Urologist Compliance With AUA Best Practice Guidelines for Benign Prostatic Hyperplasia in Medicare Population

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OBJECTIVES To improve benign prostatic hyperplasia (BPH) care, the American Urological Association created the best practice guidelines for BPH management. We evaluated the trends in use of BPH-related evaluative tests and the extent to which urologists comply with the guidelines for these evaluative tests.

METHODS From a 5% random sample of Medicare claims from 1999 to 2007, we created a cohort of 10 248 patients with new visits for BPH to 748 urologists. The trends in use of BPH-related testing were determined. After classifying urologists by compliance with the best practice guidelines, the models were fit to determine the differences in the use of BPH-related testing among urologists. Additional models were used to define the extent to which individual BPH-related tests influenced guideline compliance.

RESULTS The use of most BPH testing increased with time ($P < .001$) except for prostate-specific antigen (declined; $P < .001$) and ultrasonography ($P = .416$). Northeastern and Midwestern urologists were more likely to be in the lowest compliance group compared with Southern and Western urologists (29%, 27%, 13%, and 19%, respectively; $P = .01$). The testing associated with high guideline compliance included urinalysis and prostate-specific antigen measurement ($P < .01$ for both). Prostate ultrasonography ($P = .03$), cystoscopy ($P < .01$), uroflow ($P < .01$), and postvoid residual urine volume determination ($P = .02$) were associated with low guideline compliance. Urodynamics, postvoid residual urine volume, cytology, serum creatinine, and upper tract imaging were not strongly associated with guideline compliance.

CONCLUSIONS Despite the American Urological Association guidelines for BPH care, wide variations in the evaluation and treatment were seen. Improving guideline adherence and reducing variation could improve BPH care quality. UROLOGY 78: 3–9, 2011.

In response to calls for greater consistency and quality in patient care,[1] the American Urological Association (AUA) has created, and updated, clinical practice guidelines for benign prostatic hyperplasia (BPH). Within these guidelines, the evaluations for men newly presenting with symptomatic BPH have been placed into 3 categories: recommended care, optional care, and care that is not recommended for routine patients. More invasive tests, such as cystoscopy or urodynamics studies, are performed to identify the etiology of symptoms or further direct treatment and are considered not recommended for routine patients in the AUA guidelines.[2]

Despite the efforts to develop and promote the BPH practice guidelines, much variation remains in the treatment of men with BPH. The more than twofold differences in the rates of surgery for BPH found in the 1980s[3] have continued to be seen in more recent data.[4] Emerging minimally invasive surgical therapies have been associated with even greater geographic and racial variations in use.[5] However, little is known about the evaluations men receive to guide their care at their presentation to a urologist. Previous work from the Urologic Diseases in America Project showed decreasing rates of upper urinary tract imaging in accordance with the guideline recommendations.[6] However, the degree of compliance with the guidelines among urologists is unknown.

As medicine moves into an era with an increased focus on the costs and quality of care,[7,8] compliance with

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guidelines will be further scrutinized.[9] In the present study, we examined changes in use of guideline-recommended care first at the patient level. We then assessed the compliance with the guideline recommendations among the urologists and the factors influencing this compliance. Finally, we examined which BPH evaluative tests influenced the urologist's compliance with the guidelines to gauge the degree of agreement among urologists in the evaluation of men with BPH.

MATERIAL AND METHODS

Data Source

We created our cohort using a 5% random sample of Medicare claims from 1999 to 2007. The Medicare program provides healthcare for Americans >65 years old, patients with end-stage renal disease, and patients with long-term disability. More than 95% of Americans >65 years old use Medicare as their primary insurance.[10] We limited our study to Medicare beneficiaries >65 years old.

Study Population

We selected patients with International Classification of Disease, 9th edition, diagnosis codes (see on-line Appendix 1) consistent with a BPH diagnosis. We determined the specialty of the physician treating the patient from the Medicare records and confirmed this with data from the American Medical Association Masterfile. All patients with a visit to a urologist for a BPH diagnosis were included in the initial cohort. We excluded patients who lacked continuous enrollment in Medicare Part A and B or who had been enrolled in a Medicare health maintenance organization for 2 years before the initial visit with the urologist to 1 year after the visit. The 2-year period allowed exclusion of patients who had visited a urologist for non-BPH conditions. We also excluded patients with diagnoses suggesting previous surgical BPH therapy, prostate cancer, or neurologic disease that could contribute to lower urinary tract symptoms (see on-line Appendix 2). These restrictions resulted in a study population of 40 483 patients. Next, to examine the differences in care at the level of the urologist, we restricted the cohort to patients seen by urologists with ≥10 patients from 1999 to 2007. We established the primary urologist responsible for the patient's care by assessing the Unique Provider Identification Number for the patient visits and laboratory testing. For most patients, a single urologist provided the BPH-related care. For patients seeing multiple urologists, the primary urologist was classified as the urologist who provided the plurality of patient care services. These restrictions left a study population of 10 248 patients treated by 748 urologists.

Characterization of Compliance With Guidelines

We created an index of compliance with the 2003 AUA guidelines according to a urologist's average use of the recommended, optional, and not-recommended tests. The recommended tests included urinalysis and serum prostate-specific antigen (PSA) determination. Optional tests included postvoid residual urine volume assessment, uroflow, and urine cytology. The not-recommended tests included serum creatinine, upper tract imaging, filling cystometrogram, pressure flow urodynamic studies, cystoscopy, and prostate and kidney ultrasonography (see on-line Appendix 3). Using the International Classification of Disease, 9th edition, and Healthcare Common Procedure Coding System codes, we assessed BPH-related evaluative testing for the first 3 months after the initial urologist visit. The use of symptom scores and physical examinations could not be determined from these data. The use of recommended care was valued with 1 point for a PSA test or urinalysis. Each not-recommended care test received −1 point. Optional care received no points. Because such care is considered optional by the guidelines, we did not assign it a value. Each type of test was allowed to count more than once in the 3-month period. We then summed the points for the patient and divided that by the total amount of care provided in the 3-month period. Each individual patient score was then aggregated at the level of the treating urologist, and the average index of compliance for the urologist was calculated. If a urologist performed only not-recommended care, the index would be −1. In contrast if a urologist performed only recommended care, the index would be 1. The provision of only optional care would result in an index score of 0. We then categorized the providers into quintile groups according to their average compliance scores.

Urologist Characteristics

Using data from the American Medical Association Masterfile and Medicare, we described several characteristics of the urologists: practice structure (ie, solo, group, or hospital based), geographic location (census divisions), urban versus rural practice (urban locations included metropolitan areas of >100 000 people and rural <100 000), and years in practice (categorized as medical school graduation before and after 1985) as explanatory factors for the adherence to the guidelines.

Outcome

Our primary outcome was the rate of use of the evaluative care tests. First, we examined the use of these tests over time in the Medicare population. Next, we explored the effect of urologist's characteristics on use of these tests. We examined the use of tests as outlined in the categories of recommended care, optional care, and not-recommended care. We then determined which tests were associated with the categorization of urologists into the lowest and greatest quintiles of guideline adherence. Testing was determined according to the Medicare procedure or laboratory codes, as appropriate.

Statistical Analysis

The trends over time in the use of each type of evaluative care test were assessed using the Cochran-Armitage test for trend. We then explored differences in provider characteristics according to the quintiles of guideline compliance. Statistical inference was made using the chi-square test for all variables.

Using linear regression analysis, we determined the mean number of each type of evaluative care test by urologist quintile. For each quintile of urologists, we also determined the use of evaluative care according to the guideline category: recommended, optional, and not recommended. We compared the rates of use of the evaluative care tests among the quintiles of guideline adherence using linear regression analysis. Differences in use across the quintiles of guideline adherence were assessed using the F-statistic from linear regression analysis.

We assessed the effect of each evaluative care test on classifying urologists into the greatest or lowest quintiles of compliance with the guidelines through logistic regression analysis. We adjusted for the urologist's practice style expenditures (de-

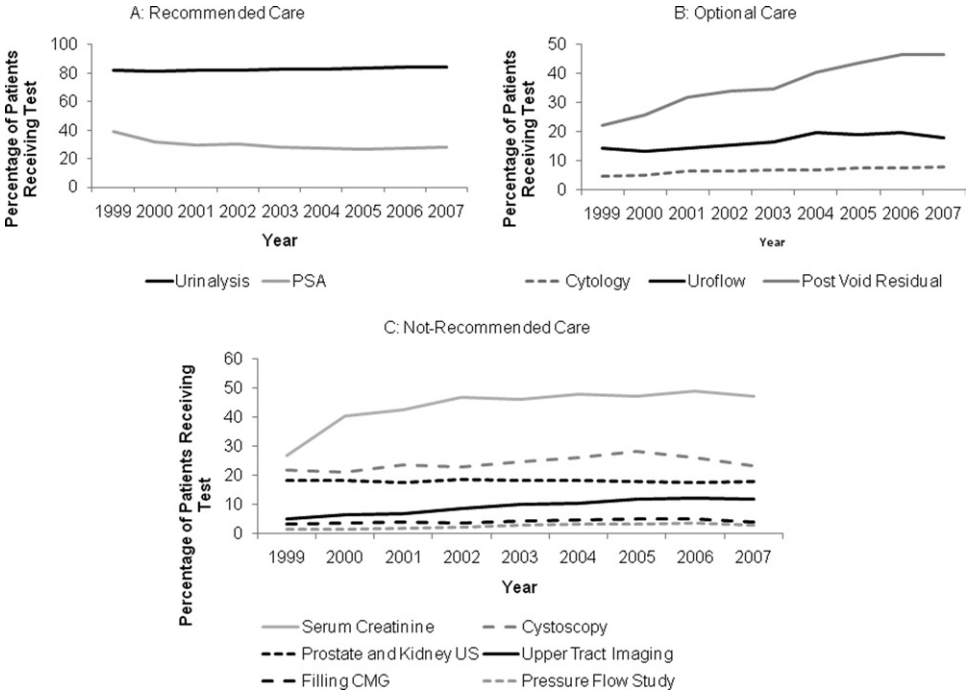

Figure 1. Changes in proportions of patients receiving evaluative care tests for BPH during study period. **(A)** Among recommended care, use of testing increased significantly over time for urinalysis ($P < .001$), but decreased for PSA testing ($P < .001$). **(B)** Use of optional care increased significantly ($P < .001$) for all tests. **(C)** Use of not-recommended care increased for all testing ($P < .001$), except for ultrasonography of kidney and prostate (stable use, $P = .416$).

fined in terms of average Medicare expenditures per month for BPH tests performed in the first year after an initial visit to a urologist)[11] and for urologist and patient characteristics. The patient factors included age (67-70, 71-74, 75-78, and ≥79 years), socioeconomic status (zip code level using the method of Diez-Roux et al[12]), race (white, black, and other), and comorbidity (Klabunde modification of the Charlson comorbidity index[13]). These patient factors were modeled as the percentage of a physician's practice population with the characteristic.

All analyses were performed using SAS software, version 9.1 (SAS Institute, Cary, NC). All statistical tests were 2 sided, and the probability of a type I error was set at 0.5. The present study was granted letters of exemption by the institutional review boards at each of the authors' institutions.

RESULTS

A wide range of evaluative care services are provided to patients within 3 months of their initial visit to a urologist (Fig. 1). Urinalysis was routinely performed, with >80% of patients receiving the test in each year of the study. The use of serum creatinine measurements and postvoid residual urine volume testing increased with time, with >40% of patients undergoing these tests by 2007. All BPH-related testing showed significant increases in use ($P < .001$), except for PSA testing, for which a significant decrease in use occurred ($P < .001$), and renal or prostate ultrasonography, which showed no changes in use ($P = .416$).

Within a possible range of the guideline compliance index from −1 (no compliance) to 1 (complete compliance), the actual levels of compliance ranged from −0.53 to 0.91 (Table 1). The lowest quintile had index values of −0.53 to 0.08, with the low to greatest quintile at 0.09-0.22, 0.23-0.33, 0.34-0.44, and 0.45-0.91, respectively. The geographic location was associated with guideline compliance, with urologists in the West evenly distributed among the quintiles (19.7% lowest compliance), urologists in the Northeast and Midwest having lower compliance with the guidelines (28.6% and 27.1% lowest compliance, respectively), and urologists in the South showing more guideline compliance than the urologists in the other regions (13.3% lowest compliance; overall $P = .01$ for the comparisons among the regions). Urologists practicing in rural areas were less likely to provide care compliant with the guidelines than urologists in urban areas (26.1% vs 17.8%, lowest compliance in rural vs urban; $P < .01$). The type of practice (solo, group, or hospital) and interval since medical school (before or after 1985) were not associated with guideline compliance ($P = .70$ and $P = .43$, respectively.)

The urologists' patient populations differed among the quintiles of guideline compliance. The patient comorbidity burdens were lower among urologists with high guideline compliance. Of the urologists with patient populations with low comorbidity (ie, >80% of the patients had no comorbid conditions), 27.1% were in the greatest quintile of compliance and 18.1% were in the lowest level of compliance ($P = .06$). Of the urologists whose practice included >10% of patients with ≥2 comorbid conditions, 14% were highly guide-

Table 1. Urologist characteristics by quintile of guideline compliance

Characteristic	Quintiles of Urologist Guideline Compliance					*P* Value
	Lowest	Low	Middle	High	Highest	
Urologists						
Compliance index	−0.53-0.08	0.09-0.22	0.23-0.33	0.34-0.44	0.45-0.91	
Physician characteristics						
Employment						.70
Solo	17.9	21.0	21.0	20.1	20.1	
Group	20.4	19.5	14.1	17.7	21	
Hospital	22.2	22.2	33.3	14.8	7.4	
Census division						.01
Northeast	28.6	15.4	20.9	23.1	12.1	
Midwest	27.1	19.3	24.0	13.5	16.2	
South	13.3	19.9	21.4	19.0	26.5	
West	19.7	21.5	19.8	20.3	18.8	
Location						<.01
Urban	17.8	20.8	22.4	16.6	22.4	
Rural	26.1	17.5	18.5	22.3	15.6	
Medical school graduation date						.43
Before 1985	21.0	23.6	19.3	17.6	18.5	
1985 and after	19.6	18.3	22.2	18.3	21.5	
Physicians' patients						
Race						
>90% White	21.3	18.6	22.3	18.3	19.6	.14
>10% Black	19.8	23.5	18.5	18.5	19.8	.79
>10% Other	15.6	25.6	18.9	15.6	24.4	.61
Comorbidity						
>80% 0	18.1	15.6	18.1	21.1	27.1	.06
>20% 1	17.4	22.8	23.2	15.8	20.9	.39
>10% ≥2	24.0	21.5	21.5	19.0	14.0	.01
Socioeconomic status						
>40% Lowest	14.2	19.3	18.8	18.3	29.4	.04
>40% Middle	26.6	22.8	19.5	14.5	16.6	.04
>70% Upper middle	19.7	16.1	21.9	16.8	25.6	.44
>10% Highest	24.7	15.1	19.2	21.9	19.2	.57
Age						
>30% 67-70 y	15.7	19.9	20.2	22.1	22.1	.10
>30% 71-74 y	19.9	21.1	29.1	20.3	19.5	.76
>30% 75-78 y	11.0	23.6	20.5	16.5	28.4	.07
>30% ≥79 y	25.5	22.2	20.9	14.1	17.3	.02

line compliant and 24% were in the lowest guideline compliance category ($P = .01$). Urologists seeing an older patient population were more likely to be in the lowest quintile of guideline compliance than in the greatest quintile (25.5% in the lowest vs 17.3% in the greatest; $P = .02$). The racial distribution of a urologist's practice was not associated with the levels of guideline compliance.

Urologists in the lowest quintile of guideline compliance had the lowest use of recommended care and the greatest use of not-recommended care (Fig. 2). A low use of both urinalysis and PSA testing was seen ($P < .01$ for both; Fig. 2A). Optional care was performed most frequently by urologists in the low guideline compliance quintile (122 tests per 100 patients; Fig. 2B). Driving this finding, the use of postvoid residual urine volume measurement was the greatest in the low guideline adherence quintile. In contrast, cytology use was relatively flat across the groups (9, 12, 10, 9, and 6 tests per 100 patients for lowest to greatest adherence). Although the use of uroflow procedures was high in the lowest quintiles of guideline adherence (32 and 28 tests per 100 patients), use of uroflow decreased rapidly in the more adherent groups (16, 12, and 6 tests per 100 patients). None of the not-recommended tests had stable use across the quintiles of urologist guideline compliance (Fig. 2C), with use of each type of evaluative care greater for the lowest versus greatest quintile of guideline compliance ($P <$ .01 for all comparisons).

Individual evaluative care tests were strongly associated with compliance quintiles (Table 2). After adjustment for patient and urologist variables, urinalysis and PSA testing were associated with urologists in the greatest quintile ($P <$ .01 for both). Prostate and renal ultrasonography ($P = .03$), cystoscopy ($P < .01$), uroflow ($P < .01$), and postvoid residual urine volume ($P = .02$) were associated with a urologist being in the lowest group. Filling cystometrogram, pressure-flow studies, and upper tract imaging provided borderline associations with urologists in the lowest quintile ($P = .07$; $P = .07$, and $P = .08$, respectively). Serum creatinine measurements and urine cytology testing were

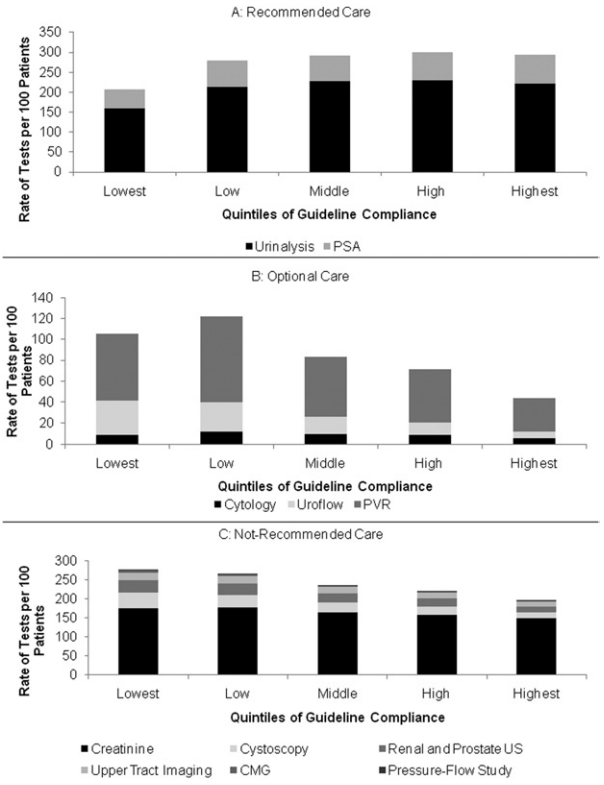

Figure 2. Use of recommended, optional, and not-recommended care. **(A)** Urologists in lowest quintile of guideline compliance had lowest use of recommended care and **(C)** greatest use of not-recommended care. **(B)** Urologists in low compliance group had greatest use of optional care. However, extensive variations in use of individual tests were found. As an example, urinalysis use was stable across low to highest guideline compliance group, and cystoscopy use declined from lowest to highest guideline compliance group.

not associated with a urologist being in the greatest or lowest quintiles of guideline compliance ($P = .44$ and $P = .35$, respectively).

COMMENT

Best practice guidelines are intended to improve and standardize clinical care quality by promoting diagnostic and treatment approaches of demonstrated clinical effectiveness while minimizing those producing little benefit or actual harm. Despite the publication of multiple guidelines since the 1990s, older men in the United States with BPH continue to receive varied care depending on the urologist they see for BPH. Variations occurred according to geographic location and urban versus rural setting. Urologists practicing in the South or urban settings provided the greatest level of guideline compliant care. Urologists with the lowest guideline compliance used the recommended care less commonly and not-recommended care more commonly than the other 80% of urologists in our study. However, the assessment of individual tests revealed that urologists used urine cytology, urodynamics studies, upper tract imaging, and serum creatinine at similar rates after adjusting for patient and provider characteristics. Differences in guideline compliance were driven largely by the use of cystoscopy, PSA testing, urinalysis, uroflow, postvoid residual urine volume determination, and ultrasonography.

Despite the creation and promotion of guidelines, patient and provider compliance with the recommendations is variable. Barriers to physician compliance with guidelines include awareness of the guideline, familiarity with the guideline recommendations, lack of agreement with the recommendations, poor self-efficacy for implementing guideline recommendations, inertia of previous practice, and a belief that the guideline would not improve patient outcomes.[14] Additional problems with guideline compliance stem from physicians' beliefs that the recommendations do not apply well to their patients[15] and the lack of opportunity for individualization of care.[16] Combined with an often poor evidence base lacking randomized trials to support recommendations,[17] the effect of guidelines on eliminating variations in care has been limited.

The variable compliance with the guidelines among urologists could result from many of these factors, including a poor evidence base on which to base care, the practice of defensive medicine, and different referral patterns by which patients reach the urologist. Although our study could not assess which of these factors is contributing to the varying levels of guideline compliance, it has provided some evidence supporting each contention.

The lack of high-quality data on the use of most evaluative care precludes making strong judgments about the value of most evaluative care testing.[18] Owing to the weak evidence base, many urologists will err on the side of performing more testing. Given the fee-for-service population studied, such testing would also increase practice income. In addition, the comparable European Association of Urology guidelines recommend many procedures the AUA guidelines consider optional and term optional the procedures the AUA considers not recommended.[19] Because the risk of harm from testing is perceived as low, the added information potentially useful, and the testing reimbursed by the Medicare program, optional and not-recommended tests are provided.

The increased use of BPH-related testing could be a response to an increasingly litigious society, with urologists protecting themselves from future malpractice actions with ever-increasing amounts of testing. The secular trends in use of optional and not-recommended care and previous published data support this contention.[20] However, all diagnostic tests have the potential for harm, including false-positive and false-negative results, and increased expense.

Finally, the types of referrals sent to a urologist might influence the practice patterns and guideline compliance. Although many patients sent to a urologist for BPH or lower urinary tract symptoms have had a limited evalu-

Table 2. Odds ratios and 95% confidence intervals for urologist in greatest versus lowest guideline compliance quintile by each evaluative care test

Variable	OR	95% CI	*P* Value
Urinalysis	7.75	4.17-14.40	<.0001
PSA	69.22	17.10-280.24	<.0001
Prostate and kidney ultrasonography	0.102	0.013-0.811	.031
Serum creatinine	0.796	0.443-1.429	.4443
Cystoscopy	0.003	<0.001-0.019	<.0001
Cytology	0.276	0.019-4.095	.3494
Uroflow	0.033	0.006-0.172	<.0001
Filling cystometrogram	0.002	<0.001-1.73	.0722
Postvoid residual urine volume	0.419	0.205-0.856	.0169
Pressure-flow study	<0.001	<0.001-1.932	.0652
Upper tract imaging	0.123	0.011-1.316	.0831

OR, odds ratio; CI, confidence interval.

ation with only some exposure to medical management,[21] some urologists might see patients with more refractory disease. This would be especially true if patients have been referred from primary care physicians who are experienced in treating men with BPH. Such factors could contribute to the increase in use of postvoid residual urine volume testing, with urologists seeing men who might be considering anticholinergic medications for their symptoms.

Our study has also revealed problems that could arise as payers and other organizations attempt to use claims data and guideline compliance as measures of quality. With claims-based studies, patient symptoms and previous therapies cannot be determined. Although our study addressed this issue by excluding patients with previous diagnoses consistent with neurologic disease or cancer that could contribute to lower urinary tract symptoms, broader attempts to gauge quality using claims and guideline adherence could include such subpopulations or be limited by changes in guidelines over time.[22] Also, all important aspects of care and outcomes cannot be assessed using only claims data.[23,24] For example, in our study, the assessment of symptom scores and performance of a physical examination could not be determined. Finally, care could be incorrectly assigned to a physician or condition when actually given for a different indication. This phenomenon might have occurred in our study with serum creatinine measurements; a common aspect of many primary care physicians' yearly patient assessments. Although in our study, this testing did not influence the assignment of urologists to a specific level of guideline compliance, it is conceivable that such misallocation of care could have substantially affected assessments of quality or compliance with guidelines in other settings.

Certain limitations existed in the present study and warrant consideration. Our results are most applicable to older men treated in a fee-for-service setting. We could not determine whether compliance with guidelines would be the same in younger men or men treated in health maintenance organizations. However, because Medicare provides the primary health insurance to >95% of older men in the United States and these are the men most likely to have BPH symptoms, our results have validity for a large population most affected by the treatment decisions in BPH management. Similarly, we have examined care among urologists with greater volumes of patients with BPH. We could not determine whether similar variations in guideline compliance occurred among urologists who see fewer Medicare patients with BPH. In addition, we grouped the BPH-related tests by the level of guideline recommendation. In so doing, we provided equal weight to procedures that have varying risks, and costs, to patients.

CONCLUSIONS

Despite the availability of AUA practice guidelines for BPH care, wide variations in BPH-related test use were seen among urologists in the United States. Additional study of the effectiveness of evaluative care testing provided to patients is needed and could help improve compliance with the guidelines.

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APPENDIX

SUPPLEMENTARY DATA

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.urology.2010.12.087.