared decision-making model in which clinicians and patients discuss the risks and benefits for different BPH treatment options [15].

A 2010 national study of Primary Care Providers (PCPs) found that about half did not routinely discuss PSA cancer screening tests with eligible patients and that their PSA screening practices were influenced by the USPSTF guidelines [16]. Furthermore, two large studies have found decreasing rates of PSA cancer screening utilization in the



US [17,18]. One of the studies, conducted in 41 practices in an integrated health system in Northeast Ohio, found that PSA cancer screening declined from 2007 to 2014, even among higher risk groups, e.g., older and African American men. Similarly, an analysis of National Health Interview Survey data from 2005–2015, found that PSA testing for prostate cancer screening decreased from 2008 to 2013 (with no change in 2015) among men aged 55–69 years (43.1% vs 32.8%) [18]. A 2020 study of 91 family and internal medicine physicians conducted in the Bronx, NY, found that a majority of clinicians reported that they follow current USPSTF guidelines (73%), were comfortable with shared decision making (68%), and wanted more information on prostate cancer screening (79%) [19].

These studies suggest that screening efforts in high-risk groups may need to be increased and clinician education related to PSA screening may be needed. The findings also include that states with larger declines in PSA screening had larger increases in metastatic disease at time of diagnosis [20].

Most studies reporting PSA testing practice patterns have focused only on PSA screening for early detection of prostate cancer and were conducted before the 2018 updated USPSTF guidelines. Although some studies have examined variation in PSA-based screening for prostate cancer by clinician specialty, they have not examined differences by patient race/ethnicity and insurance or reason to order the test. Consequently, the purpose of this descriptive pilot study was to examine clinician practices related to ordering PSA tests for screening, diagnosis and/or follow-up of prostate cancer and other prostate-related conditions. Specifically, our aims were to identify if there are significant differences in utilization of PSA testing by: (1) patient race, age and health insurance; (2) gender and specialty of the clinician ordering the test; and (3) the reason the test was ordered by the clinician.

## 2. Materials and methods

### 2.1 Study design, setting and sample

The study was conducted among patients seen at the Louisiana State University Healthcare Network (LSUHCN) outpatient clinics. LSUHCN is a non-profit, academic, multi-specialty healthcare organization that accepts most major insurance providers, including Medicaid, Medicare, private, and military insurances. Although the LSUHCN has different locations in Louisiana, this study only included patients receiving primary care services in four campus clinics providing prevention and wellness services around the Greater New Orleans area (specifically, in Orleans and Jefferson parishes). This study was a retrospective medical chart review of a random sample of patients meeting eligibility criteria of: (1) male sex; (2) between the ages of 40 and 69 years; (3) who had at least one visit to LSUHCN clinics between August 1, 2014 and July 31, 2019.

The sampling frame consisted of a total of 20,515 eligible patients identified through a search of Allscripts electronic health records. Although the USPSTF guidelines recommend PSA screening for early detection of prostate cancer only for men 55–69 years old, it also recommends PSA screening at earlier ages for African American men and those patients with a family history of prostate cancer [14]. Considering that our study includes PSA testing not only for screening but also diagnosis and follow-up of prostate-related conditions and African American men, our sample included patients 40–69 years old. In order to have a sample that was representative of the patient population seen at the targeted clinics, all patients meeting eligibility criteria (N = 20,515) were classified by age groups (40–44, 45–49, 50–54, 55–59, 60–64, and 65–69) and stratified randomization among each group was conducted electronically using the Excel RAND function to select a final total sample of 500 cases. We selected this sample size due to resource constraints and because this was a descriptive study intended for hypothesis generation to inform subsequent studies.

### 2.2 Data collection and operationalization of variables

Information on the final sample of randomly selected patients was extracted from their medical records to report on the total number of PSA tests (regardless of reason) received within the specified time frame (August 1, 2014 to July 31, 2019); specialty (family medicine, nurse practitioners, internal medicine, urologist, oncologist and other) and gender (male/female) of the clinician who ordered the PSA test; and race/ethnicity, age, insurance type, and prostate-related medical conditions of the patient. The total number of PSA tests were grouped into five categories (none, one, 2–3; 4–5; 6 and more). Patients were grouped by race/ethnicity as White, Black, Hispanic and Other (Asians, other groups, or unknown), by age ranges (40–44, 45–49, 50–54, 55–59, 60–64, 65–69), and by insurance type (none; Medicare/Medicaid; Veterans; private/employer provided; and other type). Prostate-related diagnosis (benign prostatic hyperplasia; prostatitis; urinary tract infections; erectile dysfunction; prostate cancer; elevated PSA; etc.) and reasons for having the PSA test identified in the medical chart were classified into five categories: early detection of prostate cancer; prostate-related conditions; prostate cancer surveillance; follow-up of elevated PSA; and other reasons such as hypogonadism and bladder problems. In addition, medical encounter visit notes were reviewed for documentation of shared decision making with respect to PSA testing. To protect the privacy and confidentiality of participant information, patient data was de-identified and results are reported in aggregate. The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the LSUHSC (Study # 19-1221) and Xavier University of Louisiana (Study # 748) Institutional Review Boards.

**Table 1. Demographics of male patients in the sample (n = 500).**

Race/ethnicity	White		African American		Hispanic		Other <sup>a</sup>		Total	
	n	%	n	%	n	%	n	%	n	%
Total (n)	242	48.4	184	36.8	21	4.2	53	10.6	500	100.0
Age range										
40–44	26	5.2	12	2.4	9	1.8	7	1.4	54	10.8
45–49	30	6.0	20	4.0	1	0.2	8	1.6	59	11.8
50–54	32	6.4	30	6.0	3	0.6	5	1.0	70	14.0
55–59	45	9.0	30	6.0	3	0.6	15	3.0	93	18.6
60–64	50	10.0	48	9.6	2	0.4	5	1.0	105	21.0
65–69	59	11.8	44	8.8	3	0.6	13	2.6	119	23.8
Have received PSA tests during the period (2014–2019)										
No PSA	196	39.2	154	30.8	16	3.2	51	10.2	417	83.4
≥1 PSA tests	46	9.2	30	6.0	5	1.0	2	0.4	83	16.6

PSA, Prostate Specific Antigen.

<sup>a</sup> Asians, other groups, or unknown.

### 2.3 Statistical analysis

Descriptive statistics reported include frequencies, means, and distributions. Analyses of variance (ANOVAs) logistic regression and hypothesis tests were conducted to test for significant differences in clinical and patient characteristics. For the logistic regression, the dependent variable was whether the patient had a PSA or not, and the explanatory variables considered were age, race, insurance, and gender of the provider. For the ANOVA, only patients receiving at least one PSA were included, the dependent variable was the number of PSA tests, and the explanatory variables considered included age, race, insurance, gender of the provider, what kind of medical professional ordered the PSA, and the reason for the PSA. Preliminary testing indicated a log transformation was needed for the ANOVA due to skewness in the number of PSA tests ordered. Statistical packages SPSS (version 23; SPSS Inc., Chicago, IL, USA, RID: SCR\_002865) and R (version 2020; R Core Team, R Foundation for Statistical Computing, Vienna, Austria, URL: <https://www.R-project.org/>) were used to carry out the data analyses.

## 3. Results

### 3.1 Patient characteristics by race/ethnicity, age and type of health insurance

The majority of patients in the sample (Table 1) were White (48%) or African American (37%) and between the ages of 55–69 years (63%). Based on demographic characteristics, the sample appears to represent the population covered by the four LSUHCN clinics in this study. When comparing racial demographics between Jefferson and Orleans parishes, we found that Whites represented 52% and 31%, respectively; Blacks 27% and 58%, respectively; Hispanics 15% and 6%, respectively; and Asians and other groups 6% and 5%, respectively [21,22]. It is important to

note that these percentages do not consider differences by gender and age so it is not easy to make specific comparisons for only men, 40–69 years old in the sample. The proportion of patients (Table 2) who had private or employer-provided insurance (42.6%) was about equal to those who had government-assisted coverage such as Medicare, Medicaid and Veteran Affairs (43.4%). While only 12 (2%) patients had no insurance, nine of them were younger than 54 years old.

Fisher Exact Tests showed there were statistically significant relationships between race and insurance status ( $p = 0.0005$ ) and between age and insurance status ( $p = 0.0005$ ). In particular, proportion tests showed white patients ( $p < 0.0001$ ,  $X^2 = 38.0$ , 95% CI for difference in proportions is (0.1912, 0.3667)) were more likely to have private insurance or a mix of private/public plans, while African Americans were more likely to have public insurance or no insurance ( $p < 0.0001$ ,  $X^2 = 18.69$ , 95% CI (0.1107, 0.2974)). On the other hand, older patients (65–69 years old) ( $p = 0.0016$ ,  $X^2 = 10.0$ , 95% CI (0.0673, 0.2746)) were more likely to have private insurance or a mix of private/public plans than younger patients.

### 3.2 Differences in PSA testing by patient characteristics

#### 3.2.1 All patients (N = 500)

The majority (83%) of patients in the sample (N = 500) did not receive any type of PSA testing during the study period (Table 1). Even though logistic regression found no statistically significant differences by race ( $p = 0.11$ ) in receipt of PSA tests, a higher percentage of Hispanics received PSA tests (24% = 5/21), followed by Whites (19% = 46/242), African Americans (16% = 30/184), and other groups (4% = 2/53). Logistic regression showed older patients were significantly ( $p = 0.0001$ ) more likely to have a PSA test for each year increase in age between 40 and 69 (OR = 1.06; 95% CI: (1.03, 1.10)). Patients with private

**Table 2. Demographics of male patients by type of health insurance.**

Insurance type	None		Medicare		Medicaid		Medicare & Medicaid		Veterans		Private or Employer Provided		Other <sup>b</sup>		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total patients	12	2.4	45	9.0	126	25.2	22	4.4	24	4.8	213	42.6	58	11.6	500	100.0
Age range																
40–44	4	0.8	1	0.2	23	4.6	1	0.2	2	0.4	19	3.8	4	0.8	54	10.8
45–49	2	0.4	4	0.8	19	3.8	3	0.6	2	0.4	25	5.0	4	0.8	59	11.8
50–54	3	0.6	1	0.2	20	4.0	1	0.2	3	0.6	36	7.2	6	1.2	70	14.0
55–59	1	0.2	9	1.8	25	5.0	7	1.4	4	0.8	38	7.6	9	1.8	93	18.6
60–64	1	0.2	9	1.8	34	6.8	5	1.0	6	1.2	42	8.4	8	1.6	105	21.0
65–69	1	0.2	21	4.2	5	1.0	5	1.0	7	1.4	53	10.6	27	5.4	119	23.8
Race																
White	3	0.6	16	3.2	46	9.2	3	0.6	8	1.6	137	27.4	29	5.8	242	48.4
Black	5	1.0	20	4.0	55	11.0	15	3.0	13	2.6	51	10.2	25	5.0	184	36.8
Hispanic	2	0.4	1	0.2	7	1.4	2	0.4			6	1.2	3	0.6	21	4.2
Other <sup>a</sup>	2	0.4	8	1.6	18	3.6	2	0.4	3	0.6	19	3.8	1	0.2	53	10.6
Patients receiving PSA tests by clinician's specialty																
No PSA test	12	2.4	38	7.6	110	22.0	19	3.8	24	4.8	173	34.6	41	8.2	417	83.4
Urologist			3	0.6	7	1.4	2	0.4			33	6.6	6	1.2	51	10.2
Nurse practitioner					5	1.0	1	0.2			4	0.8	8	1.6	18	3.6
Internal medicine			2	0.4	4	0.8					3	0.6	3	0.6	12	2.4
Family medicine			1	0.2											1	0.2
Oncologist			1	0.2											1	0.2

PSA, Prostate Specific Antigen.

<sup>a</sup> Asians, other groups, or unknown.

<sup>b</sup> Mix of private/public plans (different payers).

insurance or a mix of private/public plans were significantly more likely ( $p = 0.0139$ ) than patients with public insurance or no insurance to have a PSA test (OR = 1.9; 95% CI: (1.14, 3.16)).

### 3.2.2 Patients receiving at least one PSA test ( $n = 83$ )

Among those men receiving a PSA test ( $n = 83$ ) during the study timeline (Table 3), the majority were White (55%) followed by African American (36%), Hispanic (6%) and those of other racial/ethnic groups (2%). Additionally, the majority were 60–69 years old (60%); had no more than three tests in the 5-year period (74%); and received the tests for early detection of prostate cancer screening (51%). While all patients receiving PSA tests had health insurance, almost half (48%) had private or employer provided insurance and the majority (62%) were attended by urologists.

A total of 41 patients (49%) received only one PSA test over the 5 years; while 28 of those patients (68%) received the test for prostate cancer screening, two received it for elevated PSA levels, seven for prostate related conditions, one for prostate cancer surveillance, and three for other reasons (results not tabled).

Reasons noted in the medical chart for clinicians ordering the tests for the 83 patients (Table 3) included early detection of prostate cancer (51%); monitoring of prostate-related conditions (20% for enlarged prostate, erectile dysfunction, urinary obstruction or incontinence); prostate cancer surveillance (16%); follow-up of elevated PSA (10%); and for other reasons (5%). However, when looking at the total of PSA tests ordered (Table 4), most of the tests were ordered for prostate cancer surveillance (36%) followed by early detection of prostate cancer (29%).

For patients having at least one PSA test, Fisher Exact Tests showed a significant relationship between type of insurance and the specialty of the clinician ordering the PSA tests ( $p = 0.0015$ ) and the reason for ordering the exam ( $p = 0.0215$ ). Specifically, patients with private insurance were more likely to have the PSA test ordered by a urologist (proportion test,  $p = 0.0003$ ,  $X^2 = 12.78$ , 95% CI for difference (0.1936, 0.6192)), and patients with public insurance were less likely to have the PSA test for follow up of elevated PSA or prostate cancer surveillance (Fisher test,  $p = 0.0022$ ). Additionally, ANOVA results showed the reason for PSA testing had a highly significant effect ( $p < 0.0001$ ) on the log of the number of PSA tests ordered (Table 4). Specifically, pairwise post-hoc testing with a holm correction for multiple comparisons (Table 5) showed that patients having PSA tests for prostate cancer surveillance had significantly more PSA tests than patients having PSA tests for early detection of prostate cancer, prostate related conditions, and other reasons ( $p < 0.002$ ).

Also, patients having PSA tests to follow up elevated PSA had significantly more PSA tests than patients having PSA tests for early detection of prostate cancer ( $p = 0.0228$ ). However, once the reason for PSA testing was taken into

account, the ANOVA showed that no other variable (age, race, insurance, gender of the provider, and specialty of the provider) had a significant impact on the log of the number of PSA tests ordered.

### 3.2.3 Differences in PSA testing by clinician characteristics

In total, 21 clinicians (7 urologists, 1 oncologist, 4 nurse practitioners, 8 internal medicine, and 1 family medicine) ordered 214 PSA tests (Table 4) (10.2 tests per clinician) for 83 patients (2.6 tests per patient tested). The majority of these tests were: ordered by urologists (78%); received by White patients (68%); and covered by private/employer-provided insurance (57%). Most of these tests were ordered for patients 55 years and older (86%).

Although the clinician gender was equality distributed (10 men, 11 women), most of the PSA tests were ordered by male clinicians ( $n = 172$ , 80%; results not tabled); however four clinicians (3 urologist males, 1 woman nurse) were the ones who ordered most of the tests ( $n = 142$ ) and had more patients ( $n = 45$ ). While the only oncologist in the sample ordered only two PSA tests, these tests were ordered for the same patient and to screen for enlarged prostate instead of prostate cancer surveillance.

## 4. Discussion

In this descriptive pilot study designed to examine clinician practices related to ordering PSA tests for screening, diagnosis and/or follow-up of prostate cancer and other prostate-related conditions, a majority of men did not receive any PSA tests during the 5-year study period (2014–2019). Although there were no significant differences in receipt of PSA testing by patient race, a key factor associated with receipt of PSA testing was type of health insurance. In general, those patients with private health insurance had more access to healthcare provided by specialists and to receive the PSA test than those with federally-funded insurances.

As of today, Medicare/Medicaid and other private insurances (Aetna, United Health Care, BlueCross BlueShield, etc.) cover PSA tests for screening, diagnosis and follow-up of prostate-related conditions, including cancer [23–26]. In this study, all but twelve (2.4%) participants had health insurance coverage, however, only 67 out of 317 older patients (55 years and older) received PSA testing, and of those only 29 received it for screening for prostate cancer. Although other studies have documented the link between health insurance and prostate cancer outcomes [27–29], other factors related to the clinicians practices (such as type of practice, seniority level, and scientific approach) and patient characteristics (age, health status, family history, socioeconomic status, and education), in addition to insurance coverage, may affect patient access to PSA as an early detection test.

**Table 3. Patients who had PSA tests (2014–2019).**

Patients race/ethnicity	White		African American		Hispanic		Other <sup>b</sup>		Total	
	n	%	n	%	n	%	n	%	n	%
Total patients having PSA exams	46	55.4	30	36.1	5	6.0	2	2.4	83	100.0
Total of PSA tests received										
Only 1 PSA test	20	24.1	18	21.7	3	3.6			41	49.4
2 to 3 PSA tests	8	9.6	8	9.6	2	2.4	2	2.4	20	24.1
4 to 5 PSA tests	12	14.5	4	4.8					16	19.3
6 or more PSA tests	6	7.2							6	7.2
By patient age range										
40–44							1	1.2	1	1.2
45–49	3	3.6	2	2.4					5	6.0
50–54	5	6.0	4	4.8	1	1.2			10	12.0
55–59	7	8.4	7	8.4	2	2.4	1	1.2	17	20.5
60–64	11	13.3	9	10.8	1	1.2			21	25.3
65–69	20	24.1	8	9.6	1	1.2			29	34.9
By reasons for having the PSA test										
Early detection of prostate cancer	20	24.1	18	21.7	3	3.6	1	1.2	42	50.6
Prostate-related conditions	8	9.6	6	7.2	1	1.2	1	1.2	16	19.3
Prostate cancer surveillance	12	14.5	1	1.2					13	15.7
Follow-up of elevated PSA	4	4.8	3	3.6	1	1.2			8	9.6
Other	2	2.4	2	2.4					4	4.8
By insurance type										
No insurance									0	0.0
Medicare	1	1.2	6	7.2					7	8.4
Medicaid	5	6.0	9	10.8	1	1.2	1	1.2	16	19.3
Medicare and Medicaid			2	2.4	1	1.2			3	3.6
Veterans									0	0.0
Private or Employer Provided	30	36.1	8	9.6	1	1.2	1	1.2	40	48.2
Other <sup>a</sup>	10	12.0	5	6.0	2	2.4			17	20.5
By specialty of clinician ordering the test										
Urologists (7 men)	34	41.0	13	15.7	2	2.4	2	2.4	51	61.4
Nurse practitioners (4 women)	7	8.4	9	10.8	2	2.4			18	21.7
Internal medicine (6 women, 2 men)	5	6.0	6	7.2	1	1.2			12	14.5
Family medicine (1 woman)			1	1.2					1	1.2
Oncologists (1 man)			1	1.2					1	1.2

PSA, Prostate Specific Antigen.

<sup>a</sup> Asians, other groups, or unknown.

<sup>b</sup> Mix of private/public plans (different payers).

Some of the reasons found in the literature about why primary care providers do not order PSA tests are that ‘Urologists will examine the prostate anyway’; ‘Prostate exam is not relevant to my practice’; ‘There is not enough time’; and ‘The practitioner forgets’ [30]. In other studies, physicians who had not read the prostate cancer screening guidelines, did not have an academic appointment, or were in practice for over 20 years were more likely to order PSA-based screening tests for prostate cancer, while physicians new to practice (two years or less) were less likely to offer PSA screening for early detection of prostate cancer [27,31,32].

Patient preferences may also play a role in low PSA testing rates for prostate conditions. A systematic review of articles focused on patient-urologist gender concordance found that “patients with urologic problems prefer same gender urologists.” [33]. Among the main reasons for the same-gender preference are the sensitivity of the examinations (embarrassing), including cultural and religious barriers [33–35]. Considering that most of urologists are male [36], it makes sense that, in this case, there is a preference to discuss prostate issues with the urologist. Unfortunately, African American and/or Black urologists only make up 2.0% of the healthcare workforce [37], and the clinician

**Table 4. Total PSA tests ordered (2014–2019).**

Patients race/ethnicity	White (n = 46)		African American (n = 30)		Hispanic (n = 5)		Other <sup>a</sup> (n = 2)		Total (n = 83)	
	n	%	n	%	n	%	n	%	n	%
Total of PSA tests ordered	146	68.2	56	26.2	8	3.7	4	1.9	214	100.0
By Patient age-range										
40–44							2	0.9	2	0.9
45–49	9	4.2	2	0.9					11	5.1
50–54	12	5.6	5	2.3	1	0.5			18	8.4
55–59	19	8.9	13	6.1	4	1.9	2	0.9	38	17.8
60–64	35	16.4	18	8.4	1	0.5			54	25.2
65–69	71	33.2	18	8.4	2	0.9			91	42.5
By reasons for having the PSA test										
Prostate cancer surveillance	74	34.6	4	1.9					78	36.4
Early detection of prostate cancer	32	15.0	25	11.7	4	1.9	2	0.9	63	29.4
Prostate-related conditions	22	10.3	16	7.5	1	0.5	2	0.9	41	19.2
Follow-up of elevated PSA	13	6.1	9	4.2	3	1.4			25	11.7
Other	5	2.3	2	0.9					7	3.3
By insurance type										
No insurance										
Medicare	2	0.9	8	3.7					10	4.7
Medicaid	9	4.2	15	7.0	1	0.5	2	0.9	27	12.6
Medicare and Medicaid			2	0.9	2	0.9			4	1.9
Veterans										
Private or Employer Provided	101	47.2	16	7.5	3	1.4	2	0.9	122	57.0
Other <sup>b</sup>	34	15.9	15	7.0	2	0.9			51	23.8
By specialty of clinician ordering the test										
Urologists (7 men)	127	59.3	30	14.0	5	2.3	4	1.9	166	77.6
Nurse practitioners (4 women)	10	4.7	16	7.5	2	0.9			28	13.1
Internal medicine (6 women, 2 men)	9	4.2	7	3.3	1	0.5			17	7.9
Family medicine (1 woman)			1	0.5					1	0.5
Oncologists (1 man)			2	0.9					2	0.9

PSA, Prostate Specific Antigen.

<sup>a</sup> Asians, other groups, or unknown.

<sup>b</sup> Mix of private/public plans (different payers).

race was not included in the patient medical records so further studies of the roles of gender and racial concordance and their associations with rates of PSA testing are needed, especially for high-risk patient groups.

In general, clinicians order PSA testing based on patient age, symptoms, family history of prostate cancer, and findings during physical examination, and they may consider also the patient's general medical condition, expected longevity, and the patient's request for the test [38,39]. A recent study among general practitioners (GPs) and urologists in Europe found that urologists consider the PSA test useful and have a more proactive approach, while the GPs considered the test ambivalent or not useful and were less familiar with the guidelines [40]. In the US, urologists, order more PSA tests than primary care providers because they consider themselves responsible for the early detection

of prostate cancer [39,41,42], as well as to protect against malpractice claims for failure to diagnose prostate cancer in a timely manner [39]. Clinicians are increasingly being held liable for failure to obtain PSA testing for their patients and for failure to refer those with elevated PSA levels to a urologist [39,43]. A 2008 study with patients with an elevated PSA result (>4 ng/mL) and no previous prostate biopsy found that extended delays (>20 months) between first abnormal PSA and referral to a urologist occurred in 25% of younger men and that a PSA result less than 10 ng/mL was the best predictor of a delayed referral. Considering that rising PSA may be an indication of possible cancer progression, the authors recommended prompt care for these patients [44].

Although shared decision making (SDM) is considered a standard of patient-centered care in clinical practice

**Table 5. Significant differences of PSA ordered vs reason to order the test.**

Reason for PSA Test	Mean (log ( <i>number of PSA tests ordered</i> ))	Letter Plot (shared letter = no significant difference) <sup>a</sup>
Prostate cancer surveillance	1.64	A
Follow-up of elevated PSA	0.96	AB
Prostate-related conditions	0.69	BC
Other	0.35	BC
Early detection of prostate cancer	0.29	C

PSA, Prostate Specific Antigen.

<sup>a</sup> For example: Prostate Cancer Surveillance and Follow Up Elevated PSA share a letter (A), so there is no significant difference between them. However Prostate Cancer Surveillance and Prostate Related Conditions do not share a letter (A vs BC) so there is a significant difference between them.

[45], no notes were found in the patient medical records about the application or not of shared decision making during the medical encounters, regardless of whether the tests were ordered for screening, diagnosis or follow-up of prostate cancer or other related-conditions. A possible explanation is that the updated USPSTF guidelines were published in 2018 while the study timeline was 2014–2019 so not enough time had passed to have data regarding the application of the SDM. Because of the importance of SDM in clinical practice and patient care, the Merit-based Incentive Payment System (MIPS), Quality Payment Program has included two indicators to measure the use of evidence-based decision aids and documentation of implementation of SDM capabilities in the medical encounters, regardless of the medical condition (cancer, hepatitis, knee replacement, etc.) [46]. Consequently, clinicians participating in the MIPS program are required to document, in the medical records, the application of SDM with their patients. Although MIPS considers incentives for quality improvement activities, economic incentives are given to clinicians and clinics only for following guidelines where procedures are classified as high priority quality measures (control for diabetes and high blood pressure; screening for colorectal and breast cancer, fall risk, and depression; influenza immunization; tobacco cessation intervention; etc.) [47]. As SDM for PSA screening is classified as grade C evidence, no incentives are provided.

Our study found that the vast majority of patients did not receive a PSA test, those that did were more likely to have private insurance and that among those receiving a test, those with private insurance were more likely to have had it ordered by a urologist. The low rates of PSA testing raise concern as 37% of the sample was African American and almost half was age 60 or older, both factors that are associated with increased risk of prostate conditions, including prostate cancer. These results are consistent with national data regarding men who had a PSA test between 2005–2018 showing that White men (40.4%) received more PSA tests than Black men (37.0%) and men older than 70 years (44.6%) received more PSA tests than men 55–69 years old (39.0%) and 40–54 years old (13.4%) [48]. Un-

fortunately, data regarding differences in PSA screening by health insurance was not found. Furthermore, we could find no evidence of documentation of shared decision making related to PSA testing or a discussion of patient preferences. Although our results are preliminary, further study of potential explanations for the relatively low PSA testing rates and lack of mention in the medical record of patient preferences would be useful to guide quality improvement efforts and assess the quality of communication and care related to prostate health. Even though, one of the national goals of the Healthy People initiative it is to “increase the proportion of men who have discussed the advantages and disadvantages of the PSA test to screen for prostate cancer with their health care provider” [49], disparities about receiving counseling are also noted: In 2018, for men under 65 years, those with private insurance had more participation in SDM than those uninsured (19.7% vs 13%) [50]. The extent of equitable access to specialists also needs to be studied and assured among high-risk patients, especially those less likely to have private insurance.

This study has important limitations. First, as this study is a chart review of records of outpatient clinic visits during a specific time period (2014–2019), it does not account for PSA tests received outside of the specific clinic sites. Second, PSA values were not included. This study was descriptive in nature and results need to be interpreted with caution. Although the sampling was designed to reflect the general population seen in the Greater New Orleans area by LSUHCN clinicians, results may not generalize to patients living outside this area or in other healthcare systems. Considering that African American populations in other jurisdictions may have considerably different socioeconomic status and propensity to receive appropriate screening, it is recommended to conduct similar studies in different regions and healthcare systems. Because of the small sample size, some important relationships may have been missed, and this study is not powered to draw conclusions regarding predictors of PSA testing or to permit generalization of results to a wider population.



## 5. Conclusions

In conclusion, we were able to describe practice patterns for PSA testing at a public, non-profit, academic, multi-specialty healthcare organization of outpatient clinics (LSUHCN) among a randomly selected sample of male patients 40–69 years old. Results suggest that type of health insurance may play a critical role in patient access to PSA tests and that shared decision making, especially among groups at higher risk of prostate conditions, including cancer, needs to be better understood. Considering the trust that patients have in their PCPs and urologists, patients need to be counseled during the clinical encounter about PSA tests and be given culturally appropriate information and referrals to credible online resources about prostate-related conditions, including prostate cancer, and the role that PSA testing plays in each. Consistent documentation of shared decision making can provide a better understanding of the impact of discussing with the patients the options available for screening, diagnosis and treatment of prostate-related conditions, and could increase patient trust in the system and improve the quality of clinical services provided.

Although men older than 50 years are at higher risk of prostate cancer, recent data suggest that prostate cancer is increasing among older adolescents and young adults. The incidence of prostate cancer among U.S. men ages 15 and 40 years has increased 2% per year since 1990. In the U.S., men in this age group were >6 times more likely than older men to have distant prostate cancer disease at diagnosis [51,52]. Based on this data and evidence collected from a large set of retrospective data, the Memorial Sloan Kettering Cancer Center (MSKCC) recommends a PSA test done early (40–45 years), establish risk based on PSA results, and then personalize future follow-up according to identified risk [53]. Finally, and as stated in the clinical practice guideline [54], it is important the clinicians are up to date in changes not only in PSA screening guidelines but also in prostate cancer incidence, prevalence and mortality among different populations so that they can appropriately counsel their patients regarding prostate-related conditions and risks.

## Abbreviations

BPH, benign prostatic hyperplasia; GPs, general practitioners; LSUHCN, Louisiana State University Healthcare Network; MIPS, Merit-based Incentive Payment System; PCPs, Primary Care Providers; PSA, Prostate Specific Antigen; SDM, shared decision making; USPSTF, U.S. Preventive Services Task Force.

## Author contributions

Project conceptualization and methodology—ME and EY; data collection—EY; data analysis—ME and DA; writing—original draft preparation including figures and tables—ME; writing, review, editing, read and approval fi-

nal manuscript—all authors; substantial and critical contributions to interpretation of data and discussion—AMN.

## Ethics approval and consent to participate

The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Institutional Review Boards from the LOUISIANA STATE UNIVERSITY HEALTH SCIENCES CENTER (IRB# 19-1221) and XAVIER UNIVERSITY OF LOUISIANA (IRB# 748). The study met the informed consent waiver criteria stated on the 45 CFR 164.512 (i) (2) (ii).

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## Conflict of interest

The authors declare no conflict of interest.

## Data availability statement

The data is not publicly available due to privacy restrictions. De-identified summary of participant data collected in this study may be available on request from the corresponding author. Data access request will be reviewed by the respective IRBs and principal investigator. Requestors may be required to sign a Data Access Agreement.

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