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BRIEF COMMUNICATION

Prostate-Specific Antigen Testing in Men Aged 40–64 Years: Impact of Publication of Clinical Trials

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We assessed the impact of the publication of trials and changes in recommendations on the rates of prostate-specific antigen (PSA) screening in men aged 40 to 64 years by analyzing monthly medical claims for PSA testing in a commercial insurance database from 2001 to 2011, covering more than 1.5 million men in each year. The testing rates for men aged 40 to 49 years, 50 to 59 years, and 60 to 64 years were 12.1%, 32.7%, and 42.7%, respectively, in 2001 vs 15.7%, 34.2%, and 42.0%, respectively, in 2011. Men aged 40 to 49 years experienced a gradual increase in testing rate from 2001 through 2008 (annual change in PSA testing per 10 000 men [AC] = 4.37; $P < .001$), which became flat from mid-2009 through 2011(AC = –0.06; $P = .98$). The slope of PSA testing rates did not change in men aged 50 to 59 years or 60 to 64 years with the publication of the results of the large trials in 2009 or with the subsequent changes in recommendations on PSA testing.

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In early 2009, the publication of two large clinical trials reported substantial rates of overdiagnosis of prostate cancer with routine prostate-specific antigen (PSA) screening (1,2). These results led many organizations to change their recommendations on PSA screening (3–5). Both the trial publications and the new recommendations stimulated by them received substantial media coverage.

We studied PSA testing in men aged 40 to 64 years enrolled in a large private insurance plan using administrative data from Clinformatics Data Mart, which covered more than 1.5 million men aged 40 to 64 in each year (6). The study was institutional review board exempt because the data contained no personal identifiers. We excluded those with any diagnosis of prostate cancer or prostate mass in the prior 2 years (International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] codes 185, V104.6, 222.2, 233.4, or 236.5) or a prostatectomy (ICD-9-CM procedure codes 60.21, 60.29, 60.3–60.6; Current Procedural Terminology codes 55801, 55810, 55812, 55815, 55821, 55831, 55842, and 55845). PSA testing was identified through Current Procedural Terminology codes 84152–54 and 86316 or Healthcare Common Procedure Coding System code G103. For each month during the period from 2001 to 2011, we calculated the rate of PSA testing per 10 000 eligible men aged 40 to 49 years, 50 to 59 years, and 60 to 64 years. Then the monthly PSA rates were plotted and analyzed by a linear joinpoint regression model to identify any time points at which the time trends had statistically significant changes (7,8). We chose a linear model because the plot of the observed rates over time appeared linear, and residual analysis suggested the model fitted well. We also calculated yearly PSA testing rates by age category. For those analyses, we included only men with coverage for the entire year. We repeated the joinpoint analyses and calculation of yearly rates separately for each census region: Northwest, Midwest, South, and West (9). A logistic regression was used to evaluate the interactions of age, region, and time on receipt of PSA testing based on individual-level data. The data do not indicate race or ethnicity. A P value of less than.05 was considered statistically significant.

Table 1 presents the rates of PSA testing in 2001 and 2011, stratified by age and region. Because of the large numbers of subjects, all differences between 2001 and 2011 were statistically significant, although many changes were quite small. For men aged 40 to 49 years, PSA testing rates increased slightly in all regions (3.6% increase, from 12.1% to 15.7%; 95% confidence interval [CI] = 3.5% to 3.7%), with a steeper increase in the South (5.6% increase, from 14.3% to 19.9%; 95% CI = 5.4% to 5.8%). From 2001 to 2011, the overall PSA testing rates increased slightly for men aged 50 to 59 years (1.5% increase, from 32.7% to 34.2%; 95% CI = 1.3% to 1.7%) and decreased slightly for men aged 60 to 64 years (0.7% decrease, from 42.7% to 42.0%; 95% CI = 0.3% to 1.0%). In men aged 50 to 59 years and 60 to 64 years, PSA testing rates declined slightly from 2001 to 2011 in most regions, although rates in the South increased over that period (4.1% increase, 95% CI = 3.8% to 4.3% for men aged 50 to 59 years; 1.9% increase, 95% CI = 1.3% to 2.4% for men aged 50 to 59 and 60 to 64, respectively).

Figure 1 shows the number per 10 000 men, stratified by age, who underwent PSA testing in each month from January 2001 to December 2011. A joinpoint regression analysis detected a statistically significant change in slope in mid-2009 for men aged 40 to 49 years (arrow), from an increase of 4.37 men per 10 000 per year in the period from 2001 to 2008 ($P < .001$) to a decrease of 0.06 men per 10 000 per year in the period from 2009 to 2011 ($P = .98$). For men aged 50 to 59 years and 60 to 64 years, there were no statistically significant changes in slope over the entire 11-year period.

We repeated the plots shown in Figure 1 separately for each region (not shown). The decline in the slope of rate of testing in men aged 40 to 49 years seen in mid-2009 in Figure 1 was restricted to men in the West region. Similar to Figure 1, the slopes of the rate of PSA testing in men aged 50 to 59 years and 60 to 64 years did not change for any region over the period from 2009 to 2011.

Table 1. 2001 and 2011 yearly prostate-specific antigen (PSA) testing rates, by age and region*

		2001†		2011†	
Age, years	**Region**	**No.**	**% received PSA (95% CI)‡**	**No.**	**% Received PSA (95% CI)‡**
40–49	Midwest	223 095	8.8 (8.7 to 8.9)	182 226	9.5 (9.3 to 9.6)
	Northeast	65 755	14.8 (14.5 to 15.1)	74 712	15.8 (15.6 to 16.1)
	South	270 132	14.3 (14.1 to 14.4)	345 592	19.9 (19.7 to 20.0)
	West	82 099	11.4 (11.2 to 11.6)	116 206	13.0 (12.8 to 13.1)
	All	641 081	12.1 (12.0 to 12.1)	718 736	15.7 (15.6 to 15.8)
50–59	Midwest	157 354	30.7 (30.4 to 30.9)	181 771	28.7 (28.5 to 28.9)
	Northeast	42 734	33.1 (32.7 to 33.6)	62 339	30.5 (30.1 to 30.8)
	South	191 434	34.8 (34.6 to 35.0)	313 650	38.6 (38.7 to 39.0)
	West	53 946	30.8 (30.4 to 31.2)	102 775	32.0 (31.7 to 32.3)
	All	445 468	32.7 (32.5 to 32.8)	660 535	34.2 (34.1 to 34.3)
60–64	Midwest	43 284	40.8 (40.3 to 41.3)	65 532	37.0 (36.7 to 37.5)
	Northeast	12 891	41.5 (40.7 to 42.4)	19 251	36.0 (35.3 to 36.7)
	South	52 292	44.8 (44.4 to 45.3)	110 354	46.7 (46.4 to 47.0)
	West	14 899	41.8 (40.6 to 42.2)	37 784	39.9 (39.3 to 40.3)
All 60–64		123 366	42.7 (42.4 to 42.9)	232 921	42.0 (41.8 to 42.2)

* The analyses were restricted to men who had insurance coverage for the entire year. CI = confidence interval.

† Because of the large numbers of men in the analyses, all the differences in PSA testing rates between 2001 and 2011 were statistically significant at $P < .001$, although many of these differences were quite small. Z score statistics were used to test the statistical significance. All tests were two-sided.

‡ The proportion of men who received PSA testing $\hat{p}$ was binomial distributed. We calculated the standard Wald asymptotic confidence interval ($\hat{p} \pm (z_{\alpha/2} \times \sqrt{\hat{p}\,(1-\hat{p})\,/\,n}\,)$) based on the normal approximation to the binomial distribution, where n is the sample size and $z_{\alpha/2} \approx 1.96$ for 95% confidence interval calculation.

It might be argued that not enough time had elapsed to measure the impact of publication of the trials or changes in recommendations on PSA testing. However, we previously found that substantial changes in community practice can occur within days of media coverage of findings (10,11).

Cancer screening may differ from other medical interventions in the high level of belief in its effectiveness, both in the American public (12) and among physicians (13,14). Approximately 93% of primary care physicians surveyed in 2011 had heard of the changes in recommendations (15). Three-quarters responded that their patients expected them to continue testing, and this expectation may be the biggest barrier to rapid implementation of the new recommendations (15).

Zeliadt et al. (16) reported a 3% decrease in PSA testing among men aged 40 to 74 at Veterans Affairs facilities coincident with publication of the trials. The organization of Veterans Affairs clinics with full-time employee providers may have allowed for more rapid dissemination of evidence and implementation of practice change. Ross et al. (17) found a slight decrease in PSA testing rate over the period from 2008 to 2009 in men enrolled in Medicare who were aged 75 years and older after the US Preventive Services Task Force recommended against testing in men in that age group.

The rate of PSA testing showed a deflection point in mid-2009 for men aged 40 to 49 years. This change may be related to the March 2009 publication of the clinical trials. Ironically, neither trial contained men in their 40s, and no organization had recommended routine PSA testing in that age group. Some organizations, such as the American Cancer Society, had recommended PSA testing in African American men before age 50 years, given the more aggressive nature of the disease. Unfortunately, our data contain no information on race or ethnicity.

The limitations of our study include its restriction to men with commercial insurance. Also, we could not exclude men whose PSA test was performed to evaluate a sign or symptom.

In conclusion, neither the publication of the two large trials nor the subsequent changes in recommendations had an obvious effect on PSA screening rates for men aged 50 to 64 years, despite extensive media coverage of these events. The rates for men aged 40 to 49 years went from a steady increase to flat coincident with the trial publications. There seems to be considerable resistance to changing PSA screening practices. Continued public information and assistance to primary care physicians in addressing the question of unnecessary or harmful testing with their patients may be helpful.

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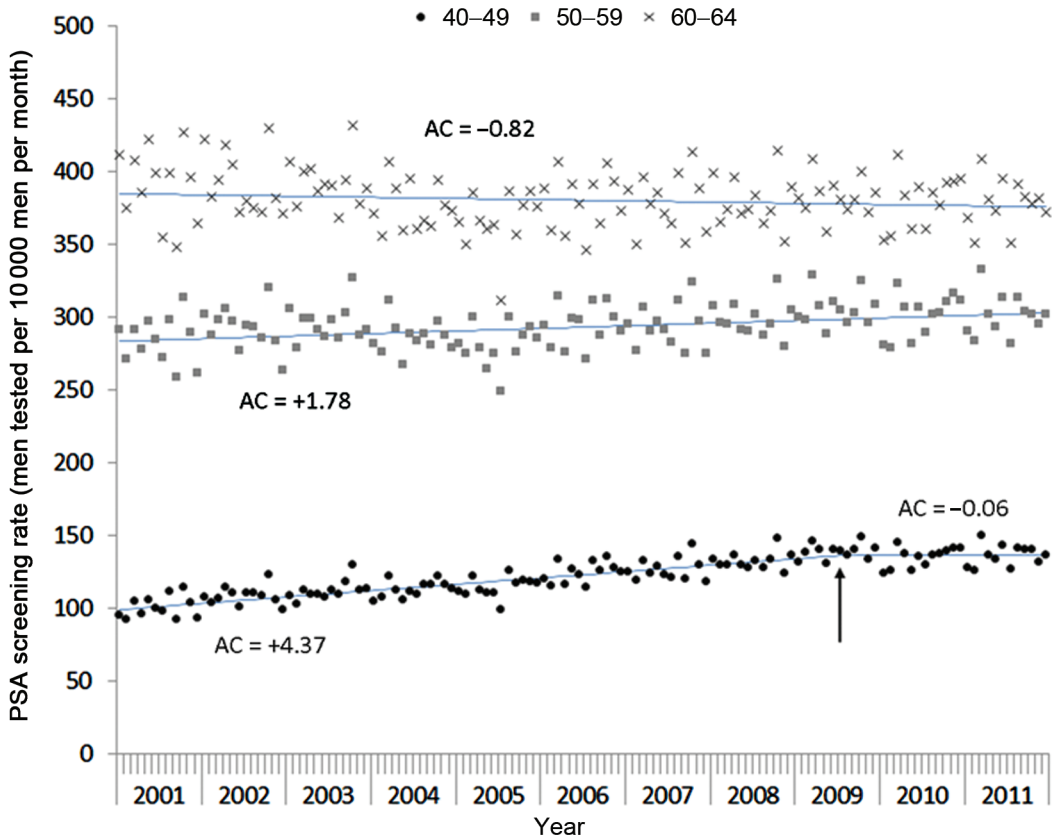

Figure 1. Monthly prostate-specific antigen (PSA) testing rates for men aged 40 to 49 years, 50 to 59 years, and 60 to 64 years from 2001 through 2011. The annual change in rate (AC) represents the change in number of men tested per 10 000 men per year. The AC for men aged 50 to 59 years and the initial AC (from the period from 2001 to 2009) for men aged 40 to 49 years were statistically significant ($P < .001$) using Z score statistics. The other ACs were not significantly different from 0 (no change over time). The joinpoint regression detected a statistically significant change (node) in the slope of rate of PSA testing at July 2009 for the group aged 40 to 49 years, indicated by the **vertical arrow**.

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Notes

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