

Psychosocial Factors Associated with an Increased Frequency of Prostate Cancer Screening in Men Ages 40 to 79 Years: The Olmsted County Study

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Abstract

Prostate cancer is the second leading cause of cancer deaths among U.S. men. Early detection is associated with drastically improved 5-year survival rates. It is unclear, however, what psychosocial factors motivate or discourage men from taking advantage of both prostate-specific antigen (PSA) testing and digital rectal examination (DRE). The goal of the current study was to identify psychosocial factors that influence screening behavior for prostate cancer in a cohort of 2,447 men. In 1990, a randomly selected cohort of Caucasian men, ages 40 to 79 years, from Olmsted County, Minnesota, were enrolled in the study. These men completed a questionnaire containing queries on family history of prostate cancer, concern about getting prostate cancer, and marital status. Medical and laboratory records were reviewed to determine the number DREs (1989-1996) and PSA tests (1989-1998).

Frequent screening was defined as the upper 25th percentile for number of DREs (>4) or PSAs (>3). Men who have a family history and men who worry or have concern about prostate cancer were more likely [odds ratio (OR), 1.5; 95% confidence interval (95% CI), 1.2-2.0 and OR, 1.9; 95% CI, 1.4-2.5] to seek screening compared with those without a family history or worry. The association between family history and frequent screening was similar in men who were married or living with someone (OR, 1.7; 95% CI, 1.2-2.2); however, it was reduced among men who live alone (OR, 0.6; 95% CI, 0.2-1.8). These data suggest that psychosocial factors such as family history, worry, or concern about prostate cancer and marital status may play an important role in men's decisions about prostate cancer screening. (Cancer Epidemiol Biomarkers Prev 2008;17(12):3588-92)

Introduction

Prostate cancer is the second most common noncutaneous cancer and leading cause of cancer deaths in U.S. men (1). It has been predicted that, in 2007 alone, 219,000 new cases of prostate cancer will be detected (2). Currently, two screening examinations are available for prostate cancer detection, the digital rectal examination (DRE) and the prostate-specific antigen (PSA) test. In the United States, screening utilization rates among Caucasian men, however, remain low with only 58% of men receiving an annual PSA test (3). Current research has begun to focus on determining which factors influence screening behavior. Although greater knowledge and belief in the efficacy of the tests have been shown to predict behavior (3), little is known about what other factors motivate men to frequently seek screening for prostate cancer.

Family history is a known risk factor for prostate cancer, with men having a first-degree relative being at least twice as likely to develop prostate cancer compared with men with no family history (4). In regards to

screening behavior, men with a family history of disease have been found to have stronger intentions to undergo screening as well as an increased perceived vulnerability to disease (5). However, others have observed that men with first-degree relatives who had prostate cancer were not more likely to seek screening than men without a family history of prostate cancer, suggesting that men with a family history of prostate cancer may believe that the disease is inherited and that little can be done in terms of prevention (6). Nonetheless, men with a family history of prostate cancer are specifically targets of many screening programs, yet it remains unclear how having a family history of prostate cancer affects a man's decision to take part in prostate cancer screening.

Worry or concern about prostate cancer has also been examined as a factor that could influence screening for prostate cancer, but the results have been inconsistent. Kunkel et al. found that men who were not worried about prostate cancer were more likely to avoid conventional medical screening tests but increased self-care practices (7). Other investigators have also found that worry or concern about prostate cancer has been shown to significantly increase the use of prostate-related alternative medicines (8, 9). Although other cancer literature has shown that worry about cancer and concern regarding potentially negative diagnoses decrease screening rates (10, 11), fear of prostate cancer was

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shown to be a significant determinant of male screening behavior across seven different races, suggesting that fear universally motivates men to get screened for disease (3).

This study sought to examine how family history of and worry or concern about prostate cancer influence the frequency of both PSA and DRE screening in a population-based, randomly sampled cohort of Caucasian men, ages 40 to 79 years, and whether specific participant characteristics might modify associations between family history or worry or concern and prostate cancer screening. A better understanding of the factors that motivate men to get screened may help identify potential educational targets that can be used to promote prostate cancer screening and early detection.

Materials and Methods

Study Subjects. The Olmsted County Study of Urinary Symptoms and Health Status among Men is a population-based cohort study of urinary health of men residing in Olmsted County, Minnesota. Details of the study have been published previously (12, 13). Briefly, the cohort was compiled through a random sample of all male Olmsted County residents ages 40 to 79 years on January 1, 1990 using the resources of the Rochester Epidemiology Project (14). Men with a previous history of prostate cancer, prostatectomy, or other urologic conditions (bladder cancer, disorders or surgery, and urethral disorders or surgery) were excluded. Of the 3,874 eligible men, 2,115 (55%) agreed to participate in an in-home interview in 1990 and biennially thereafter. To replace men who either died or dropped out of the study during the follow-up period, additional men were randomly sampled from the community and were invited to participate during the first 4 years of follow-up. All men were passively followed through medical records for the occurrence of urologic events.

Measures of Screening. Screening frequency was defined as the number of DREs and PSA testing events. The frequency of DREs was assessed for the period of 1989 to 1996 via the abstraction of participants' medical records. This includes DREs conducted in any medical setting (research, clinical, and emergency room). The number of DREs ranged from 0 to 31. Frequent DREs were defined as those in the upper 25th percentile of screening frequency, with a defining cut point of >4 DREs.

Analyses included all PSA tests done at an Olmsted County medical clinic between 1989 and 1998. The number of PSA tests ranged from 0 to 19. Frequent PSA testing was defined as those in the upper 25th percentile of screening frequency with a defining cut point of >3 PSA tests. Frequent prostate cancer screening was then defined to be men who had >4 DREs or >3 PSA tests.

Measures of Family History of and Worry or Concern about Prostate Cancer. Self-reported family history of prostate cancer was collected via questionnaire and was categorized as a history of a first-degree relative (father or brother) having prostate cancer versus no history of a first-degree relative having prostate cancer. Worry or concern about prostate cancer was evaluated from

responses to the following question: "During the past month, how worried or concerned have you been about having or getting prostate cancer?" Answers were scored from 1 to 6, with 1 being "not at all" and 6 being "extremely" and categorized as "some or more worry" (3-6) versus "little or no worry" (1-2).

Measures of Covariates. Marital status was also collected via questionnaire and was categorized as married or living together versus single, divorced, separated, or widowed. Age was collected at time of enrollment and categorized by decade beginning with age 40 years through ages ≥ 70 years. Education level was classified as a high school graduate (≥ 12 years of education) versus not a high school graduate (<12 years of education).

Statistical Analyses. Frequent prostate cancer screening (frequent DREs and/or frequent PSA testing) was examined by family history of and worry or concern about prostate cancer. The relationship between family history of or worry or concern about prostate cancer and educational and marital status with frequent DREs and PSA testing as individual outcomes was examined and found to be similar to the combined outcome. Associations between frequent prostate cancer screening and family history of and worry or concern about prostate cancer were examined overall and stratified by age, marital status, and educational status. Differences in these associations were tested using the Breslow-Day test of homogeneity. A multivariable logistic regression model was used to examine the associations between frequent screening and family history of and worry or concern about prostate cancer adjusted for age, marital status, and education. *P* values < 0.05 were considered statistically significant. All analyses were completed using SAS 8.2.

Results

In this population of Caucasian men, the median age was 51.9 years (Q1, 44.8; Q3, 62.8) and the median number of PSA and/or DRE tests was 4 (Q1, 1; Q3, 7). The majority of this population completed high school (89.3%) and were married or living with someone (85.0%). Of the 2,447 men, 229 (9.4%) men reported having a family history of prostate cancer, with 252 (10.3%) reporting worry or concern about prostate cancer (Table 1).

Family history of and worry or concern about prostate cancer were both found to be significantly associated

Table 1. Description of the Olmsted County study cohort

Measures	Median (Q1, Q3)
Age	51.9 (44.8, 62.8)
No. PSA measures	1 (0, 3)
No. DRE	2 (1, 4)
No. PSA or DRE	4 (1, 7)
	<i>n</i> (%)
High school graduate	2,184 (89.3)
Married/living together	2,081 (85.0)
Family history of prostate cancer	229 (9.4)
Worry/concern about prostate cancer	252 (10.3)

Table 2. Univariate and multivariate associations between participant characteristics and frequent prostate cancer screening

	OR (95% CI)	
	Unadjusted	Multivariable* adjusted
Age (y)		
40-49	1.0 (reference)	1.0 (reference)
50-59	3.8 (3.0-4.8)	3.4 (2.7-4.4)
60-69	7.5 (5.8-9.6)	6.9 (5.3-9.0)
≥70	12.1 (9.0-16.4)	11.3 (8.2-15.7)
High school graduate	0.5 (0.4-0.6)	1.2 (0.9-1.7)
Married/living together	1.3 (1.0-1.7)	1.2 (0.9-1.7)
Worry/concern about prostate cancer	1.9 (1.4-2.5)	1.5 (1.1-2.0)
Family history of prostate cancer	1.5 (1.2-2.0)	1.4 (1.0-1.9)

*Adjusted for age, education, marital status, worry/concern about prostate cancer, and family history of prostate cancer.

with frequent prostate cancer screening (Table 2). Specifically, men with a family history of prostate cancer were 1.4 times more likely to have frequent screening when compared with men without a family history of prostate cancer [multivariable adjusted odds ratio (OR), 1.4; 95% confidence interval (95% CI), 1.03-1.9; Table 2]. Worry or concern about prostate cancer was also found to significantly increase the odds of frequent prostate cancer screening when compared with men who reported little or no worry about disease (multivariable adjusted OR, 1.5; 95% CI, 1.1-2.0; Table 2). Older age, a high school education, and having a partner were also associated with increased odds of frequent screening (Table 2).

Age did not significantly modify the association between family history of prostate cancer and frequent screening (Breslow-Day $P = 0.76$) or the association between worry or concern about cancer and frequent screening (Breslow-Day $P = 0.89$; Table 3). Married men who reported a family history of prostate cancer had a 1.7 greater odds of frequent prostate cancer screening compared with married men with no family history of prostate cancer (OR, 1.7; 95% CI, 1.2-2.2); however, men who were single, divorced, widowed, or separated and had a family history did not have an increased odds of frequent screening (OR, 0.6; 95% CI, 0.2-1.8; Breslow-Day $P = 0.08$; Table 4). Marital status did not modify the association between worry or concern about prostate

cancer and frequent prostate cancer screening (Breslow-Day $P = 0.67$; Table 4). The magnitude of the associations between worry about prostate cancer and frequent screening were homogeneous across marital status, albeit the association among single, divorced, or separated men was not significant (Table 4). Finally, education level did not modify the associations between family history of or worry or concern about prostate cancer and frequent screening (Breslow-Day $P = 0.98$ and 0.37 , respectively; Table 5).

Discussion

In this population-based study of Caucasian men ages 40 to 79 years, we observed that family history of and worry or concern about prostate cancer were significantly associated with prostate cancer screening behaviors. Additionally, we found that marital status modified the association between family history of prostate cancer and frequent screening, such that men who were married or living with someone had a significantly increased odds of frequent screening, whereas men who did not have a partner had decreased odds of frequent screening.

Although differential screening rates are known to exist for prostate cancer, the factors that motivate men to seek screening have not been well characterized. In our study, family history was found to be associated with frequent prostate cancer screening. It has been suggested that men with a family history more often use screening tests for prostate cancer because they perceive their risk to be greater and are more worried about getting prostate cancer (15). Our findings lend credence to this hypothesis because men who reported worry or concern about prostate cancer were found to more frequently seek screening for this disease. However, after adjustment for the effect of worry or concern, having a family history of prostate cancer was still shown to be associated with an ~2-fold increase in odds of frequent screening (data not shown). This finding may be the result of men who have a positive family history of prostate cancer more often being advised by their physicians or family members to seek screening and suggests that perhaps professional and personal encouragement are positively influencing screening behavior independently of how they feel about the disease.

It has also been found that men who are married were more likely to have had a PSA test in the past year (16). How involved a man's partner is in his screening has been found to increase his uptake of PSA screening as

Table 3. Frequency of frequent prostate cancer screening by family history, worry, or concern about prostate cancer and age

	Age groups, <i>n</i> (%)				Breslow-Day P^*
	40-49	50-59	60-69	≥70	
No family history	140 (14.1)	218 (38.4)	223 (54.3)	161 (65.4)	0.7587
Family history	16 (17.4)	23 (44.2)	35 (67.3)	26 (78.8)	
OR (95% CI)	1.3 (0.7-2.3)	1.3 (0.7-2.3)	1.7 (0.9-3.2)	2.0 (0.8-4.7)	0.8935
No worry or concern	140 (14.0)	211 (38.0)	217 (55.1)	145 (65.0)	
Worry or concern	15 (19.0)	27 (49.1)	39 (60.0)	40 (75.5)	
OR (95% CI)	1.4 (0.8-2.6)	1.6 (0.9-2.7)	1.2 (0.7-2.1)	1.7 (0.8-3.3)	

*The Breslow-Day is testing the homogeneity across age.

Table 4. Frequency of frequent prostate cancer screening by family history, worry, or concern and marital status

	Marital status, <i>n</i> (%)		Breslow-Day <i>P</i> *
	Single, divorced, separated, or widowed	Married or living together	
No family history of prostate cancer	73 (31.2)	663 (35.2)	0.0793
Family history of prostate cancer	5 (22.7)	95 (47.5)	
OR (95% CI)	0.6 (0.2-1.8)	1.7 (1.2-2.2)	
No worry or concern about prostate cancer	64 (28.7)	646 (34.8)	0.6734
Worry or concern about prostate cancer	12 (40.0)	107 (51.4)	
OR (95% CI)	1.7 (0.8-3.6)	2.0 (1.5-2.6)	

*The Breslow-Day is testing the homogeneity across marital status.

well (17). Our results further suggest that marital status does affect prostate cancer screening usage among men who have a family history. Married men with a family history of prostate cancer were found to be 70% more likely to frequently use screening tests compared with married men without a family history of prostate cancer. Interestingly, the association between family history of prostate cancer and screening frequency was attenuated among men who were widowed, divorced, separated, or single. Taken together, these findings suggest that marital status influences the frequency of prostate cancer screening among men with a family history of prostate cancer and may suggest that providing a high-risk man's significant other with materials that explain the benefits of screening has the potential to positively influence a man's screening behavior.

Age has been found previously to be an important predictor of men's prostate cancer screening behavior, with older men more frequently seeking screening (18, 19). Our results confirm this notion but also suggest that family history, worry, or concern about prostate cancer influence screening frequency independent of age, marital status, and education. Although the trend in our data suggests that, as men age, they more frequently seek screening, the effect of family history on screening frequency was not found to be significantly different across age groups. Current screening guidelines suggest that all men with a family history of prostate cancer get screened for prostate cancer starting at age 45 years (20). Our data suggest that men with a family history of prostate cancer are not more likely to frequently get screened compared with men without a family history until after age 60 years. This supports providing high-risk men with screening information materials earlier in their lifetime to promote earlier detection.

Worry or concern about prostate cancer was also found to be associated with frequent prostate cancer

screening. Men who reported being worried or concerned about prostate cancer had a 2-fold greater odds of having frequently used screening tests in the past compared with men who reported no worry or concern about prostate cancer. This is similar to results presented by Consedine et al. who found that fear was a strong determinant of men's screening behavior (3). Marital status was not found to significantly influence the effect of worry or concern on prostate cancer screening frequency, with both married and single men having ~2-fold increase odds of frequent screening. This suggests that men who are worried or concerned about prostate cancer are more likely to be screened regardless of marital status.

Importantly, the definition of frequent screening used in this study was based on the distribution of PSA and DRE tests in this specific cohort, which differs from recommended annual screening as suggested by the American Urological Association guidelines. When we compared men who had ever had a PSA or DRE test compared with men who did not, the results only slightly changed. Specifically, married men were found to be significantly more likely to have experienced at least one screening test and the associations between worry or concern about prostate cancer and family history and ever having either screening test were attenuated.

Although this study used a randomly sampled, large population-based cohort, several limitations need to be considered. First, the measures of family history of and worry or concern about prostate cancer in this study were based on self-report. As the questionnaire administered at baseline in 1990 preceded the release of the American Cancer Society guidelines for prostate cancer screening, it is possible that men underreported their true family history of or worry or concern about prostate cancer because they did not truly understand their potential risks. It is unlikely, however, that this underreporting

Table 5. Frequency of frequent prostate cancer screening by family history, worry, or concern and educational status

	Educational status, <i>n</i> (%)		Breslow-Day <i>P</i> *
	Not a high school graduate	High school graduate	
No family history of prostate cancer	104 (49.3)	632 (31.9)	0.9775
History of prostate cancer	15 (60.0)	85 (41.7)	
OR (95% CI)	1.5 (0.7-3.6)	1.5 (1.1-2.0)	
No worry or concern about prostate cancer	94 (47.0)	617 (31.4)	0.3653
Worry or concern about prostate cancer	25 (69.4)	96 (44.7)	
OR (95% CI)	2.6 (1.2-5.5)	1.8 (1.3-2.3)	

*The Breslow-Day is testing the homogeneity across educational status.

differed by screening frequency and therefore would underestimate the effects observed.

Additionally, it is possible the number of DREs in this cohort is underestimated relative to the number of PSAs as the time frame examined for DRE utilization was 2 years shorter than for PSA. However, when analyzed separately, frequent PSA screening and frequent DRE screening yielded similar results (data not shown). Furthermore, the time frame for data collection regarding PSA tests falls relatively early in the PSA era; therefore, it is possible that the number of PSA tests used to define frequent screening in this study may have also been underestimated compared with what current estimates of screening frequency would be.

Finally, our cohort consisted of only Caucasian men, which may limit our ability to generalize these findings to other racial groups.

Conclusions

Our findings from this population-based study of Caucasian men suggest that men with a family history of or worry or concern about prostate cancer are more likely to be frequently screened for prostate cancer. Among men with a family history of prostate cancer, those who were married or living with someone were more likely to get screened when compared with men who were not, suggesting a role for marital status in influencing screening behavior. Although these results provide insight as to how to better promote the benefits of early detection among high-risk men, further research is necessary to determine what other social and psychologic factors influence screening behavior.

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

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