Practitioner-Level Determinants of Inappropriate Prostate-Specific Antigen Screening

B. Price Kerfoot, MD, EdM; Erika F. Holmberg, MPH; Elizabeth V. Lawler, MPH, ScD; Edward Krupat, PhD; Paul R. Conlin, MD

Background: None of the major clinical practice guidelines recommend that prostate-specific antigen (PSA) screening be routinely performed in asymptomatic men older than 75 years or younger than 40 years. We investigated the practitioner-level determinants of inappropriate PSA screening in 7 Veterans Health Administration (VHA) hospitals.

Methods: Data on PSA test use from 1997 to 2004 were obtained from VHA databases for 181,139 male patients and the 4,823 health care providers who ordered their tests. Patients were excluded from the study population if they underwent PSA testing for nonscreening reasons, as indicated by prostate cancer-specific medications, diagnoses, and procedures. Inappropriate PSA test use was defined as PSA screening in patients older than 75 years or younger than 40 years. Univariate and multivariate Poisson regressions were performed.

Results: The mean ± SD percentage of inappropriate tests by health care provider was 19.3% ± 15.0%, with 18.4% ± 14.9% in patients older than 75 years and 0.8% ± 3.0% in patients younger than 40 years. Practitioners who were urology specialists, male, infrequent PSA test orderers, and affiliated with specific hospitals had significantly higher levels of inappropriate PSA screening. Compared with attending physicians, nurses and physician assistants had significantly lower levels of inappropriate screening. Under multivariate modeling, infrequent PSA test ordering and hospital affiliation retained statistical significance. The percentage of inappropriate PSA screening increased significantly with the age of male health care providers (P < .001).

Conclusions: This study elucidates several important provider-level determinants of PSA screening misuse and substantiates that PSA screening is frequently performed counter to evidence-based guidelines. Further work is needed to determine the degree to which “prostaticopathy” contributes to PSA misuse by older male providers.

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While there is great debate if and how prostate-specific antigen (PSA) should be used for prostate cancer screening, a consensus exists as to when it should not be used. None of the major clinical practice guidelines recommend that PSA screening be routinely performed in asymptomatic men younger than 40 years, older than 75 years, or with less than a 10-year life expectancy, even if the patient is in a group at high-risk for prostate cancer.1-4 To our knowledge, there is currently no solid evidence that PSA screening provides any health benefits for these patient populations.5 Rather, it imposes substantial psychological and financial costs and may lead to diagnostic and therapeutic procedures of questionable benefit.6,7

Inappropriate PSA screening is performed frequently, although there is substantial variability among reported rates. A recent nationwide study found that more than 50% of male veterans 75 years or older underwent PSA screening in 2003,8 and a national telephone survey of patients conducted by the Centers for Disease Control and Prevention (the Behavioral Risk Factor Surveillance System) found that 72% of men 80 years or older underwent PSA screening in the prior 2 years.9 Physician-reported data from the 1999-2002 National Ambulatory Medical Care Survey placed the population-based PSA screening rate in men older than 75 years at 28%,10 while patient-reported data from the 2000 National Health Interview Survey found that rate of screening of men 75 years or older to be 33%.11

Ultimately, the decision whether to perform PSA screening rests with the health care provider. Little is known about the provider-level determinants of inappropriate PSA screening, although it is well established that the demographic characteristics of health care practitioners can significantly influence their cancer-screening
behaviors. Physician sex has been found to be associated with significant differences in cervical and breast cancer screening behaviors.\(^{22}\) In a telephone survey, male physicians were more likely to recommend PSA testing compared with their female counterparts.\(^{13}\) Multiple studies have also demonstrated an inverse relationship between the number of years that a physician has been in practice and their adherence to standards of practice in the use of screening tests and preventive health care.\(^{14}\)

We report the results of a retrospective cohort study that investigated the practitioner-level determinants of inappropriate PSA screening in 7 Veterans Health Administration (VHA) hospitals of the Department of Veterans Affairs (VA) in the New England region.

### STUDY DESIGN AND DATA SOURCES

This study is a retrospective analysis of practitioner characteristics, patient characteristics, and PSA test use from January 1, 1997, to October 1, 2004, in 7 VHA hospitals in the New England region (Veterans Integrated Service Network 1 [VISN-1]). Institutional review board approval was obtained to perform this study.

Data on PSA testing and patient characteristics were extracted from VISN-1 VISTA (Veterans Health Information Systems and Technology Architecture) databases for 181,139 male patients whose PSA levels were tested over this 8-year period. Medication data were collected from VISN-1 pharmacy databases. Data on the corresponding 4823 practitioners who ordered these PSA tests were extracted from the VISN-1 VISTA practitioner database. Additional clinical data for the patients with PSA test results were obtained from the VA National Patient Care Database outpatient clinic files and the patient treatment files (inpatient data), Austin Automation Center, Austin, Texas. Mortality data were obtained from the VA Beneficiary Identification Records Locator Subsystem, Austin Automation Center.

### PATIENT AND PRACTITIONER VARIABLES

Health care provider type (attending physician; trainee physician; or registered nurse [RN], nurse practitioner [NP], or physician assistant [PA]) and urology expertise were determined by keyword searches of provider class, provider title, provider signature block, and/or service and section name within the VA VISTA practitioner database. Keywords included urology (urology expertise) and resident and fellow and intern (trainee physician). The practitioners' age was defined at the point of the first PSA test that they ordered. 39.9% of practitioners were missing age data. Of those health care providers without age data, 76.3% were trainees. For those trainees with age data, the median age was 29 years. Patient age was defined at the time of each individual PSA test. The rate of PSA test ordering was calculated by dividing the total number of PSA tests ordered by a practitioner over the duration of the data set by the number of months between the first and last PSA test ordered. Hospital was defined as the VA medical center in which a health care provider’s PSA test results were most frequently processed. Since many facilities have both hospital-based and community-based clinic components, the hospital designation did not do not distinguish between these 2 alternative sites of care. History of a prostate needle biopsy was determined by the presence of codes 55700 (Current Procedural Terminology [CPT]) or 60.11 (International Classification of Diseases, 9th Revision [ICD-9]) in the patient VISN 1 records.

### EXCLUSION CRITERIA

Patients who underwent PSA testing for reasons other than screening were excluded from the study population. Exclusion criteria included ICD-9 diagnosis codes for prostate cancer, prostate carcinoma in situ (prostate intraepithelial neoplasia III), nodular prostate and prostatitis; ICD-9 and CPT procedure codes for radical prostatectomy, external beam radiotherapy, brachytherapy, cryosurgery, and simple orchectomy; prostate cancer-specific medications including leuprolide acetate, goserelin acetate, abarelix, flutamide, nilutamide, and bicalutamide; and medications such as finasteride and dutasteride for which obtaining a baseline PSA level may be appropriate. If a single exclusion criterion was met, all of that patient’s PSA data were eliminated from the data set. To optimize the reliability of the data set, PSA data were excluded when the patient was younger than 20 years or older than 95 years at the date of the test and when patient age was not recorded. In addition, PSA data points were excluded if ordering practitioners ordered PSA tests fewer than 5 times over the 8-year duration of the data set, could not be classified by health care provider type, or were an unusual provider type (eg, optometrist). Duplicate records in the database from multiple hospital facilities for a single practitioner were consolidated.

### VALIDATION OF STUDY POPULATION

To confirm that the patient-level exclusion criteria were appropriately applied in the construction of the database, a medical chart audit was performed on the electronic records from 90 patients in the database from the VA Boston Healthcare System. These 90 patients were selected at random, after stratification by age group and health care provider type. Patients’ problem lists, medication lists, progress notes, consult requests, operative notes, and pathology records were reviewed for the presence of patient-level exclusion criteria.

### OUTCOME MEASURES

Based on published clinical guidelines and reports, inappropriate PSA test use was defined for the study as the use of PSA screening for prostate cancer in patients who were older than 75 years, who were younger than 40 years, or who had an estimated life expectancy of less than 10 years.\(^{14}\) For the average man in the United States, an estimated life expectancy of 10 years is reached at age 76 years.\(^{15}\) No adjustments were made to account for patients’ comorbid conditions that might alter life expectancy. We dichotomized appropriateness of screening based on the age of the patient at the time of the screening test.

### DATA ANALYSIS

Crude estimates of the percentage of PSA tests ordered inappropriately were calculated by counting the number of inappropriate PSA tests ordered by a group (ie, all physicians) and dividing by the total number of PSA tests ordered by that group. Univariate and multivariate Poisson regressions were performed for each predictor in the model, using PROC GENMOD in SAS version 9.0 (SAS Institute Inc, Cary, North Carolina). All analyses were performed adjusting for repeated measures by health care provider and patient. These analyses were both pooled and stratified by the sex of the health care provider. To examine variability in case-mix between health care providers, we separately analyzed a subset of providers who frequently ordered PSA tests more than once per week, using the same statistical methods.
RESULTS

Of the 181 139 male veterans in VISN-1 whose PSA levels were tested between January 1, 1997, and October 1, 2004, 75 374 (41.6%) were excluded from the study population because of patient- and health care provider-level exclusion criteria. Within the remaining study population of 105 765 male patients, the total number of PSA tests was 232 302, the median patient age was 65 years (interquartile range [IQR], 54-73 years), the median number of PSA levels checked per patient was 1 (IQR, 1-3), and the median PSA value was 0.60 ng/mL (IQR, 0.30-0.79; Table 1). A medical chart audit of 90 randomly selected patients from the study population at the VA Boston Healthcare System revealed exclusion criteria in 2 (2.2%; 95% confidence interval [CI], 0.6%-7.7%): 1 patient had a history of prostate cancer treated at a non-VA institution, and 1 patient had prostatic intraepithelial neoplasia on prostate needle biopsy for which no ICD-9 code had been recorded.

Of the 1552 health care providers who ordered these PSA tests, 51.3% were urologists, and 53.4% were trainee physicians; the median provider age was 40 years (IQR, 31-49 years) (Table 2). The frequency of PSA test ordering ranged from less than once per 3 months for 238 health care providers (15.3%) to more than once per week for 328 health care providers (21.1%). Of the 232 302 PSA tests in the study population, 37 483 (16.1%) were performed inappropriately, with 51 374 (21.1%) in patients younger than 40 years, 85 920 (36.1%) in patients older than 75 years, and 11 512 (4.9%) in patients younger than 40 years. After aggregating PSA tests by practitioner, the mean ± SD percentage of inappropriate tests by health care providers was 19.3% ± 15.0%, with 18.4% ± 14.9% in patients older than 75 years and 0.8% ± 3.0% in patients younger than 40 years.

Univariate analysis by provider-level characteristics demonstrated that inappropriate use of PSA screening was significantly elevated among urologists, male health care providers, and health care providers who ordered the test most infrequently (P < .05; Table 3). Compared with attending physicians, nurses, and physician assistants who had significantly lower levels of inappropriate screening. The percentage of inappropriate PSA test use varied substantially between hospitals: the univariate risk ratio ranged from 1.77 (95% CI, 1.52-2.06) at hospital 2 to 0.76 (95% CI, 0.64-0.91) at hospital 7. Under multivariate modeling, the interhospital and ordering-frequency differences remained statistically significant (P < .05; Table 3).

To determine the degree to which case-mix variability accounted for the univariate and multivariate results, we performed identical calculations on the subgroup of health care providers who performed PSA screening most frequently (> 1/wk) and thus would likely be less influenced by case-mix variation. The results were similar: inappropriate use of PSA screening was significantly elevated among urologists, male health care providers, and health care providers who ordered the test most infrequently (P < .05; Table 3).
significantly elevated among urologists and male health care providers, and compared with attending physicians, nurses and physician assistants had significantly lower levels of inappropriate screening (P < .05, univariate analysis). In multivariate analysis, male health care providers and trainee physicians demonstrated significant elevations in inappropriate PSA screening, while the univariate findings for urologists and nurses and physician assistants did not retain statistical significance. Significant variation in PSA test use between hospitals was demonstrated in both univariate and multivariate analyses.

Male health care providers older than 40 years had a higher percentage of inappropriate PSA test use compared with female health care providers of similar age (Figure). A significant interaction was present between provider age and sex (P = .01). The percentage of inappropriate PSA screening increased significantly with the age of male health care providers (P < .001) but decreased with the age of female health care providers (P = .048). At ages 46 to 50 years, male health care providers were 9% more likely than female health care providers to screen inappropriately; this increased to 51% at ages 51 to 55 years and 95% at ages older than 55 years.

In our study population, 21% of all PSA tests were ordered by male health care providers aged 51 years or older.

### Table 3. Inappropriate PSA Test Use by Provider-Level Characteristics

<table>
<thead>
<tr>
<th>Health Care Provider Characteristic</th>
<th>Inappropriate PSA Tests, % (95% CI)</th>
<th>Univariate Risk Ratio (95% CI)</th>
<th>Multivariate Risk Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provider type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RN/NP/PA</td>
<td>14.0 (13.8-14.2)</td>
<td>0.81 (0.70-0.93)(^a)</td>
<td>0.94 (0.80-1.10)</td>
</tr>
<tr>
<td>MD trainee</td>
<td>17.4 (16.8-17.9)</td>
<td>1.00 (0.85-1.18)</td>
<td>1.15 (0.98-1.36)</td>
</tr>
<tr>
<td>MD attending physician</td>
<td>17.3 (17.1-17.5)</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Urology expertise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urologist</td>
<td>18.5 (17.7-19.3)</td>
<td>1.15 (1.02-1.30)(^b)</td>
<td>0.87 (0.69-1.09)</td>
</tr>
<tr>
<td>Nonurologist</td>
<td>16.0 (15.9-16.2)</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Hospital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>14.6 (14.4-14.9)</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>2</td>
<td>25.9 (25.3-26.5)</td>
<td>1.77 (1.52-2.06)(^c)</td>
<td>1.74 (1.47-2.05)(^c)</td>
</tr>
<tr>
<td>3</td>
<td>18.7 (18.1-19.3)</td>
<td>1.28 (1.06-1.53)(^a)</td>
<td>1.26 (1.03-1.54)(^b)</td>
</tr>
<tr>
<td>4</td>
<td>17.0 (16.6-17.4)</td>
<td>1.16 (0.98-1.35)</td>
<td>1.10 (0.85-1.43)</td>
</tr>
<tr>
<td>5</td>
<td>14.8 (14.4-15.1)</td>
<td>1.01 (0.80-1.26)</td>
<td>0.96 (0.73-1.26)</td>
</tr>
<tr>
<td>6</td>
<td>18.2 (17.7-18.6)</td>
<td>1.24 (0.99-1.55)</td>
<td>1.22 (0.94-1.59)</td>
</tr>
<tr>
<td>7</td>
<td>11.1 (10.8-11.5)</td>
<td>0.76 (0.64-0.91)(^a)</td>
<td>0.76 (0.62-0.94)(^b)</td>
</tr>
<tr>
<td>Age, y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 30</td>
<td>16.3 (15.6-16.9)</td>
<td>0.99 (0.75-1.30)</td>
<td>0.92 (0.70-1.22)</td>
</tr>
<tr>
<td>31-40</td>
<td>15.7 (15.3-16.0)</td>
<td>0.95 (0.77-1.18)</td>
<td>0.96 (0.78-1.19)</td>
</tr>
<tr>
<td>41-45</td>
<td>16.4 (16.0-16.8)</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>46-60</td>
<td>14.2 (13.9-14.5)</td>
<td>0.86 (0.70-1.06)</td>
<td>0.85 (0.70-1.03)</td>
</tr>
<tr>
<td>51-55</td>
<td>15.5 (15.0-16.1)</td>
<td>0.94 (0.74-1.20)</td>
<td>0.94 (0.77-1.14)</td>
</tr>
<tr>
<td>56-65</td>
<td>19.5 (19.0-19.9)</td>
<td>1.18 (0.92-1.52)</td>
<td>1.05 (0.83-1.33)</td>
</tr>
<tr>
<td>&gt; 65</td>
<td>18.9 (18.2-19.6)</td>
<td>1.15 (0.83-1.59)</td>
<td>1.03 (0.70-1.51)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>14.8 (14.6-15.0)</td>
<td>0.85 (0.74-0.97)(^b)</td>
<td>0.86 (0.74-1.00)</td>
</tr>
<tr>
<td>Male</td>
<td>17.4 (17.2-17.7)</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Rate of PSA test ordering</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 1/wk</td>
<td>15.4 (15.2-15.5)</td>
<td>0.80 (0.70-0.90)(^c)</td>
<td>0.91 (0.79-1.05)</td>
</tr>
<tr>
<td>1/wk-1/mo</td>
<td>19.3 (18.9-19.8)</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>1/mo-1 per 3 mo</td>
<td>19.2 (18.5-20.0)</td>
<td>0.99 (0.89-1.12)</td>
<td>0.99 (0.83-1.17)</td>
</tr>
<tr>
<td>&lt; 1 per 3 mo</td>
<td>24.0 (22.2-25.9)</td>
<td>1.24 (1.07-1.44)(^a)</td>
<td>1.22 (1.01-1.48)(^b)</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; MD, doctor of medicine; NP, nurse practitioner; RN, registered nurse; PA, physicians assistant; PSA, prostate-specific antigen.

\(^a\) P < .01.

\(^b\) P < .05.

\(^c\) P < .001.

**COMMENT**

This study elucidates several important provider-level determinants of inappropriate PSA screening for prostate cancer. Practitioners who were urology specialists, male, infrequent PSA test orderers, and affiliated with specific hospitals had significantly higher levels of inappropriate PSA screening. Compared with attending physicians, nurses and physician assistants had significantly lower levels of inappropriate screening. In multivariate modeling, infrequent PSA test ordering and hospital affiliation retained statistical significance.

To our knowledge, this is the first study that has identified practitioner sex and age as significant determinants of PSA screening misuse: the percentage of inappropriate PSA screening increased with age for male health care providers, while it decreased with age for female health care providers. These findings are consistent with previous research demonstrating that patterns of health
The large variations in inappropriate PSA screening across different hospital sites in New England are not unexpected, given the well-documented geographical variations in practice patterns and health care costs across and within regions of the United States. The centrally administered VA system would likely have less variability than the private sector owing to its relatively homogeneous patient population, its many uniform policies and procedures, and its salaried health care providers who do not receive financial incentives for ordering more tests or procedures. Even so, significant geographical variations in the use of hospital and outpatient services have been identified within the VA system. The evidence suggests that these variations reflect geographical differences in health care providers’ approaches to patient care, not differences in disease prevalence, rates of coexisting medical conditions, patient bed availability, or the use of ambulatory care as a substitute for hospital care. A recent telephone survey found that primary care physicians in regions with high health care spending were significantly more likely to recommend interventions (including PSA screening) than those in low-spending regions. These findings provide further evidence that the hospital-level variations in PSA screening may reflect regional clustering of providers with similar practice patterns rather than the influence of the hospital-level factors alone. Further research is needed to determine the degree to which hospital- and regional-level factors contribute to these differences.

It is not unexpected that providers who performed PSA screening the least frequently had significantly higher levels of PSA screening misuse. Screening frequency is likely a surrogate marker for familiarity with PSA screening guidelines, and lack of familiarity with guidelines is a common reason for poor adherence. Of note, our results are at odds with 2 recent studies that found that urologists were more likely to order PSA screening in men older than 75 years compared with nonurologists and primary care providers. This provider-level characteristic did not obtain statistical significance in our multivariate model, possibly due to its correlation with other factors such as provider age and sex. These additional provider-level variables were not included in these previously published analyses. Our findings also confirm the results of previous studies that have documented high levels of inappropriate PSA screening among elderly male patients. The reason for these high levels is not clear. One possible explanation is that elderly male patients are specifically requesting PSA screening when they visit their primary care providers, but in one study, medical chart reviews showed that only 4% of PSA tests were documented as being requested by patients. It also has been suggested that health care providers may overestimate the life expectancies of their elderly male patients. Recent data refute this explanation. In an online survey, 95 VA primary care providers were asked at what age the average US male reaches a 5- and 10-year life expectancy. On average, the primary care providers actually underestimated the 5- and 10-year life expectancies of the average male patient by more than 12 and 6 years, respectively (unpublished data). This underestimation of life expectancy would act to reduce, not increase, the rate of inappropriate PSA screening. Lack of guideline familiarity by health care providers is also considered to be a major barrier to their effective implementation.

Several factors should be taken into consideration when interpreting the results of this study. Our databases did not contain information on the number of men seen by a given health care provider, so our analyses focused on (1) the number of inappropriate PSA tests ordered by a health care provider over the total number of PSA tests ordered by that provider, rather than (2) the number of inappropriate PSA tests ordered by a provider over the total number of age-stratified male patients seen by that provider who were eligible for PSA testing. To assess the degree to which our results may have been influenced by the case-mix variation between health care providers, we performed a subgroup analysis among frequent PSA test orderers because this group would likely be less influenced by case-mix variation. The findings in this subgroup were consistent with the overall study results, thus supporting their validity. The fact that the median PSA values in our study population are lower than would be expected in the general population is likely because of the tight exclusion criteria used to define this population. Even so, this difference should not significantly impact the generalizability of our findings: our study focused on age-inappropriate PSA screening by health care providers, which is unrelated to the actual PSA levels of the patients.

One of the many strengths of this study is its use of a multi-institutional, longitudinal database from a regional VA hospital system that has little patient turnover com-
pared with private sector institutions. In contrast, many previously published studies on PSA test use have relied largely on data from surveys, such as the National Ambulatory Medical Care Survey, and the National Health Interview Survey, and Behavioral Risk Factor Surveillance System. While the source of our data adds validity to our results, the generalizability (external validity) of these findings to non-VA health care providers, patients, and institutions has not yet been established.

How can the current levels of inappropriate PSA screening be reduced? Improving patient knowledge about PSA screening is an important first step. One recent randomized trial assessed the efficacy of having patients view a 20-minute informational video on PSA screening prior to a routine office visit. On follow-up, those patients in the intervention group had greater knowledge of PSA screening, and fewer underwent the test. Given that most patients learn about PSA screening from their physicians, it is also critical to improve physician knowledge about PSA screening guidelines. Unfortunately, little has been published to date on educational interventions to improve practitioners’ PSA screening knowledge and practice patterns. Systems-level changes may also be an effective method by which to improve PSA screening practices. For example, a computerized ordering system could alert practitioners when they attempt to order a PSA test on an age-inappropriate patient. Similar reminder systems have demonstrated moderate success in other practice domains.

In summary, this study highlights several important provider-level determinants of PSA screening misuse and substantiates that PSA screening is frequently performed counter to evidence-based guidelines. Further research is needed to determine the root causes of the observed differences in PSA screening misuse between older male and female health care providers.

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Correspondence: B. Price Kerfoot, MD, EdM, VA Boston Healthcare System, 150 S Huntington Ave, 151DIA, Jamaica Plain, MA 02130 (price.kerfoot@gmail.com).

Author Contributions: Dr Kerfoot had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Kerfoot, Holmberg, Lawler, Krupat, and Conlin. Acquisition of data: Kerfoot, Holmberg, and Lawler. Analysis and interpretation of data: Kerfoot, Holmberg, Lawler, and Conlin. Drafting of the manuscript: Kerfoot. Critical revision of the manuscript for important intellectual content: Holmberg, Lawler, Krupat, and Conlin. Statistical analysis: Holmberg and Lawler. Obtained funding: Kerfoot and Conlin. Administrative, technical, or material support: Kerfoot, Holmberg, Lawler, and Conlin. Supervision: Lawler, Krupat, and Conlin.

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REFERENCES

26. Skelton NK, Skelton WP III. Changing physician PSA ordering patterns as the US federal government or the Department of Veterans Affairs. No official endorsement should be inferred.