Influence of Publication of US and European Prostate Cancer Screening Trials on PSA Testing Practices

Steven B. Zeliadt, Richard M. Hoffman, Ruth Etzioni, John L. Gore, Larry G. Kessler, Daniel W. Lin

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Correspondence to: Steven B. Zeliadt, PhD, Health Services Research and Development Center of Excellence, VA Puget Sound Health Care System, 1100 Olive Way, Ste 1400, Seattle, WA 98101 (e-mail: steven.zeliadt@va.gov).

In 2009, results from the Prostate, Lung, Colorectal and Ovarian Cancer Screening Trial indicated no difference in mortality between the screening and the control groups (rate ratio = 1.13, 95% confidence interval = 0.75 to 1.70), whereas those from the European Randomized study of Screening for Prostate Cancer trial indicated a 20% reduction in mortality among the screening group (rate ratio = 0.80, 95% confidence interval = 0.65 to 0.98). In this study, we examined whether prostate-specific antigen (PSA) testing has changed following these publications. The primary outcome measure was the proportion of men seen at least once in a primary care or urology clinic between August 1, 2004, and March 31, 2010, who received a PSA test. Following the publications, PSA use declined slightly—by 3.0 percentage points and 2.7 percentage points among men aged 40–54 and 55–74 years, respectively. PSA testing among men older than 75 years initially declined slightly following the recommendations by the US Preventive Services Task Force in 2008 and continued to decline after the trial publications.

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In the last two decades, limited evidence about the benefit of prostate-specific antigen (PSA) screening to prevent deaths from prostate cancer, relative to potential harm from screening, has led to mixed endorsements of PSA testing. Some clinical organizations including American Cancer Society (ACS) and American Urological Association (AUA) recommend screening, whereas others including the US Preventive Services Task Force (USPSTF) advise patients to discuss the potential benefits and risks of the PSA test with their physicians (1–3). Despite limited evidence and consensus regarding the benefits of PSA testing, it has become a widely adopted screening test in the United States with more than 75% of men older than 50 years having been tested at least once (4). Notably, PSA testing has been the highest among older men. Longitudinal patterns of testing in the 1990s suggest that 45% of white men aged 70–79 years received annual PSA tests compared with 35% of men aged 50–59 years (5). This may reflect overuse of PSA testing as most recommendations guard against screening men with less than a 10-year life expectancy because of the increased likelihood of experiencing harm from screening relative to any potential benefit (6).

Two recent sets of publications received broad media coverage, potentially influencing the way PSA testing is viewed among clinicians and the general public. First, in August 2008, the USPSTF released updated recommendations suggesting an upper age limit of 75 years for PSA screening, citing accumulating evidence of high rates of screening among elderly men for whom a small benefit is likely. Second, in March 2009, the long-awaited results of the Prostate, Lung, Colorectal and Ovarian (PLCO) and the European Randomized study of Screening for Prostate Cancer (ERSPC) screening trials were simultaneously published, generating considerable attention because of their mixed findings (7,8). The PLCO trial reported similar death rates in both the screening and the control groups (rate ratio = 1.13, 95% confidence interval = 0.75 to 1.70), whereas the ERSPC reported a 20% reduction in prostate cancer–specific deaths with screening (rate ratio = 0.80, 95% confidence interval = 0.65 to 0.98).

To explore whether these publications have begun to influence the patterns of PSA testing, we conducted a cross-sectional study from August 2004 to March 2010 to assess the frequency of PSA testing in the Veterans Health Administration (VHA) Pacific Northwest Network. To specifically examine changes in PSA testing patterns potentially associated with the USPSTF guidelines and the publication of the trial results (7,8), we focused on the 8-month period starting in August 2008, when the USPSTF guidelines were published, and ending in March 2009, when the trial results were published. We reviewed testing in four periods before the USPSTF recommendation update was released (period 1: August 2004–March 2005; period 2: August 2005–March 2006; period 3: August 2006–March 2007; period 4: August 2007–March 2008). In period 5 (August 2008–March 2009), we examined testing after the USPSTF update, and finally, in period 6 (August 2009–March 2010), we examined PSA testing patterns after the publication of the screening trials (7,8).

During each of the six periods, we calculated the proportion of eligible men who had a PSA test (numerator) from among all eligible men with a primary care or urology clinic visit (denominator). We excluded men who were diagnosed with prostate cancer before the date of the first clinic visit in each period. The total number of eligible men ranged between 125,000 and 140,000 in each period (Table 1).

We observed a slightly increased trend in PSA testing for men aged 40–54 and 55–74 years before the publication of the trials (7,8), with minimal changes in testing among men aged 75 years and older. The updated USPSTF guidelines in 2008 did not appear to correspond to a change in PSA testing for men younger than 75 years, as PSA testing rates continued to increase slightly for all men aged 40–74 years.
However, we observed a decrease in testing among men aged 75 years and older from 28.4% to 46.5% in the period just before the USPSTF update to 24.3% in the period just after the USPSTF update (P = .036).

We observed a decrease in PSA testing among all three age groups, 40–54, 55–74, and ≥75 years, by 3.0 percentage points, 2.7 percentage points, and 2.2 percentage points, respectively, following the publication of the PLCO and ERSPC trial results (7,8). This trend was statistically significant when comparing the final study period (period 6) with the immediate previous period (period 5) among all age groups (P < .001). However, when comparing the final study period with all previous periods (periods 1–5 combined), the decrease was only statistically significant for younger (40–54 years) and older (≥75 years) men (P < .001 for both groups; and P = .842 for men aged 54–74 years) (Table 1).

Notably, PSA testing varied substantially among the eight regional practice groups within the Pacific Northwest Network (Figure 1). In the most recent study period (period 6), testing ranged from 28.4% to 46.5% among men aged 40–54 years, 39.7% to 60.7% among men aged 55–74 years, and 12.7% to 48.8% among men aged 75 years and older. Notably, testing decreased following the trial publications in six of the eight practice groups, was unchanged in one group, and continued to increase in one group.

Furthermore, we investigated whether the preliminary findings of this observational study showing reduced PSA testing was because of other temporal factors. We note that there have been few changes in the VHA or the Department of Defense (DOD) guidelines. Both the VHA and DOD have focused on encouraging educating patients on PSA screening tests but have not provided formal policies about screening because of a lack of evidence of its benefit (9). The VHA implemented national clinical reminders for annual counseling about prostate cancer screening in 1997, which were discontinued in 2003. A review of local clinical guidelines for the Pacific Northwest Network regarding prostate cancer screening identified one clinical bulletin (VA Puget Sound Health Care System, Clinical Bulletin 01–09, December 2001) before our study that called for patient visits focused on “education about

### Table 1. Number of patients in each study period, proportion receiving prostate-specific antigen (PSA) testing, and comparison of proportion receiving PSA testing across study periods

<table>
<thead>
<tr>
<th>Patient age, y</th>
<th>Period No. (calendar period)</th>
<th>No. (% tested for PSA)</th>
<th>No. (% tested for PSA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40–54</td>
<td>Period 1 (August 2004–March 2005)</td>
<td>32 009 (33.2)</td>
<td>68 041 (43.0)</td>
</tr>
<tr>
<td></td>
<td>Period 2 (August 2005–March 2006)</td>
<td>27 728 (33.1)</td>
<td>67 675 (45.2)</td>
</tr>
<tr>
<td></td>
<td>Period 3 (August 2006–March 2007)</td>
<td>27 444 (35.7)</td>
<td>72 581 (48.0)</td>
</tr>
<tr>
<td></td>
<td>Period 4 (August 2007–March 2008)</td>
<td>28 088 (35.7)</td>
<td>77 245 (47.5)</td>
</tr>
<tr>
<td></td>
<td>Period 5 (August 2008–March 2009)*</td>
<td>29 042 (36.8)</td>
<td>80 373 (49.5)</td>
</tr>
<tr>
<td></td>
<td>Period 6 (August 2009–March 2010)†</td>
<td>30 660 (33.8)</td>
<td>86 648 (46.8)</td>
</tr>
</tbody>
</table>

Comparison of the proportion of men tested across study periods by age group

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Patient age, y</th>
<th>No. (% tested for PSA)</th>
<th>No. (% tested for PSA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40–54</td>
<td>Period 5</td>
<td>Z statistic = 7.89</td>
<td>Z statistic = 7.89</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P &lt; .001</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>55–74</td>
<td>Period 5</td>
<td>Z statistic = 10.83</td>
<td>Z statistic = 9.61</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P &lt; .001</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>≥75</td>
<td>Period 5</td>
<td>Z statistic = 2.26</td>
<td>Z statistic = 9.61</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P = .842</td>
<td>P &lt; .001</td>
</tr>
</tbody>
</table>

* This study period was after publication of updated US Preventive Services Task Force guidelines.
† This study period was after the publication of the Prostate, Lung, Colorectal and Ovarian Cancer Screening Trial and the European Randomized study of Screening for Prostate Cancer trial (7,8).
‡ Two-sample Z test of proportions (two-sided).

### CONTEXT AND CAVEATS

**Prior knowledge**

Even though prostate-specific antigen (PSA) testing is a widely used screening method to detect prostate cancer in men, there is limited evidence of its benefits. The test may also be overused in older men.

**Study design**

Whether the frequency of PSA testing has changed after the release of updated United States Preventive Services Task Force guidelines in 2008, and the publication of results of the Prostate, Lung, Colorectal and Ovarian and European Randomized study of Screening for Prostate Cancer screening trials in 2009, was examined in men from eight regional practice groups in the Veterans Health Administration Pacific Northwest Network. Trends in PSA testing before and after these publications were evaluated in men aged 40–54 years, 55–74 years, and 75 years and older.

**Contribution**

PSA testing decreased slightly in men aged 40–54 and 55–74 years after the trial publications. A decrease in PSA testing was noted among men aged 75 years and older right before the updated United States Preventive Services Task Force guidelines were released and continued to decrease thereafter. Overall, a decrease in PSA testing was noted in six of the eight practice groups following the trial publications, remained unchanged in one group, and increased in one group.

**Implications**

The publication of the Prostate, Lung, Colorectal and Ovarian and European Randomized study of Screening for Prostate Cancer screening trials and to an extent the updated United States Preventive Services Task Force guidelines may have had a modest impact on PSA testing.

**Limitations**

PSA testing in the Veterans Health Administration may not represent the trend in the general community, and the results may not be generalizable outside the Veterans Health Administration. The decrease in PSA testing could be because of other temporal factors.

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the risks and benefits of prostate cancer screening” to be included in the group of preventive services where no co-payments were required. We were unable to identify any other changes in local or national clinical guidelines within the VHA related to PSA screening during our study period.

Our study has a few limitations. The patterns of PSA testing in the VHA may not be similar to community practice. Historically, PSA testing has been higher among veterans using VHA services compared with the community setting (10,11); therefore, the decline observed in this study could be because of higher under-

Figure 1. Trends in the proportion of veterans attending primary care or urology clinic visits who received a PSA test across eight regional practice groups in Veterans Health Administration Pacific Northwest Network from August 2004 through March 2010. Each of the eight lines with symbols represents a regional practice group; the solid black line without a symbol represents all men combined. A) Men aged 40–54 years. B) Men aged 55–74 years. C) Men aged 75 years and older. The number of men attending a clinic visit in each of the regional practice groups varied slightly across study time periods. The number of men in each regional practice group represents the mean number of men attending a clinic visit across all time periods in each age group.
lying use of testing and may not be generalizable outside the VHA. Some veterans may have had PSA tests at non-VHA facilities that were not investigated in this study. Additionally, this study was not able to determine if the observed trends in PSA testing were reflective of patient preferences or physician practices.

This profile of recent PSA testing practices suggests that the publication of the trial results (6,7) may have influenced the changes. Our study provides a preliminary indication that patients and physicians may have interpreted the evidence from the trials negatively and responded by decreasing PSA testing rates. Future studies are needed to evaluate how patients and providers have interpreted the nuanced evidence from the trials and how this evidence has shaped their beliefs and practices regarding PSA screening for prostate cancer.

References

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Notes
The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the US Department of Veterans Affairs. The authors are solely responsible for the design of the study, analysis or interpretation of the results, writing of the article, and decision to submit the article for publication.

Affiliations of authors: Health Services Research and Development Center of Excellence (SBZ) and Department of Urology (DWL), VA Puget Sound Health Care System, Seattle, WA; Department of Health Services (SBZ, RE, LGK) and Department of Urology (JLG, DWL), University of Washington, Seattle, WA; Medicine Service, Department of Veterans Affairs Medical Center, and Department of Medicine, University of New Mexico, Albuquerque, NM (RMH); Public Health Sciences, Fred Hutchinson Cancer Research Center, Seattle, WA (SBZ, RE, JLG, DWL).