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Prostate specific antigen screening for prostate cancer: Knowledge of, attitudes towards, and utilization among primary care physicians

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Abstract

Objective: Prostate specific antigen (PSA) screening for prostate cancer screening is not uniformly recommended by national organizations or primary care physicians (PCPs). Given this lack of consensus, we sought to identify patterns in physician knowledge of and attitudes towards PSA screening and to determine how these patterns along with patient and provider demographics influence PSA screening practices.

Methods: A self-administered questionnaire, which assessed provider's knowledge of prostate cancer, confidence in his/her knowledge, and PSA screening practices, was mailed to PCPs at an academic medical center. Frequencies of responses were summarized and 3 outcome variables (knowledge, confidence, and propensity to screen) were derived. Association of covariates with the outcome variables was determined using multivariable logistic regression.

Results: Eight-two (30.4%) physicians completed the survey; 98% identified African-American race as a prostate cancer risk factor, 42% identified digital rectal exam and PSA as the accepted screening method, and 59% underestimated the likelihood of prostate cancer in a man with a PSA level > 4 ng/ml; 19% were confident in their knowledge of prostate cancer; 86% screened fewer than 60% of their male patients over 50. A knowledge score above the median was not associated with a higher propensity to screen ($r = 0.06$, $P = 0.61$). Confidence in one's knowledge was correlated with ordering PSA testing ($r = 0.33$, $P < 0.01$). Physician (e.g., ethnicity) and patient (e.g., request for PSA testing) related factors, as well as practice guidelines, particularly those of the US Preventative Services Task Force, influenced providers' decision to offer PSA screening.

Conclusions: Respondents correctly identified prostate cancer risk factors but were less knowledgeable about prostate cancer screening tests and overall prostate cancer risk. Most respondents were not confident in their knowledge and did not screen men over 50. Multiple patient- and provider-specific factors influence the decision to offer or not offer PSA screening.

Keywords: Prostate cancer; Cancer screening; Prostate-specific antigen; Physician decision

1. Introduction

Prostate adenocarcinoma is the most common type of noncutaneous cancer among men. In 2009, 192,280 men were expected to be diagnosed with, and 27,360 to die from, prostate cancer [1]. Before the introduction of the prostate specific antigen (PSA) assay, most men with prostate cancer presented at advanced stages, at which point disease-specific mortality was high [2]. PSA screening has dramatically altered the stage of presentation. Today, most men present with localized disease, for which many therapeutic options are available. However, along with the stage migration of prostate cancer, detection of low-grade, low-volume tumors has risen [3]. In certain populations, such cancers may not affect length or quality of life if managed expectantly [4,5].

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This wide spectrum of disease-specific mortality, together with the uncertain efficacy and adverse impacts of treatment, has generated controversy over the need to routinely screen men for prostate cancer with serum PSA testing.

The American Cancer Society recommends annual prostate cancer screening including serum PSA and digital rectal examination (DRE) for men over age 50 with over a 10-year life expectancy, after discussion of the benefits and limitations of screening [6]. The American Urological Association guidelines recommend informed counseling of patients and obtaining a baseline DRE and PSA at the age of 40 for healthy males with subsequent screening based on the baseline value. This is consistent with recommendations from the National Comprehensive Cancer Network [7]. Other organizations, however, do not recommend prostate cancer screening. The United States Preventive Services Task Force (USPSTF) is neither for nor against screening for prostate cancer in men under 75 and recommends against screening men over 75 [8]. Similarly, the American College of Preventive Medicine recommends against routine screening [9].

This lack of consensus is reflected by primary care physicians (PCPs) practice patterns. A survey earlier this decade across 3 states found that 67% of family practitioners and 40% of internists routinely screen men over age 50 [10]. We conducted a cross-sectional questionnaire study among PCPs at the University of California, San Francisco (UCSF) and its affiliated medical centers to identify patterns in knowledge of and attitudes towards PSA screening for prostate cancer. A second goal was to determine how these patterns, along with patient and provider demographics, influence PSA screening practices.

2. Methods

2.1. Design

Study participants were faculty and resident physicians in the departments of internal or family medicine at UCSF Medical Center, San Francisco General Hospital (SFGH), and/or the San Francisco Veteran's Administration Medical Center (SFVA). The study design and questionnaire were approved by the local institutional review board, after which eligible physicians were mailed a self-administered 29-question survey. Non-respondents received two follow-up emails reminding them of the survey and again asking for their participation.

2.2. Survey instrument

The questionnaire obtained provider demographics; assessed physicians' knowledge of and confidence in their knowledge of prostate cancer risk factors, prostate cancer screening tests, and likelihood of prostate cancer based on PSA level; and asked if the provider offered PSA screening and his/her reasons for either offering or not offering PSA screening. Additionally, 7 case scenarios were included, representing male patients 42 to 69 years old of different ethnicities with varying medical co-morbidities, family histories of prostate cancer, and severity of lower urinary tract symptoms. For each patient, the physician was asked to respond whether or not he/she would offer PSA screening. A separate set of case scenarios presented 53-year old patients of different ethnicities (African-American, Caucasian, Asian) with different baseline PSA test values (1.9, 2.9, 3.3 ng/ml, respectively). Providers were asked to choose whether they would order a fractionated (free/complexed) PSA, repeat PSA testing in 6 weeks, repeat PSA in 1 year, refer for further evaluation, or take no action.

2.3. Measures

Responses were summarized with frequency tables. Three composite outcome variables were derived: (1) physician knowledge of prostate cancer risk factors and screening tests (knowledge score), (2) confidence in their own understanding of prostate cancer risk factors and screening practices (confidence score), and (3) propensity to screen for prostate cancer (propensity to screen score).

The knowledge score (0–100 scale) was the percentage of correct responses to questions about major prostate cancer risk factors (African-American race, positive family history in first-degree relative), the best method for early detection, and the likelihood of prostate cancer based on PSA level. The confidence score (0–100 scale) was computed by calculating the mean of the responses to 6 questions. Each of these 6 questions was scored on a 5-point Likert scale (strongly agree to strongly disagree) and was scaled by multiplying by 20. Four questions asked specifically about confidence in their knowledge of: (1) prostate cancer risk factors; (2) which patients should be screened; (3) how often a patient should be screened; and (4) national organizations' practice guidelines. The other 2 questions asked physicians to rate their ability to answer patients' questions about PSA testing and communicate effectively with patients about the accuracy and results of a PSA test. The propensity to screen score (0–7 scale) was the sum of positive responses to 7 case scenarios that included information about a patient's age, ethnicity, co-morbid conditions, and family history about which the physician was asked if he/she would offer a PSA test to each type of patient.

2.4. Statistical analyses

The composite outcome variables were dichotomized using the following cut-points: knowledge score above or below the median of 80%, confidence score above or below the median of 40, and propensity to screen score above or below the median of 3. Multivariable logistic regression was used to determine which physician characteristics were in-

dependently associated with each outcome variable. The covariates in multivariable analysis were physician demographics (age, gender, ethnicity, medical specialty, academic rank, and years in training or practice) and practice environment characteristics (patient ethnicity, the number of men older than 40 that the physician sees daily; whether the physician recently cared for a patient with prostate cancer, had a patient who died of prostate cancer within the past 5 years, or had a family member who has prostate cancer). Forward stepwise selection of covariates was used to identify the variables that were significantly associated with each outcome. P values < 0.05 were considered significant. Statistical analysis was done using SAS ver. 9.1 (SAS Institute, Inc., Cary, NC).

3. Results

Eighty-two (30.4%) physicians who were contacted between 2003–2004 completed the survey. A majority of the respondents were Caucasian, specialized in internal medicine, and saw mostly Caucasian patients; 41% were residents and 59% were faculty. Approximately one-fourth of respondents had cared for patients who had died of prostate cancer in the past 5 years or had a family member or friend with prostate cancer (Table 1).

Table 1
Characteristics of physicians who participated in the survey

Physician characteristic	Value	N (%)
Age	<30 y	19 (23)
	30–35 y	22 (27)
	36–45 y	24 (29)
	>45 y	17 (21)
Sex	Female	44 (54)
	Male	38 (46)
Race/Ethnicity	African American	1 (1)
	Asian	12 (15)
	Asian+Caucasian	2 (2)
	Caucasian	56 (69)
	Latino	6 (7)
	Unknown	5 (6)
Medical specialty	Internal medicine	75 (92)
	Family medicine	6 (7)
	Unknown	1 (1)
Status	Resident	34 (41)
	Faculty	48 (59)
Number of years in training/practice	0–2 y	17 (18)
	3–5 y	19 (21)
	6–10 y	13 (23)
	>10 y	18 (16)
	Unknown	15 (22)
Practice site	SFGH	20 (25)
	SFVA	15 (18)
	UCSF	42 (51)
	Other	5 (6)
Number of men > 40 seen daily	None	3 (4)
	1–5	48 (59)
	6–10	10 (12)
	11–20	3 (4)
	>20	2 (2)
	Unknown	16 (19)
Recently cared for patient with prostate cancer	No	30 (37)
	Yes	52 (63)
Patient who died of prostate cancer within past 5 Years	No	58 (71)
	Yes	23 (28)
	Unknown	1 (1)
Family member or friend diagnosed/died of prostate cancer	No	60 (74)
	Yes	20 (24)
	Unknown	2 (2)

3.1. Knowledge of prostate cancer risk factors

Overall, responses were mixed, but generally correct, in identifying prostate cancer risk factors; 98% of respondents correctly identified African-American ethnicity as a significant risk factor; 87% and 55% correctly identified history of prostate cancer in a father and a brother, respectively, to be risk factors. However, 29% incorrectly identified smoking as a risk factor.

Ninety-eight percent of respondents correctly recognized PSA testing as a screening method for prostate cancer; however, only 42% correctly identified PSA with DRE as the preferred and accepted screening method; 59% incorrectly indicated that the likelihood of prostate cancer in a 55-year old with PSA > 4.0 ng/ml was less than 20%.

Multivariable analysis demonstrated that having recently cared for a patient with prostate cancer (OR 3.37, 95% CI 1.04–10.98) and having had a patient die of prostate cancer in the past 5 years (OR 4.24, 95% CI 1.14–14.84) were associated with a knowledge score > 80. A statistically significant but weak correlation existed between knowledge and confidence scores ($r = 0.24$, $P = 0.03$). No correlation between knowledge and propensity to screen scores was found ($P = 0.61$). There was no association between knowledge score > 80 and the other covariates, including academic rank and years in training or practice.

3.2. Confidence in knowledge

Nineteen percent felt comfortable with their knowledge of prostate cancer risk factors while 44% and 37% were neutral or uncomfortable, respectively. Almost two-thirds of responding physicians felt uncomfortable with their ability to answer patients' questions about PSA; 62% of respondents were not confident in their ability to pick appropriate screening candidates. One-third were confident about their knowledge of prostate cancer screening practice guidelines.

In multivariable analysis, confidence score > 40 was associated with senior academic status (attending vs. resident) (OR 0.07, 95% CI 0.02–0.45). Other covariates did not significantly predict the confidence outcome in multivariate analyses.

Table 2
Factors affecting patient and physician decision-making

	Important factor	Positive response $n = 82$ (%)
Patients' decision to undergo PSA screening	Fear of pain or discomfort	34 (44)
	Lack of understanding	33 (42)
	Perception of lack of risk	17 (22)
	Knowledge of uncertainties	38 (49)
	Family history	70 (90)
	Insurance status	10 (13)
Physicians' decision to screen	Age	56 (68)
	Ethnicity	67 (82)
	Comorbidity/life expectancy	55 (67)
	Patient request	79 (96)
	Concern over liability	10 (12)
	Family history	70 (85)
Physicians' decision not to screen routinely	PSA inaccurate	28 (45)
	Does not extend life	39 (63)
	Too expensive	1 (2)
	Not enough time	11 (18)
	Other	14 (23)

3.3. Propensity to screen for prostate cancer

Eight-six percent of responding physicians routinely screened less than 60% of patients over 50, and very few (1%) screened more than 80% of male patients over 50. Fewer than 40% stated they would screen a 55-year-old Caucasian man with hypertension. Similarly, fewer than half of the PCPs surveyed discussed PSA testing with the majority of their male patients over 50.

Ninety percent of physicians responded that family history most influenced a patient's decision to undergo PSA screening, whereas patient request for PSA testing was the factor that most influenced the provider to offer PSA screening (Table 2). Sixty-nine percent reported the USPSTF clinical guideline most influenced their practice of prostate cancer screening (Fig. 1). If the respondents did not routinely screen men for prostate cancer, it was because they felt that it did not extend life or that PSA testing was inaccurate (Table 2). Patients' age, ethnicity, presenting symptoms, and co-morbid conditions had varying degrees of influence in determining whether or not the physician would offer PSA screening. African-Americans and a Caucasian patient with a strong family history were most likely to be offered PSA screening (Table 3A). In general, younger patients and those with significant medical co-morbidities (e.g., congestive heart failure and diabetes) tended not to be offered PSA screening. There was some variability in the follow-up plans chosen for 53-year old patients of different races, all of whom had PSA levels under 4 ng/ml (Table 3B).

In multivariate analysis, Caucasian physician ethnicity (OR 5.39, 95% CI 1.20–24.26), faculty status (OR 6.58, 95% CI 1.77–24.40), and having a practice with fewer than 20% of patients of Asian descent (OR 0.24, 95% CI 0.07–0.82) were associated with discussing PSA with at least 40% of patients who were older than 50 years. However, only physician ethnicity was associated with a propensity to

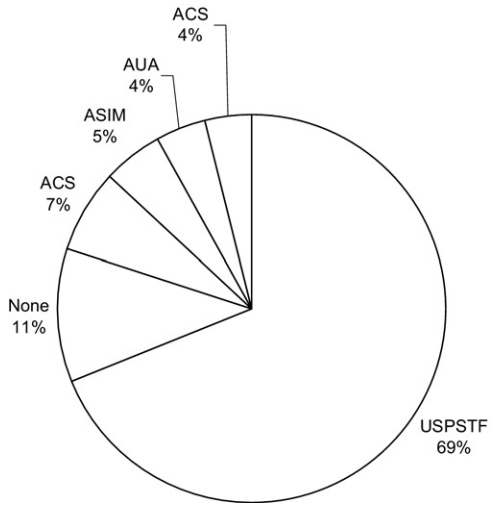

Fig. 1. Influence of Organizations on Practice. ACS = American Cancer Society; ASIM = American Society of Internal Medicine; AUA = American Urological Association; USPSTF = United States Preventive Services Task Force; The responses of which professional organization's guidelines most influenced the use of PSA screening are shown. The USPSTF was the organization that most influenced respondents.

Table 3
Factors Affecting PSA Screening

(A) Patient ethnicity: Patients to whom PSA testing would be offered

The frequency with which PSA was ordered varied depending on patient age, race, and co-morbid conditions

Patient Age, race, history	Physicians offering PSA test $n = 82$ (%)
69, Caucasian, class I CHF, DM	23 (29)
47, Asian, no symptoms or history	2 (3)
48, African American, urinary complaints	69 (86)
42, Caucasian, father died of PC at 54	66 (83)
46, African American, routine exam	34 (43)
45, Latino, requests PSA	34 (43)
55, Caucasian, hypertension	30 (38)

(B) Physicians' plan for a 53-year old patient depending on ethnicity and PSA level

The aggressiveness of prostate cancer screening varied in 53-year old men of different races with PSA levels < 4 ng/ml

Follow-up action	Asian PSA 3.3 ng/ml $n = 82$ (%)	Caucasian PSA 2.9 ng/ml $n = 82$ (%)	African American PSA 1.9 ng/ml $n = 82$ (%)
None	7 (15)	8 (22)	7 (18)
Test for free/ complexed PSA	9 (19)	3 (8)	5 (13)
Repeat PSA in 6 weeks	24 (51)	21 (58)	20 (53)
Repeat PSA in 1 year	1 (2)	3 (8)	3 (8)
Refer for further evaluation	15 (32)	4 (11)	4 (11)

screen score greater than 3, with Caucasian physicians more likely to screen than non-Caucasian physicians (OR 5.10, 95%CI 1.46–17.81).

Confidence score > 40 was correlated with both discussing ($r = 0.40$, $P < 0.01$) and ordering PSA screening ($r = 0.33$, $P < 0.01$) for patients over 50 years old. The correlation between discussing and offering PSA testing was the strongest of all the outcome variables tested ($r = 0.74$, $P < 0.01$).

4. Discussion

Our study found that, among PCPs in an academic medical center, knowledge of prostate cancer risk factors was relatively high; however most respondents were not confident in their knowledge of prostate cancer and did not routinely screen men over 50.

Major risk factors such as race and family history were correctly identified by a majority of respondents. However, fewer correctly identified appropriate prostate cancer screening tests or accurately estimated prostate cancer likelihood given a specific PSA value. The lack of consensus among professional organizations and the misunderstanding that men with a "normal" PSA of 4 ng/ml still have a significant risk of having prostate cancer could potentially explain the finding that respondents were less knowledgeable about prostate cancer screening tests and prostate cancer risk, respectively [11]. Recently, Hoffman et al. found that patients generally have a poor knowledge of prostate cancer prevalence and screening accuracy [12]. Our study found similar findings among providers.

Our study revealed that providers' confidence in their own knowledge of prostate cancer and prostate cancer screening was quite low. A confidence score above the median was associated with faculty status. However, faculty members did not have correspondingly greater knowledge of prostate cancer risk factors and screening. These findings intimate that, over time, confidence in one's knowledge of prostate cancer increases more than actual knowledge. Additionally, there was moderate correlation between the provider's confidence score and the likelihood of discussing and offering PSA screening to patients. This suggests that as a provider's confidence increases (e.g., ability to answer patient's questions about PSA and prostate cancer), he or she may be more likely to discuss and offer PSA screening.

In our cohort, the propensity to screen for prostate cancer was low. Few respondents routinely provided or discussed PSA screening with their patients; however, those that did discuss screening also tended to offer PSA testing. This is in partial contrast to prior studies. The DECISIONS study found, from a patient perspective, in contrast to our findings, that most providers did discuss PSA testing and, similar to our findings, that most patients with whom PSA testing was discussed went on to have a PSA test [12]. In an earlier study, Hoffman found that PCPs who have a high propensity to screen believe that PSA screening is accurate and early detection is beneficial, which suggests that belief in PSA validity may drive use [13].

Our results indicate that the decision to screen is multifactorial, which supports the results of prior studies [14–18]. In our study, physician, patient, and medical environmental factors influenced PSA screening practices. Both patient and provider ethnicity were statistically significantly associated with prostate cancer screening. African-American race was correctly identified as a prostate cancer risk factor and there was an indication that African-Americans were more likely to be offered PSA testing than other races. Caucasian providers were more likely to screen and discuss PSA testing with patients over 50. Stroud et al. reported that African-American PCPs regularly recommended prostate cancer screening with PSA and DRE for patients over the age of 50 and began prostate cancer screening 5–10 years earlier in African-American patients or those with a positive family history [16]. Unfortunately, our data cannot address this finding specifically as there was only 1 African-American provider who responded.

We found that having a direct professional experience with prostate cancer was associated with greater knowledge of prostate cancer, whereas other provider-related factors such as academic rank or overall years spent in practice were not. However, our model also suggests that while a provider's recent experience may influence learning more about prostate cancer, it does not affect his/her likelihood of offering PSA screening. This supports the lack of correlation we observed between knowledge of and propensity to screen for prostate cancer.

Although we did not specifically ask what sources the PCPs use to obtain information about PSA screening, our results indicate that the USPSTF provides the most influential clinical guideline amongst our study cohort. The generalized influence of the USPSTF guideline is reflected by the finding that it was the only outcome variable with which no specific covariate was associated. This is the only organization that neither recommends for nor against PSA screening for men under 75 [19]. It is conceivable that the lack of consensus among the professional organizations and reliance of our cohort on the ambiguous USPSTF guidelines may help explain low propensity to screen found in our study. Indeed, Purvis-Cooper et al. reported that physicians who routinely provide prostate cancer screening were generally unaware of the lack of consensus between PSA screening guidelines, whereas the non-routine screeners were all aware [17].

There are several limitations to this study. First, despite multiple attempts at contacting non-respondents, the response rate to the questionnaire was low; therefore, our results may reflect a response bias. The low response rate may be due to the method of survey distribution (mailed hard copy). Using a web-based survey may have increased the response rate. Furthermore, our response rate simply

reflected the number of completed surveys returned divided by the number of physicians who were mailed surveys and did not take into account other factors such as partial responses and inability to contact the respondent. These factors, which the Council of American Survey Research Organizations recommends using in determining the actual survey response rate, were not recorded in the present study. If they were, the response rate would likely have been higher. Second, the survey instrument used was not validated. However, the questionnaire was distributed to a single type of physician, was developed by a multidisciplinary team of urologists, internists, statisticians, and epidemiologists, and used standard survey research methods (e.g., Likert scale). Nevertheless, the lack of formalized testing of internal and construct validity may limit the inferences that could be drawn from the survey results. We are not aware of a questionnaire that has been validated to assess PSA practice patterns of PCPs. Development and validation of such a survey instrument to assess this topic could provide important longitudinal data on how PSA screening practices may change over time. Third, our findings may not be generalizable to the broader population of PCPs in the United States as this study only queried physicians affiliated with an academic institution. However, despite these limitations, our results were generally consistent with that of previous studies on PSA utilization by PCPs.

Finally, the need for routine prostate cancer screening is under debate. The recent publication of the European Randomized Study of Screening for Prostate Cancer (ERSPC) demonstrated that PSA screening reduced prostate cancer-specific mortality by 20% at 9 years median follow-up [20]. The Prostate, Lung, Colon, and Ovary (PLCO) trial, however, observed no difference in prostate cancer deaths at 7 years follow-up [21]. There was a high frequency of PSA screening in the control arm of the PLCO study and a low compliance rate with recommended prostate biopsies in the intervention arm. Such factors indicate the need for careful and cautious interpretation of the PLCO results; however, this may not be recognized by all PCPs and may affect both provider and patient perception of PSA screening. Therefore, our study, which was conducted prior to ERSPC and PLCO, can only serve as a reference of attitudes towards PSA screening. Continued study of perception and practice patterns of PSA utilization by PCPs is warranted, especially given the current debate about the utility of PSA screening in decreasing prostate cancer-specific mortality.

5. Conclusions

In this survey of PCPs, respondents correctly identified prostate cancer risk factors but were less knowledgeable about prostate cancer screening tests and overall prostate cancer risk. Most respondents were not confident in their knowledge and did not screen men over 50. Ultimately, multiple patient-, provider-, and medical community-specific determinants drive the decision to screen or not to screen for prostate cancer.

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