Factors Influencing Use of the Prostate-Specific Antigen Screening Test in Primary Care

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Abstract

Objective: **To evaluate the use of the prostate-specific antigen (PSA) test and digital rectal examination (DRE) in prostate cancer screening by primary care physicians.**

Study Design: **Physician survey and retrospective medical record review.**

Methods: **We randomly selected and reviewed the medical records of 3 cross-sectional samples of male patients and surveyed their primary care physicians at 1-year intervals. All the physicians practiced in Colorado. The study spanned 3 years, including late 1992, when the American Cancer Society recommended the use of PSA in a prostate cancer screening guideline.**

Results: **We reviewed the medical records of 4772 male patients and surveyed 109 primary care physicians. We found that PSA testing for men aged 50 or older increased significantly from 1992 to 1994, from 24% in 1992 to 35% in 1993 and 40% in 1994 (overall odds ratio, 2.94; $P < .05$). Over the same time period, the DRE rate remained relatively unchanged (39% in 1992, 41% in 1993, and 36% in 1994). Overall PSA use was positively associated with patient age greater than 59 years, patient nonsmoking status, physician "readiness to change cancer screening behavior," private insurance status, and nonsolo practice. Before the release of a prostate cancer screening guideline, participating physicians cited the American Cancer Society as the organization that most influenced their practice with respect to cancer screening. The magnitude of the reported influence of the American Cancer Society was correlated with the subsequent use of PSA in 1994 by primary care physicians after adjustment for change in DRE and baseline PSA rates, although the association did not reach statistical significance in multivariable regression models.**

Conclusions: **Primary care physicians in Colorado significantly increased their use of the PSA test from 1992 to 1994, during which time the American Cancer Society issued a guideline recommending the use of PSA for prostate cancer screening. The reported influence of the American Cancer Society on cancer screening practices correlated with the subsequent increase in PSA testing.**

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Prostate cancer is the most commonly diagnosed nonskin cancer in men, and the second leading cause of cancer death, with an estimated 179,300 new cases and 37,000 deaths predicted to occur in the United States in 1999.[1] Despite this substantial burden of illness, controversy persists regarding the most appropriate clinical strategy for screening, diagnosing, and treating prostate cancer. Aggressive strategies advanced by authorities

and experts include intensive systematic screening of all men beginning at age 50 years with screening of high-risk patients at younger ages, and definitive surgical therapy for diagnosed disease. Proponents of conservative strategies oppose all prostate cancer screening and espouse "watchful waiting" symptomatic treatment for diagnosed cases. Unfortunately, the direct empiric evidence critically important in assessing the effectiveness of a prostate cancer screening and treatment program, attending to the issues of the target population, appropriate diagnostic strategy, complications of treatment, competing mortality, and overall cost effectiveness, is not sufficient to allow definitive recommendations.[2] Given this lack of high-quality evidence, conflicting interpretations of available evidence either support or refute the contention that decreases in mortality from prostate cancer can be achieved by a screening program with an acceptable level of morbidity from the diagnostic and therapeutic interventions.[2-4] Thus clinicians and their patients continue to face the task of deciding whether to pursue prostate cancer screening and need to openly discuss the ramifications of screening, diagnosis, and treatment.[5]

Many clinicians and patients have elected to pursue screening efforts to detect prostate cancer, in part because of a recently expanded array of screening and diagnostic studies.[6,7] The digital rectal examination (DRE) has been the traditional screening examination for prostate cancer, but its performance characteristics (ie, sensitivity, specificity, and predictive value for detecting prostate cancer) are suboptimal.[4] The development of an inexpensive assay for prostate-specific antigen (PSA), coupled with low-risk pathologic confirmation using transrectal ultrasound and prostate needle biopsy, have increased interest in screening for prostate cancer. In fact, investigators have attributed an observed increase in the incidence of prostate cancer to increased prostate cancer screening.[7]

The lack of clear evidence to support prostate cancer screening and PSA testing provides an opportunity to examine the potential factors that influence primary care physicians in their decision to use new technology, such as PSA, in their practice. With respect to prostate cancer screening, the PSA test is an easily performed, fairly inexpensive blood test, so the cost of the technology and patient discomfort are minimal barriers to testing. Because definitive evidence to support the use of PSA is lacking, physician knowledge of the effectiveness of prostate cancer screening, test performance characteristics, and long-term clinical outcomes may also be less important factors in the decision-making process.[8,9] Physicians' professional experience and attitudes toward cancer screening, as well as practice characteristics and environment, may thus be the more important predictors of PSA use.

Practice guidelines have been touted as a potentially important way to guide physician decision making. Such guidelines may be based on strong evidence from clinical trials showing favorable outcomes or simply reflect expert opinion in the absence of definitive clinical evidence.[10,11] Mistrust by some physicians of expert opinion has been cited as one reason for the relative ineffectiveness of practice guidelines in changing physician practice.[8] If so, then the converse might also be true—practice guidelines, promulgated by influential and respected regional and national authorities, may be an important factor in changing physician practice.

In late 1992, the American Cancer Society endorsed the use of PSA screening to detect prostate cancer in otherwise asymptomatic men and approved a clinical practice guideline, recommending that all men aged 50 years or older be screened for prostate cancer annually.[12] Despite acknowledgment of uncertain evidence to support prostate cancer screening[12] and in the face of cautionary statements from the National Cancer Institute, public figures also began to promote screening for prostate cancer, including the use of PSA.[3,13] Many other nationally recognized organizations, including the US Preventive Services Task Force, recommended against prostate cancer screening programs and did not support the use of the PSA test for screening.[4]

In this study, we sought to answer the following questions: Did a sample of Colorado primary care physicians selectively increase their use of PSA (compared with DRE) for screening men aged 50 years or older for prostate cancer from 1992 to 1994? If so, what physician, practice, or patient factors were associated with increased PSA use?

···METHODS ···

We evaluated data on primary care cancer screening practices collected during the "Partners for Prevention" study. This randomized, controlled trial examined the impact of 3 interventions on physician screening for breast, cervical, skin, and prostate cancer among 109 primary care physicians. The original study sample was drawn from a population of Colorado physicians obtained from the Copic Insurance Company, a physician-owned medical liability carrier that insures more than 80% of all

Colorado physicians. As part of the "Partners for Prevention" study, 1041 Copic-enrolled general internists and family physicians throughout Colorado were asked to complete a questionnaire, which included questions based on Prochaska and DiClemente's transtheoretical model of "readiness to change cancer screening and counseling behaviors."[14,15] This readiness to change questionnaire assessed physicians' attitudes and stage of readiness to screen patients for breast, cervical, skin, and prostate cancers and is described elsewhere.[16] The DRE readiness to change score (calculated as 1 = precontemplation, 2 = contemplation, 3 = preparation, and 4 = action or maintenance) was one of 11 components of the overall questionnaire.

Primary care practices were eligible for recruitment into the "Partners in Prevention" study if more than 50% of the physicians in the practice returned the readiness to change questionnaire and if more than two thirds of the physicians in the practice were insured by Copic. Overall readiness to change scores were calculated for each practice, and practices were classified as "ready" or "nonready" on the basis of the average practice score. The objective was to recruit approximately 30 practices into each of 4 study cells (ready urban, nonready urban, ready rural, and nonready rural). Practices within each cell were randomly assigned to 1 of 4 intervention groups: (1) usual care (n = 28); (2) self-help care package of practice materials, such as flowcharts and patient activation forms, mailed to the practice (n = 28); (3) regional training intervention with one regional workshop and one in-office follow-up visit (n = 26); and (4) regional training plus monthly continuing contact with telephone calls and return visits to the practice every 6 months by the study staff (n = 27). Thus the 3 "Partners for Prevention" interventions focused predominantly on office systems interventions (activation of physician and office staff using reminders and feedback) and less on physician knowledge. Interventions were aimed at increasing the use of DRE for prostate and colorectal cancer screening, and no effort was made by the investigators to increase the use of PSA testing as a cancer screening tool. The Copic Insurance Company did not recommend or endorse PSA testing and specifically stated to primary care physicians that their liability risk would not increase if they did not use the PSA test.

The readiness to change cancer screening and counseling behavior questionnaire was also used to assess individual physician attiudes.[16] The primary contact, or "sentinel," physician for the practice was the one with the highest overall readiness to change score in a ready practice and the one with the lowest readiness to change score in a nonready practice. Medical records were reviewed for a randomly selected, cross-sectional sample of 22 male patients seen at the index visit by the sentinel physician within the preceding year, and the patients must have made at least one visit to the physician before the index visit. Trained reviewers obtained data from the medical records at each of 3 time points—baseline in 1992, midpoint in 1993, and study endpoint in 1994.

Physicians were grouped according to their sex, specialty (general internal medicine or family practice), DRE readiness to change score, and self-assessment of the influence of regional and national organizations on their cancer screening practices. Practice characteristics included location (urban or rural), and size (solo or multiphysician). For male patients, cancer screening data abstracted included DRE and PSA during the year of the visit. Other patient and visit data abstracted included age (50 to 59 years, 60 to 69 years, or 70 to 74 years), sex, insurance status, smoking status (current or nonsmoker), and whether the patient had a health maintenance visit within the past year. Criteria for characterizing an office visit as a health maintenance visit were established at baseline by the sentinel physician for his or her practice and subsequently applied during the medical record review. No effort was made to determine whether a DRE or PSA test was related to a complaint or symptom or whether the patient requested a DRE or PSA test. We present data for DRE and PSA for men aged 50 or older because screening men younger than age 50 is limited to those at high risk for prostate cancer (eg, those with a family history) and these data were not obtained during the medical record review.

Statistical Analysis

The study interventions and physician, patient, and practice characteristics were analyzed by simultaneously estimating parameters from multivariable logistic regression models for PSA and DRE. For completeness, we report model-adjusted odds ratios for both significant and nonsignificant predictors and interpretations for the former. We applied logistic models to patient data using nested analysis of variance for binary outcomes defined as whether the patient is current for an annual DRE or PSA test during the year of the visit.[17,18] This approach provides standard errors for regression coefficients that account for the correlational structure between observations from individual patients seen in the same practice, irrespective of time. Thus observations of patients

Table 1. Demographic and Practice Characteristics of 109 Primary Care Physicians

Characteristic	Family Physicians	General Internists	Total
	N (%)	N (%)	N (%)
Total	84 (77)	25 (23)	109 (100)
Male	73 (87)	21 (84)	94 (86)
White	79 (94)	23 (92)	102 (94)
Urban practice	40 (48)	18 (72)	58 (53)
Solo practice	52 (62)	14 (56)	66 (61)
"Ready practice"	37 (44)	18 (72)	55 (51)
DRE readiness score			
Pre-contemplation	51 (61)	6 (24)	57 (52)
Contemplation/preparation	14 (17)	3 (12)	17 (16)
Action/maintenance	19 (23)	16 (64)	35 (32)
	Mean (SD)	Mean (SD)	Mean (SD)
Physician age	44.9 (9.4)	48.5 (10.0)	45.7 (9.7)
Patients seen per day	26.3 (7.7)	17.8 (5.4)	24.4 (8.1)

DRE = digital rectal examination.

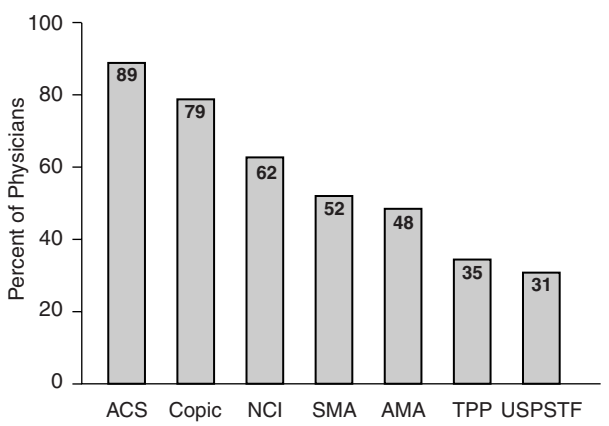
in the same practice are assumed not to be independent. This approach, known as generalized estimating equations, has been applied to breast cancer screening data from the "Partners for Prevention" study,[19] and more generally to medical[20] and public health outcomes.[21]

···RESULTS ···

Data at all 3 time points (1992, 1993, 1994) were available for 109 primary care physicians. Most of these physicians were white, male family practitioners (Table 1). About half practiced in urban locations, and half were in "ready to change cancer screening behavior" practices (Table 1). There were few differences between family physicians and general internists in individual physician or practice characteristics, with 2 exceptions—general internists had higher readiness to change scores and were more likely to practice in urban settings than were family physicians ($P < .05$).

Physicians were asked at baseline to rate, using a scale of 1 to 4, with 1 = not at all, 2 = only a little, 3 = moderately, and 4 = strongly, which national or regional organizations influenced their cancer screening practices. At the time of the baseline survey, the American Cancer Society had not released its guideline recommending the PSA test for prostate cancer screening, but Copic Insurance Company had reassured clinicians that PSA screening did not affect liability risk. The percentage of physicians rating various organizations as moderately or strongly influencing their cancer screening practices is shown in Figure 1. The American Cancer Society and Copic Insurance Company were rated as moderately or strongly influential by the most physicians and the US Preventive Services Task Force was rated as moderately or strongly influential by the fewest physicians. Only the American Cancer Society was significantly associated with PSA use ($r = 0.18$; $P = .05$), and no organization was a significant predictor of DRE use.

Figure 1. Percent of Primary Care Physicians Rating National or Regional Organizations as Moderately or Strongly Influencing Their Cancer Screening Practices at Baseline



ACS = American Cancer Society; Copic = Copic Insurance Company (malpractice liability insurer for the study physicians); NCI = National Cancer Institute; SMA = Colorado State Medical Society; AMA = American Medical Association; TPP = third-party payers; USPSTF = US Preventive Services Task Force.

Thus only the American Cancer Society was included in our multivariable logistic regression model.

A total of 4772 records were reviewed for men aged 50 years or older across all 3 time points (n = 1543 at baseline, n = 1615 at midpoint, and n = 1614 at endpoint) (Table 2). There were no significant effects of any of the "Partners for Prevention" interventions, so these were dropped from the multivariable model. Selected patient characteristics are presented in Table 3. As a result, we collapsed data for the 4 intervention groups in the current analysis. We found a strong association between cancer screening procedures and health maintenance visits for both DRE (odds ratio [OR], 44.9; 95% confidence interval [CI], 37.3 to 54.0), and PSA (OR, 5.67; 95% CI, 4.96 to 6.47). The effect of the health maintenance visit as a correlate of cancer screening and not as a predictor of cancer screening activity in the strictly temporal sense has been shown for other cancer screening activities in the "Partners for Prevention" study.[17]

The unadjusted rate for PSA testing for all age-eligible men almost doubled, from 23% at baseline to 35% at midpoint and 40% at endpoint, while DRE remained stable at 39%, 41%, and 36%, respectively (Figure 2). The difference in the percent of patients screened using PSA (baseline to endpoint) after adjusting for DRE and other variables approached significance (P = .058). Not surprisingly, there was a strong association between DRE and PSA testing (OR, 6.84; 95% CI, 5.98 to 7.81, data not shown).

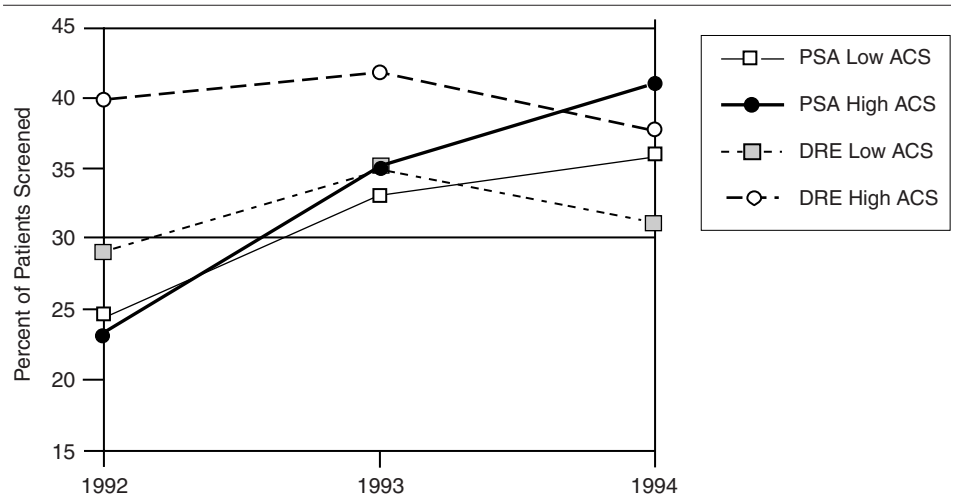
We constructed logistic regression models examining the overall use of PSA and DRE. Complete data were available for 4335 of the 4772 patients in the study. The model for use of DRE and PSA in all patients suggested that significant predictors for DRE were DRE physician "readiness" score, urban practice, older age groups (patients aged 60 to 69 and 70 to 74), private insurance, and nonsmoking status (Table 4). The nonsignificant odds ratios at midpoint and endpoint with respect to baseline indicate that DRE use did not change over the course of the study. The overall model predicting higher odds for PSA use included all significant DRE model factors except urban practice, but also includ-

Table 2. Percent of Patients Screened in the "Partners for Prevention" Study

Prostate-Specific Antigen Test Intervention Group*	1992	1993	1994
1	19	29	40
2	26	42	40
3	25	36	43
4	24	33	39
Digital Rectal Examination Intervention Group	**1992**	**1993**	**1994**
1	35	37	33
2	45	49	44
3	34	40	33
4	40	38	38

*See page 13 for description of each intervention group.

Figure 2. Percent of Patients Screened Using the Prostate-Specific Antigen (PSA) Test or Digital Rectal Examination (DRE) by Primary Care Physicians Stratified by Self-Reported Influence of the American Cancer Society (ACS)



High ACS is strongly influential; low ACS is less influential.

ed nonsolo practice, study midpoint, and study endpoint. When we compared the odds ratios for DRE and PSA within the overall model, only the older age group, and endpoint were statistically significant (Table 4). This finding implies that the differential predictors for the odds of PSA use over and above DRE use were patient age older than 59 years (with 50 to 59 years as the reference ages) and year of visit (1993 or 1994, with 1992 as the reference year). In the overall model, the odds ratios for PSA use were almost double at midpoint and more than double at endpoint compared with baseline.

The influence of the American Cancer Society on subsequent PSA and DRE use is shown in Figure 2. There was no significant change in the rate of DRE use over the 2 years of follow-up. The rate of PSA use increased significantly even among physicians who rated the influence of the American Cancer Society as low. Physicians who rated the influence of the American Cancer Society as high, however, showed a more rapid increase in PSA use over the 2 years of follow-up. This difference approached statistical significance (P = .058) after adjusting for baseline PSA use and other factors in the model (Table 4).

···DISCUSSION ···

A primary care physician's decision to screen patients for prostate cancer using the PSA test is a complex one, and a number of factors may lead physicians to change their prostate cancer screening behavior. Several studies have shown that primary care physicians use the PSA test extensively and believe that PSA screening decreases prostate cancer mortality and improves quality of life, despite a lack of conclusive evidence.[21,22] In a survey of more than 400 primary care physicians, belief that use of the PSA test was the standard of care in their community, positive feelings about the PSA test, patient request for the PSA test, and, indirectly, fear of litigation were associated with physician use of PSA for cancer screening.[23]

Physicians report that guidelines and recommendations of national specialty organizations influence their use of the PSA test. In a study by Williams et al,[23] physicians aware of the American Cancer Society recommendation to screen for prostate cancer were more likely to use the PSA test, while those aware of the US Preventive Services Task Force rec-

Table 3. Characteristics of Male Patients Aged 50 or Older*(All 3 Annual Samples Combined)

			Overall (%)		HMV Only (%)	
	N (%)	HMV (%)	PSA	DRE	PSA	DRE
Health insurance status						
None/self-pay	153 (3)	30	24	30	57	74
Medicaid	101 (2)	23	18	22	39	74
Private insurance	4101 (86)	32	34	40	60	90
Not determinable	416 (9)	32	33	34	56	83
	4771					
Age (y)						
50 - 59	2150 (45)	30	27	36	55	89
60 - 69	1889 (40)	35	38	41	64	89
70 - 74	733 (15)	32	36	40	58	88
Smoker						
Yes	1008 (21)	27	28	33	54	90
No	3764 (79)	34	34	40	60	89
Total	4772	32				

HMV = health maintenance visit; PSA = prostate-specific antigen; DRE = digital rectal examination.
*Data not available for all patients.

ommendation not to screen were less likely to use the PSA test. In one study of 60 primary care practices, physicians who reported a strong or moderate influence of the American Cancer Society guidelines on their daily practice were more than 6 times as likely to report regular use of the PSA test.[24] In the same study,[23] medical record review of 496 asymptomatic men aged 50 or older showed that use of the PSA test increased from 19% before the American Cancer Society guideline was issued to 25% after the guideline was published. The study design, however, could not demonstrate a direct relationship between the American Cancer Society influence on physicians and PSA screening of their patients.

Our study indicates that primary care physicians in Colorado substantially increased their use of the PSA test between 1992 and 1994, increasing the odds of testing men aged 50 or older by more than 3-fold. We believe this increase was attributable, in part, to the promulgation and sustained effect of the American Cancer Society clinical practice guideline released in October 1992, which recommended the use of PSA to screen all men aged 50 or older for prostate cancer. This conclusion is supported by the temporal association between the release of the PSA guideline and increased PSA use, also reported by Williams et al,[23] by the physician self-report that the American Cancer Society is the most influential organization, and by direct linkage between the physician report of influence and subsequent use of the PSA test in their own practice.

Obviously, the strong temporal association between the American Cancer Society guideline and increased PSA use is crucial support for the contention that the guideline influenced use of this screening test. From 1986 to 1991, the national age-specific rate of PSA use rose exponentially from 21 to 20,007 per 100,000 men aged 65 to 74 years.[7] Data from the Mayo Clinic for men living in Olmsted County, Minnesota, showed that age-specific rates of

Table 4. Model-Adjusted Odds Ratios (OR), Confidence Intervals (CI), and *P*-Values

	Prostate-Specific Antigen (PSA)			Digital Rectal Examination (DRE)			PSA vs DRE
	OR	CI	*P*	OR	CI	*P*	*P*
DRE readiness score (ref. pre-contemplation)							
Contemplation/preparation	1.01	(0.70, 1.47)	.949	0.97	(0.68, 1.37)	.863	.828
Action/maintenance	1.39	(1.05, 1.83)	.022	1.34	(0.98, 1.83)	.069	.831
Solo (reference non-solo)	0.72	(0.55, 0.93)	.013	0.85	(0.66, 1.10)	.265	.230
Urban (reference rural)	1.04	(0.82,1.33)	.730	1.41	(1.09, 1.82)	.017	.071
Patient age (y) (reference 50 - 59)							
60 - 69	1.67	(1.44, 1.94)	< .001	1.24	(1.08, 1.43)	.002	< .001
70 - 74	1.54	(1.26, 1.88)	< .001	1.22	(1.02, 1.46)	.032	.053
Nonsmoker (reference smoker)	1.24	(1.05, 1.48)	.012	1.27	(1.10, 1.47)	.001	.815
Patient insurance (reference Medicaid)							
No insurance	1.55	(0.84, 2.88)	.161	1.49	(0.81, 2.72)	.217	.871
Private insurance	1.84	(1.13, 2.99)	.014	1.76	(1.08, 2.89)	.028	.878
Midpoint (low ACS)	1.56	(0.94, 2.58)	.084	1.09	(0.92, 1.29)	.154	.350
Endpoint (low ACS)	1.92	(1.16, 3.17)	.011	0.92	(0.79, 1.08)	.551	.002
ACS - baseline	0.93	(0.57, 1.51)	.776	1.53	(1.05, 2.23)	.026	.071
ACS - midpoint	1.09	(0.77, 1.56)	.629, .569*	1.25	(0.84, 1.86)	.279, .332*	.636, .082*
ACS - endpoint	1.14	(0.71, 1.83)	.580, .471*	1.24	(0.81, 1.92)	.323, .294*	.795, .058*

ACS = American Cancer Society.
*2nd *P*-value adjusts for baseline.

PSA use from 1986 to 1992 rose from 260 to 14,040 per 100,000 men aged 50 to 54 years and from 14,040 to 46,985 per 100,000 men aged 80 to 84 years.[6] This rapid rise in the use of the PSA test may reflect the influence of academic physicians and the academic institution in that region on clinician behavior.[6]

In our study, only a small proportion of age-eligible men had a PSA test in 1992, suggesting that primary care physicians in Colorado were not convinced of the value of this screening tool. The fact that DRE did not increase significantly over the 3-year study period suggests that cancer screening with PSA—in response to the American Cancer Society guideline and not prostate cancer screening in general—increased in Colorado. Two factors distinguished the use of PSA from DRE in both our multivariable models—patient age from 60 to 69 years and year of visit, either 1993 or 1994. By 1993, the odds of a man aged 50 or older receiving a PSA test had increased almost 2-fold. Although PSA use rose considerably from 1992 to 1993, however, use of the PSA test continued to increase from 1993 to 1994, albeit at a slower rate. This continued increase suggests continued diffusion of PSA use and indicates that factors other than the American Cancer Society guideline influenced use of the PSA test. Odds of DRE remained constant for routine visits but increased more than 1.5-fold for a health maintenance visit at endpoint, perhaps indicating an increased sensitivity by the primary care physician to both prostate and colorectal cancer screening. This finding illustrates a weakness in directly comparing the odds of undergoing DRE with those of PSA in studying prostate cancer screening, because the comparison is potentially confounded by the use of DRE as a screening tool for colorectal cancer.

Our conclusion that the American Cancer Society guideline influenced PSA use is also supported by the finding that the physicians in our study consider the American Cancer Society a highly influential organization with respect to primary care cancer screening practices. Of the regional and national organizations rated in the physician survey, only the American Cancer Society recommended PSA screening for prostate cancer at any time during the study. Physician self-report of the American Cancer Society's influence at baseline predicted subsequent use of the PSA test, although this relationship did not persist after adjusting for other physician and patient factors. In our sample, 89% of physicians rated the American Cancer Society as moderately or highly influential on their cancer screening practices. Copic Insurance had assured physicians that PSA use did not affect liability risk, and the National Cancer Institute had not recommended PSA and prostate cancer screening. The US Preventive Services Task Force, arguably the most evidence-based organization making screening recommendations for primary care practice, had in fact recommended against the use of PSA and other prostate cancer screening interventions, but this organization was reported as moderately or strongly influencing the practices of fewer than one third of the physicians in our study.

A critically important question not answerable in this study is whether patients themselves were influenced by the American Cancer Society guideline and requested PSA screening from their primary care physicians. The publication of this guideline was accompanied by wide media coverage and subsequent support by high-profile political figures.[13] Thus it is likely that at least some patients asked their physicians to perform prostate cancer screening tests during visits after the publication of the guideline and ensuing media coverage.[19] The primary care physician might acquiesce to patient requests and order a PSA test even if not convinced of the need for testing, and we would expect, but cannot prove, that a proportion of patients in this study influenced their physicians' cancer screening behavior.[24]

Many authors (including the American College of Physicians) currently recommend that physicians and patients engage in an open discussion of the risks and benefits of prostate cancer screening before undertaking screening tests.[25,26] Such discussions should highlight the unknown benefit of early detection and treatment of prostate cancer, the lack of specificity of the PSA test and the need for subsequent, more invasive confirmatory studies, and the known morbidity and complications associated with aggressive treatment of prostate cancer.[27-29] Complications of aggressive or potentially curative treatment, such as impotence, urinary incontinence, and radiation proctitis, can significantly lower a patient's quality of life.

There is a growing consensus that men who are unlikely to live more than 10 years as a result of concomitant disease or comorbidity are not likely to benefit from prostate cancer screening,[30-34] but primary care physicians may nevertheless be performing PSA testing in men unlikely to benefit from such screening. In a national survey using a probability sample, primary care physicians ordered PSA tests for men in the oldest age groups, although they agreed with urologists that surgical treatment of prostate cancer was of dubious value in men with less than 10 years' life expectancy.[22] In our study, the odds of PSA

testing continued to increase with increasing age, with the odds ratio of PSA testing being 1.67 for men aged 60 to 69 years (compared with 1.0 for ages 50 to 59 years) and 1.54 for men aged 70 to 74 years. We cannot infer from these data whether confounding issues, such as competing mortality and risk-benefit relationships, influenced decisions about PSA use. However, our data show that nonsmokers were more likely to have a PSA test (OR, 1.24) and DRE (OR, 1.27), encouraging speculation that patients or their physicians are weighing the risks and benefits of prostate cancer screening in a group (smokers) at higher risk for mortality from causes other than prostate cancer.

Physician attitudes toward cancer screening (as measured by readiness to change cancer screening behavior scores), although significantly associated with increased odds of PSA use, did not distinguish PSA use from DRE use. The increase in PSA screening varied little by physician sex and training; both general internists and family physicians and male and female physicians all increased their use of the PSA test. System interventions used in the "Partners for Prevention" trial, such as generic flowcharts and reminders, regional training, and periodic follow-up with practice performance feedback, had no impact on the rate of DRE or PSA use, although PSA use was not an intervention target. Practice characteristics associated with increased odds of PSA use in nonsolo practice may relate to the availability of the PSA test, although there is clearly no association between PSA use and DRE use by urban or rural location of practice. Our finding that privately insured patients are more likely to undergo DRE or PSA than are Medicaid and uninsured patients has also been reported by Gann et al.[24] Whether this difference relates to reimbursement is entirely speculative.

Our study has a number of limitations, and our findings warrant cautious interpretation. First, the impact of the American Cancer Society practice guideline is inferred from PSA use; no data were collected to directly measure physician knowledge about prostate cancer screening effectiveness, PSA screening efficacy, or the practice guideline. It can be argued that the effectiveness of a screening guideline should ultimately be measured by a change in use of the recommended screening test, and that knowledge of screening program effectiveness is an intermediary step to that end. To counter this utilitarian view, our finding that men aged 70 to 74 were less likely than younger men to undergo screening implies modulation of screening activity, perhaps attributable to the issues of quality of life and competing mortality at older ages. The strong association between DRE and PSA use implies that primary care physicians are in fact using 2 screening procedures (OR, 6.84 for the association between PSA and DRE) rather than relying on a single modality, thereby increasing sensitivity.

Of necessity, our medical record review was limited, and we made no effort to determine whether the PSA test and DRE were used for cancer screening (ie, case finding) or in response to a patient complaint (ie, diagnostic evaluation). We would expect that DRE and PSA were performed in a small proportion of the men studied as a diagnostic response to symptoms. However, it is unlikely that the proportion of men with symptoms seen by primary care physicians over 3 years would increase by more than 3-fold, even with increased patient awareness of prostate cancer screening resulting from media coverage of the American Cancer Society guideline. Furthermore, the high concurrence of the health maintenance visit with DRE and PSA use strongly supports our contention that cancer screening motivated much of the PSA and DRE use, because diagnostic testing would occur with equal odds during routine office visits. The preferential increase in PSA use compared with DRE over the 2-year follow-up seems unlikely to be related to symptom evaluation, because the incremental contribution of the PSA test over and above DRE in symptomatic patients is unclear. Also, the possibility of malpractice risk might have fueled the increase in PSA use, despite the reassurance of the malpractice underwriter.

···CONCLUSIONS ···

In summary, primary care physicians and their patients must decide whether to use an imperfect and inadequately evaluated screening tool (the PSA test) or assume the risk of failing to detect the presence of cancer in asymptomatic patients. In the case of prostate cancer, we believe that the high prevalence of the disease, substantial burden of illness, and availability of an inexpensive screening test and a broad range of treatment options have driven clinicians to screen for the disease in the absence of clear evidence of long-term benefit for most patients. Indeed, investigators have drawn analogies between the current controversy over PSA screening and the recommendations for lung cancer screening later shown to be clinically ineffective.[35]

Given the unclear clinical benefits of the PSA test to patients, what factors influence physician behavior? Our data suggest that a clinical practice guideline recommended by the American Cancer Society

may have contributed to the significant increase in PSA testing seen in 1993 and 1994, especially among primary care physicians who consider the American Cancer Society a highly influential organization. With this apparent influence on physicians in primary care practice, nationally recognized specialty organizations must be cognizant of their responsibility for presenting evidence of screening efficacy and effectiveness in a clear and balanced fashion when recommending and publicizing practice guidelines to physicians and their patients.

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