

# US Internists' Awareness and Use of Overtreatment Guidelines: A National Survey

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**O**vertreatment in medicine, defined as “the waste that comes from subjecting patients to care that, according to sound science and the patients’ own preferences, cannot possibly help them,”<sup>1</sup> is estimated to account for nearly 30% of healthcare spending.<sup>2</sup> Increasing awareness that diagnostic and therapeutic interventions that physicians order are in some instances unnecessary<sup>3</sup> has culminated in widely disseminated overtreatment guidelines, such as the Choosing Wisely campaign.<sup>4</sup> Introduced in 2012, Choosing Wisely, an initiative of the American Board of Internal Medicine (ABIM) Foundation, has partnered with Consumer Reports and other medical organizations to provide physicians and patients with lists of potentially avoidable tests, treatments, and procedures.

In a 2014 telephone survey of 600 physicians, 38% of respondents reported having seen or heard about the Choosing Wisely campaign and 81% reported feeling “very comfortable” about “talking to patients about why they should avoid an unnecessary test or procedure.”<sup>5</sup> Despite the positive response from practicing physicians, there is little evidence that guidelines alone influence physicians’ ordering decisions. In fact, a recent report using commercial health plan claims data to evaluate the utilization of 7 services targeted by the guidelines failed to detect a meaningful decline in their use.<sup>6</sup> However, the study looked at global use of services by health plan beneficiaries without accounting for physician characteristics. For example, a 2012 study of Massachusetts health plan data revealed that physicians with fewer than 10 years’ experience had the highest cost profiles compared with those of more senior physicians.<sup>7</sup> Whether physicians’ awareness of overtreatment guidelines reduces the propensity to recommend a targeted service remains unknown.<sup>8</sup>

To explore possible explanations behind the higher cost profiles of less experienced physicians, we surveyed recent internal medicine residency graduates about their adoption of overtreatment guidelines. Our specific objectives were to: 1) assess physician views of overtreatment guidelines using a novel 5-item scale, 2) estimate self-perceived practices according to select guidelines using hypothetical patient presentations, and 3) measure whether perceived

## ABSTRACT

**OBJECTIVES:** To assess physician views and perceived adoption of overtreatment guidelines and measure whether adoption of these guidelines influenced the recommendation of a targeted service.

**STUDY DESIGN:** A cross-sectional survey mailed from July 2014 to January 2015 to 902 internists who completed residency between 2003 and 2013, randomly selected from the American Medical Association Masterfile.

**METHODS:** Poisson regression was used to model the rate of recommending a targeted service included in the guidelines, based on the level of guideline adoption.

**RESULTS:** A total of 456 physicians responded (51% response rate). Most expressed familiarity with overtreatment guidelines (88.5%), a comfort level with discussing these guidelines with patients (79.9%), and described overtreatment guidelines as a useful tool in their practice (81.6%). Physicians in the highest tertile of guideline adoption reported double-digit rates of recommending antibiotics for sinusitis (29.7%), mammogram at end of life (16.5%), and electrocardiogram testing for asymptomatic patients (11.0%). Physicians in the top tertile of guideline adoption reported lower rates of recommending x-rays [−12.0%; 95% confidence interval (CI), −19.4% to −4.5%;  $P = .002$ ], magnetic resonance imaging for lower back pain [−4.8%; 95% CI, −8.1% to −1.5%;  $P = .004$ ], and cardiac testing for asymptomatic patients [−10.2%; 95% CI, −18.9% to −1.5%;  $P = .02$ ].

**CONCLUSIONS:** US internal medicine physicians who completed residency between 2003 and 2013 reported high levels of adoption of overtreatment guidelines. Physicians who reported the highest levels of guideline adoption reported recommending services targeted by these guidelines in their practice.

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adoption of the guidelines correlates with the likelihood to recommend a targeted service.

## TAKEAWAY POINTS

We surveyed US internists who graduated residency in 2003 through 2013 about their views of overtreatment guidelines or recommendations against the use of potentially unnecessary tests and procedures. Key findings:

- ▶ US internists reported high levels of awareness, agreement, and use of overtreatment guidelines.
- ▶ Even physicians who reported the highest levels of guideline adoption, however, reported recommending services targeted by the guidelines in their practice.
- ▶ This research highlights the challenge of evidence-based de-implementation of medical tests and treatments in everyday practice.

## METHODS

### Survey Development

A literature review revealed no previously validated instruments evaluating physician attitudes toward overtreatment guidelines. To identify potential items for cognitive testing, we reviewed the literature, combed references from previously reported studies of physician views,<sup>9-19</sup> and interviewed experts. Items were developed to assess: 1) physician awareness, agreement with, and use of overtreatment guidelines; 2) self-perceived propensity to recommend a service targeted by the guidelines; and 3) other potential confounders of physician practice identified in prior studies. We conducted 2 cycles of cognitive pilot testing to calibrate the wording to detect differences among physicians about these topics. After initial “think aloud” reviews with local (ie, Pennsylvania) practicing physicians, followed by revisions, we performed broader pilot testing with 100 internal medicine physicians randomly selected from the American Medical Association (AMA) Masterfile.

The final survey included questions about physician demographics, practice characteristics, attitudes known to influence overtreatment, views on overtreatment guidelines (awareness of, agreement with, and usefulness in practice), and self-reported practice in specific clinical scenarios related to the guidelines ([eAppendix A](#) [eAppendices available at [ajmc.com](#)]). Self-reported practice was assessed using fill-in-the-blank questions asking physicians to estimate the percentage of their patients they recommended for a specific test or treatment. Specifically, respondents were presented with brief descriptions of patient presentations for: 1) low back pain, 2) acute sinusitis, 3) cancer screening with a life expectancy of fewer than 10 years, 4) cardiac screening in asymptomatic routine care, and 5) a low pretest probability of venous thromboembolism (VTE). For example, when asked “For what percentage of patients with acute lower back pain do you order the following?” the respondent would fill in a percent for x-ray, magnetic resonance imaging (MRI), physical therapy, acetaminophen/anti-inflammatories, and opioids. The fill-in-the-blank questionnaire regarding treatment decisions has been shown to have high criterion validity (ie, it correlates with actual practice on similar patients) in prior studies.<sup>20,21</sup> To establish content validity, these items were tested by 11 clinical and survey design experts, including practicing primary care clinicians, researchers, and experts in survey design.

### Study Sample

Using the AMA Masterfile, we pre-screened 2170 randomly selected internal medicine physicians who completed training within the

last 10 years to confirm qualifying specialty, mailing address, and that the physician was actively seeing patients at least 20 hours a week. The final sample included 902 internal medicine physicians who were mailed a paper survey between July 2014 and January 2015 using a modified Dillman method.<sup>22</sup> The initial mailing was done by first class mail accompanied by a \$2 bill and followed by 2 reminder mailings approximately 6 weeks apart.

### Overtreatment Guidelines Adoption Scale

A set of 9 questions comprised the Overtreatment Guidelines Adoption (OGA) Scale, which assessed physicians' attitudes toward overtreatment guidelines and cost containment in general. Six questions focused on awareness of, agreement with, and perceived usefulness of overtreatment guidelines; comfort denying patient requests for tests or treatments; comfort discussing costs with patients; and self-perception of cost consciousness. These were assessed using a 4-point Likert scale, ranging from strongly disagree to strongly agree. A second set of 3 questions assessed how frequently physicians discussed costs, used the overtreatment guidelines in practice, and found these guidelines to be useful. These were measured using a 5-point Likert scale of frequency.

To summarize overtreatment guidelines, their adoption, and measure physician attitudes toward guidelines separately from general attitudes toward cost containment, we developed 2 subscales: a 5-item OGA subscale and a 4-item cost-containment subscale, using standard factor analysis techniques ([eAppendix B](#)). The OGA subscale possible values ranged from 5 to 22; higher scale scores reflected a higher degree of adoption of overtreatment guidelines. The OGA subscale had high internal consistency with Cronbach alpha of 0.82 and rotated loadings of 0.44 to 0.75. Principal components analysis supported a separate cost-containment subscale of 4 questions related to costs (Cronbach alpha, 0.76; rotated loadings, 0.51-0.70).

### Outcome Variables

Our main outcome measures were self-reported percentages of patients who were advised to elect 8 services targeted by 5 overtreatment guidelines. The guidelines were selected because they described common clinical scenarios in internal medicine, had

**TABLE 1.** Overtreatment Guidelines<sup>a</sup> Related to Reported Practices in Survey

Targeted Practice	Guidelines Example	Societies With Similar Guidelines (year included in Choosing Wisely) <sup>4</sup>
Imaging for back pain	Do not obtain imaging studies in patients with nonspecific lower back pain.	American College of Physicians (2012), American Academy of Family Physicians (2012), American College of Emergency Physicians (2014), American Association of Neurological Surgeons and Congress of Neurological Surgeons (2014), American College of Occupational and Environmental Medicine (2014), American Society of Anesthesiologists – Pain Medicine (2014)
Antibiotic prescribing for acute sinusitis	Do not routinely prescribe antibiotics for acute mild to moderate sinusitis unless symptoms last for 7 or more days or symptoms worsen after initial clinical improvement.	American Academy of Family Physicians (2012); American Academy of Allergy, Asthma & Immunology (2012); American College of Emergency Physicians (2014)
Cancer screening at end of life	Do not recommend cancer screening in adults with a life expectancy of fewer than 10 years.	Society of General Internal Medicine (2013), The Society for Post-Acute and Long-Term Care Medicine (2015), American College of Preventive Medicine (2015), American Geriatrics Society (2014), American Society of Clinical Oncology (2013), American College of Surgeons (2013), American Academy of Family Physicians (2013), American Society of Nephrology (2012)
Cardiac testing	Do not order annual electrocardiograms or any other cardiac screening for low-risk patients without symptoms.	American College of Physicians (2012), American Academy of Family Physicians (2012), American College of Cardiology (2012), The Society of Thoracic Surgeons (2013), American Society of Echocardiography (2013), American Society of Nuclear Cardiology (2012)
Imaging for venous thromboembolism	In patients with low pretest probability of venous thromboembolism, obtain a high-sensitive D-dimer measurement as the initial diagnostic test; do not obtain imaging studies as the initial diagnostic test.	American College of Physicians (2012), American College of Emergency Physicians (2014), American College of Chest Physicians and American Thoracic Society (2013)

<sup>a</sup>Choosing Wisely guidelines.<sup>4</sup>

been released at least 2 years prior to our survey, and were endorsed by multiple medical groups (Table 1). We asked physicians to fill in the blank with the percentage of their patients they advised to receive a particular service. The options included services targeted by overtreatment guidelines, as well as other management options commonly offered to patients in each clinical context. The following tests and treatments were measured: x-ray and MRI imaging for acute low back pain; antibiotics for mild to moderate sinusitis; breast, prostate, and colon cancer screening for patients with a life expectancy of fewer than 10 years; electrocardiogram (EKG) testing for asymptomatic patients; and computerized tomography scan as the initial test for low-risk patients with possible VTE. Services that were recommended to less than 5% of patients (eg, Papanicolaou test for cervical cancer and stress test for cardiac testing in asymptomatic patients) were excluded from analysis.

**Other Variables**

Physician demographics, attitudes, reimbursement, and practice characteristics that may confound the relationship between physician views of, and practice according to, overtreatment guidelines, were included in the analysis. Physician demographics included age, gender, and race. Other physician characteristics included practice region, type of practice, compensation type, financial incentives (eg, quality, patient satisfaction, utilization

review, productivity), insurance mix (eg, patients with Medicaid insurance), and attitudes (eg, comfort with clinical uncertainty, satisfaction with the practice of medicine in general, malpractice concerns). These items were either drawn from the AMA Masterfile (ie, age and gender) or included questions drawn from previously validated surveys of physicians.

**Analysis**

Responses were entered in the REDCap electronic data capture tool (Harvard Catalyst; Boston), hosted at the University of Pennsylvania.<sup>23</sup> Ten percent of entries were double-entered with perfect concordance. The data were exported in, and all analyses were conducted, using STATA version 13.0 (StataCorp; College Station, Texas).

We used the American Association for Public Opinion (Research Response Rate 2) definition.<sup>24</sup> Nonresponse bias was assessed by comparing respondents with nonrespondents and early to late respondents using the Pearson  $\chi^2$  test.

The reported percentages of patients who were recommended for a particular test or treatment indicated a discrete number of events over a constrained range (0%-100%) and were positively skewed. Thus, the reported percentages were converted to a count variable based on a denominator of 100 (ie, 10% was converted to 10 out of 100) and modeled using Poisson regression. The independent

variable of interest was a trichotomized OGA scale. Other variables in the model included a scale of physician attitudes toward cost containment in general (measured using the cost-containment subscale), physician demographics, practice characteristics, and attitudes previously shown to be associated with overuse (see "Other Variables" section of text). The predicted percentage of patients recommended for a particular test or treatment were estimated. Bootstrapping with 1000 iterations was used to estimate 95% confidence intervals (CIs). This study was reviewed and approved by the University of Pennsylvania Institutional Review Board.

## RESULTS

Of the 902 potential respondents, 456 (51%) returned a completed survey. No differences between respondents and nonrespondents were observed by age, gender, region of current practice, or practice setting (Table 2). Aside from Asian or Asian American respondents being overrepresented among late responders, there were no differences between early and late responders regarding gender, primary compensation, organization or setting of practice, or self-reported attitudes or satisfaction with medicine as a practice (eAppendix Table 1). Nearly half of the respondents self-characterized primary compensation type as salary with bonus (49.5%), followed by billings (28.1%) and salary only (20.9%), and the majority reported compensation linked to quality of care (62.9%) or productivity (65.1%) (Table 3). Less than 5% of respondents (4.2%) completed residency in 2013. Other characteristics of the respondents' practices are reported in Table 3.

Respondents' attitudes toward cost containment are shown in Table 4. Most (88.5%) considered their practice style to be cost conscious. One in 4 (25.1%) reported discomfort discussing costs of care with patients, and 34.7% said they would not feel comfortable making a patient unhappy by denying a request for unnecessary care.

Respondents generally reported high levels of awareness, familiarity, and use of overtreatment guidelines (Table 4). Most (88.5%) reported being familiar with overtreatment guidelines in their specialty, 81.6% reported that the guidelines were useful in their practice, and 79.9% said they felt comfortable bringing up overtreatment guidelines in discussions with patients. However, less than 30% of respondents rated their agreement with these statements as "strong." Respondents generally reported using overtreatment guidelines in practice with high frequency: 30.9% reported bringing up the guidelines in discussions with patients "frequently" or "always" and 44.2% reported bringing up the guidelines

**TABLE 2.** Characteristics of Physicians to Whom a Survey Was Mailed: Respondents vs Nonrespondents

Characteristic	Overall Sample (N = 902)	Respondents (n = 456)	Nonrespondents (n = 446)	P
Gender, n (%)				
Male	460 (51.0)	236 (52.6)	224 (50.7)	.51
Female	433 (48.0)	213 (47.4)	220 (49.3)	
Mean age, years (SD)	40.7 (7.2)	40.3 (7.6)	41.1 (6.9)	.13
Region of current practice, n (%)				
South	283 (31.4)	149 (33.5)	134 (30.0)	
Midwest	188 (20.8)	95 (21.4)	93 (20.9)	.61
Northeast	232 (25.7)	108 (24.3)	124 (27.8)	
West	185 (20.5)	93 (20.9)	92 (20.6)	
Practice setting type, n (%)				
Group/HMO	471 (52.2)	255 (28.3)	216 (23.9)	
Small/solo	81 (9.0)	32 (3.5)	49 (5.4)	.07
City/state/federal government	7 (0.8)	5 (0.6)	2 (0.2)	
Medical school	8 (0.9)	4 (0.4)	4 (0.4)	

HMO indicates health maintenance organization; SD, standard deviation.

"occasionally." Approximately 40% of respondents (41.1%) found the guidelines useful in practice "frequently" or "always," and 42.4% found them "occasionally" useful. When individual responses were combined in the 5-item OGA subscale, the mean scale score was 15.6 (SD = 3.0) and the median 16 (interquartile range [IQR] = 14-18; observed range = 5-22).

In the fully adjusted models, respondents in the middle or top third of OGA subscale scores reported lower rates of recommending a test or treatment targeted by the guidelines for imaging for lower back pain, antibiotics for sinusitis, and cardiac testing for asymptomatic patients compared with the respondents in the bottom third of OGA scores (Figure). Physicians in the highest tertile of guideline adoption reported double-digit rates of recommending antibiotics for sinusitis (29.7%), mammogram at end of life (16.5%), and EKG testing for asymptomatic patients (11.0%). Physicians with OGA scores in the top third had significantly lower predicted rates of recommending x-rays (-12.0%; 95% CI, -19.4% to -4.5%;  $P = .002$ ) or MRI (-4.8%; 95% CI, -8.1% to -1.5%;  $P = .004$ ) for lower back pain and EKG for asymptomatic patients (-10.2%; 95% CI, -18.9% to -1.5%;  $P = .02$ ) compared with physicians in the bottom third of OGA scores. Physicians with OGA scores in the middle third also had lower predicted rates of recommending antibiotics for sinusitis (-6.9%; 95% CI, -13.0% to -0.8%;  $P = 0.03$ ) and EKG for asymptomatic patients (-8.7%; 95% CI, -15.9% to -1.4%;  $P = .02$ ) compared with physicians in the bottom third of OGA scale scores. The differences in predicted probabilities across the tertiles of OGA scale scores were not significant for cancer screening and imaging as the initial test for patients at a low risk of VTE (Figure).

**TABLE 3.** Respondents' Characteristics (n = 456)

Characteristic	N (%)
Race (n = 452)	
Asian or Asian American	124 (27.4)
Black or African American	24 (5.3)
White or Caucasian	258 (57.1)
Other	46 (10.2)
Hispanic/Latino	26 (5.8)
Primary compensation (n = 455)	
Billing only	128 (28.1)
Salary only	95 (20.9)
Salary plus bonus	225 (49.5)
Other	7 (1.5)
Compensation linked to:	
Quality of care measures	287 (62.9)
Patient satisfaction	196 (42.9)
Utilization review	91 (20.0)
Productivity measures	297 (65.1)
Other	27 (5.9)
Outpatient vs inpatient	
Exclusively outpatient	185 (40.6)
Mostly (>50%) outpatient	113 (24.8)
50% outpatient/50% inpatient	24 (5.3)
Mostly (>50%) inpatient	134 (29.4)
Patients insured by	
Medicaid, mean (SD)	16.9 (16.6)
Medicare, mean (SD)	38.6 (21.4)
Dual coverage (Medicare/Medicaid), mean (SD)	14.5 (15.8)
Uninsured, mean (SD)	8.9 (13.5)
Private, mean (SD)	31.1 (27.9)
Agreement with the following statements:	
My enjoyment of the practice of medicine is substantially lessened because of the threat of lawsuits.	261 (57.2)
I am generally satisfied with practicing medicine.	369 (80.9)
I find the uncertainty involved in patient care disconcerting.	254 (55.7)

SD indicates standard deviation.

The association between physician cost consciousness and the percentage of patients recommended for a test or treatment targeted by the guidelines was not consistent: physicians in the top third of cost-consciousness scale scores reported lower rates of prescribing antibiotics for sinusitis and recommending mammography at the end of life, but this association was not observed for the other guidelines (eAppendix Table 2). Other factors associated with recommending services targeted by the guidelines were physician age, practice region, type and setting,

practice that treated patients with Medicaid, and satisfaction with medicine as a profession.

## DISCUSSION

In this survey study of physician views of overtreatment guidelines, internal medicine physicians generally reported high levels of awareness, agreement, and use of the guidelines in everyday practice, and their attitudes toward the guidelines were distinct from their attitudes toward cost containment. In addition, physicians who reported greater adoption of overtreatment guidelines recommended fewer tests or treatments targeted by some overtreatment guidelines, even after accounting for their overall cost consciousness. Physicians who reported the highest levels of guideline adoption, however, also reported recommending services targeted by the guidelines in their practice.

Although most physicians generally reported agreement with overtreatment guidelines, only about one-third of the respondents rated their agreement as strong or reported using the guidelines frequently, suggesting considerable ambiguity in their attitudes toward overtreatment. Consistent with this finding, recommended rates of some of the services targeted by the guidelines (eg, x-rays for lower back pain, antibiotics for acute sinusitis) were high even for physicians in the top third of overtreatment guidelines adoption. On the other hand, most respondents (88.5%) assessed their practice style as cost-conscious. These findings suggest that even among physicians who generally had positive attitudes toward cost containment, perceptions of the use of overtreatment guidelines were poor, potentially limiting their impact on physician behavior.

Considering these findings, the lack of a consistent decrease in the use of tests and treatments targeted by the Choosing Wisely campaign is not surprising.<sup>6</sup> Of note, although some of the guidelines (eg, cancer screening) categorically recommend against testing when patients meet certain criteria, many guidelines implicitly or explicitly allow for exceptions (eg, for worsening symptoms or prolonged duration of acute sinusitis). These important distinctions were difficult to capture in a survey question that did not ascertain how frequently physicians saw patients that meet the exclusion criteria in the guidelines. Nevertheless, it is unlikely that the variation and high rates of targeted services reported by some of the respondents would be fully explained by variation in case mix.

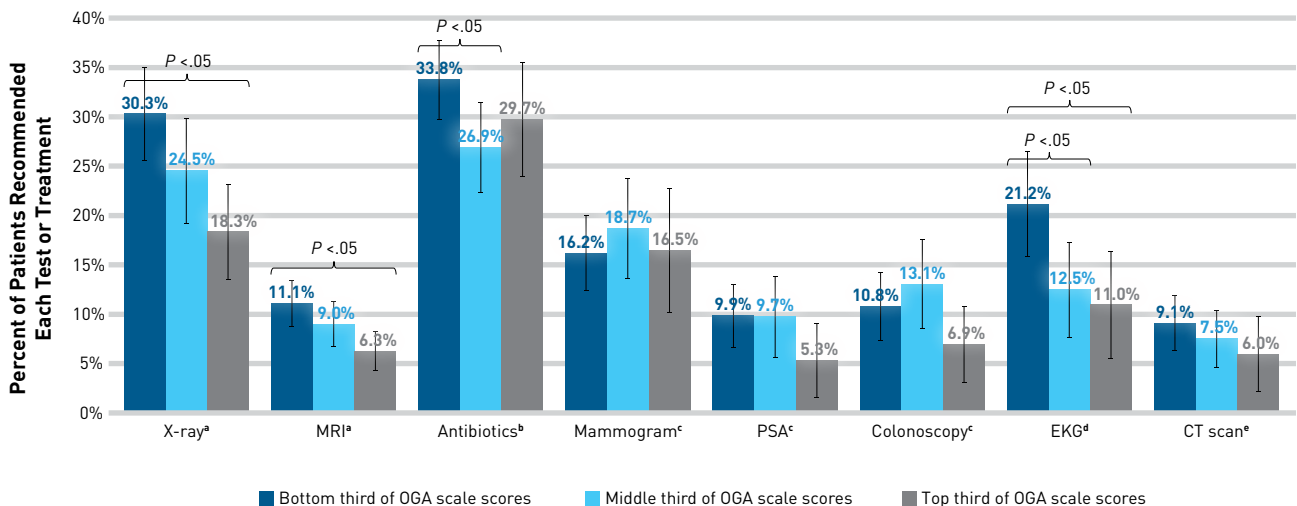
The 4 services for which we did not observe an association with the OGA scale scores (ie, mammography, colonoscopy, prostate cancer screening, and imaging for VTE) were targeted by guidelines that did not include exceptions in certain patient presentations or for duration of symptoms. This contrasts with the other 4 services that were targeted by guidelines that were worded to include exceptions for certain patient presentations (ie, antibiotics for acute sinusitis, which recommended against ordering antibiotics unless

**TABLE 4.** Physician Responses to Questions About Overtreatment Guidelines Adoption and Costs of Care

Please indicate your degree of agreement or disagreement with the following statements:	N (%)				
	Strongly Disagree	Moderately Disagree	Moderately Agree	Strongly Agree	
I am familiar with overtreatment guidelines in my specialty <sup>a</sup> (n = 452)	7 (1.6)	45 (10.0)	270 (59.7)	130 (28.8)	
Overtreatment guidelines are useful in my practice <sup>a</sup> (n = 450)	11 (2.4)	72 (16.0)	246 (54.7)	121 (26.9)	
I am comfortable bringing up overtreatment guidelines in my discussions with patients <sup>a</sup> (n = 452)	17 (3.8)	74 (16.4)	231 (51.1)	130 (28.8)	
I am comfortable discussing costs of care with my patients (n = 451)	22 (4.9)	91 (20.2)	204 (45.2)	134 (29.7)	
I am comfortable making a patient unhappy by denying a request for unnecessary tests or treatments (n = 453)	23 (5.1)	134 (29.6)	227 (50.1)	69 (15.2)	
In general, my practice style is cost conscious (n = 451)	5 (1.1)	47 (10.4)	293 (65.0)	106 (23.5)	
Please check the appropriate box:	Never	Rarely	Occasionally	Frequently	Always
How often do you discuss costs of care with patients? (n = 453)	11 (2.4)	66 (14.6)	193 (42.6)	164 (36.2)	19 (4.2)
How often do you bring up overtreatment guidelines in your discussions with patients? <sup>a</sup> (n = 453)	21 (4.6)	92 (20.3)	200 (44.2)	132 (29.1)	8 (1.8)
How often do you find overtreatment guidelines useful in your practice? <sup>a</sup> (n = 450)	12 (2.7)	62 (13.8)	191 (42.4)	159 (35.3)	26 (5.8)

<sup>a</sup>Included in the Overtreatment Guidelines Adoption subscale.

**FIGURE.** Predicted Percent of Patients With Each Condition Recommended a Service Targeted by Overtreatment Guidelines



CT indicates computerized tomography; EKG, electrocardiogram; MRI, magnetic resonance imaging; OGA, Overtreatment Guidelines Adoption; PSA, prostate-specific antigen.

<sup>a</sup>Imaging for back pain.

<sup>b</sup>For sinusitis.

<sup>c</sup>End-of-life cancer screening.

<sup>d</sup>EKG for asymptomatic patients.

<sup>e</sup>CT scan for low-risk venous thromboembolism.

symptoms lasted longer than 7 days or worsen, or for acute lower back pain that is nonspecific). This suggests that guidelines that are more categorically worded may be less likely to influence physician behavior. However, our study was not powered to determine the significance of this pattern. Future research should evaluate the effect of guideline wording on physician behavior.

The 8 tests and treatments evaluated in this study were selected to correspond to recommendations of the Choosing Wisely campaign, which had advantages, including widely disseminated endorsement by multiple professional physician organizations. All recommendations included in the study were proposed by 3 or more specialty groups. The Choosing Wisely campaign leaves the mechanism of endorsement up to the group, emphasizing the grassroots characteristics of the campaign. Specialty groups play a lead role in developing the lists of recommendations, an approach designed to appeal to physician professionalism and establish specialty-endorsed norms of care. However, a review of the recommendations by the first 25 professional groups that participated in the Choosing Wisely program raised concerns that groups may be reluctant to endorse recommendations limiting the use of services that are highly lucrative to the specialty.<sup>25</sup> Furthermore, the extent of regional and local professional groups' involvement in the development of national specialty societies' Choosing Wisely recommendations is not clearly mandated by the campaign. Hence, regional variation in the propensity of physicians to recommend some services may be less responsive to guidelines endorsed at the national level. Although practice region was significantly associated with only 1 of the 8 services evaluated (EKG for asymptomatic patients), local costs may influence physicians' recommendations of specific tests and treatments. Future studies should assess how physician perceptions of costs influence their recommendations of services targeted by overtreatment guidelines.

Even in cases in which relatively strong consensus exists regarding the evidence base for optimal care, such as the overtreatment guidelines evaluated in this study, a complex interplay of working environment and personal factors plays a role in physician recommendations.<sup>26</sup> Whereas overtreatment guidelines target intrinsic motivation in practicing evidence-based care, policy-level interventions typically focus on extrinsic motivators, such as value-based payments, bundling of payments, or other types of monetary incentives.<sup>27,28</sup> Our findings provide empiric evidence supporting the importance of evaluating the effect of intrinsic and extrinsic motivators on physician behavior within the context of practice environment and physician characteristics.

While a mix of incentives could be calibrated to achieve value-based care in theory, in practice, these factors are in flux and conflict with each other at times. Although the current study evaluated the adoption of overtreatment guidelines within the context of environmental (ie, treatment facility), practice, and physician-level factors,<sup>29</sup> we were unable to evaluate actual physician practice or

compare the relative effect of alternative motivators. Behavioral theory suggests that getting physicians to “de-adopt” practices is more challenging than the adoption of healthcare innovations.<sup>30</sup> Moreover, physicians often lack self-awareness of the nonclinical factors that may influence their behavior.<sup>31</sup> Although overtreatment guidelines that are evidence based and disseminated in a transparent way may be successful in engaging physicians to consider these issues, the sheer magnitude of factors that influence physician behavior suggests that overtreatment guidelines alone are unlikely to produce a sizeable impact on overuse.

### Limitations

Alternative explanations of the observed associations between overtreatment guideline adoption and the rate of recommending targeted services include patient case mix, social desirability bias (ie, underreporting undesirable behaviors, such as the use of services targeted by the guidelines in our study), and recall bias. Although case vignettes with open-ended answer options have high criterion validity (ie, they correlate with actual practice on similar patients),<sup>20,21</sup> reported practices may not represent actual physician recommendations to their patients. Furthermore, the proximity of questions about practice patterns and overtreatment guidelines in the questionnaire may have primed respondents to underreport overtreatment.

Concerns about priming and desirability bias suggest that the rates of recommending services targeted by the overtreatment guidelines may be underestimated in this study. Although we obtained a relatively high response rate for a physician survey, and our respondents were similar to the general population (ie, nonrespondents and early and late respondents), the potential for response and selection bias remains.

Lastly, despite efforts to confirm physician eligibility during prescreening, specialty and contact information in the AMA Masterfile may be inaccurate, introducing respondents who fall outside our target sample. A recent comparison of AMA Masterfile physician contact information with other databases found that only 37% were accurate.<sup>32</sup>

## CONCLUSIONS

In a national survey, the majority of US internal medicine physicians reported positive attitudes toward overtreatment guidelines in their specialty. However, physicians' recommendations in guideline-specific standardized patient cases varied. Physicians' propensity to recommend low-value services was explained in part by physician and practice characteristics. The complexities of physician decision making may explain an observed lack of reduction in the utilization of tests and treatments targeted by such widely disseminated overtreatment guidelines as the Choosing Wisely initiative. Guidelines or similar broad educational interventions by physician organizations

are unlikely to reduce physician-level variation in the utilization of low-value services. Furthermore, interventions to reduce low-value care should be evaluated within the context of health system-, practice-, and physician-level factors to avoid unanticipated effects. ■

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# eAppendix

## eAppendix A. Survey Items

### Your Practice Style

The following questions ask you to estimate the percentage of your patients who are recommended the following tests or treatments. Think of the last 10 patients you saw with each of the following conditions. Please enter "0" if you never recommend a particular test or treatment.

10. For what percentage of patients with acute low back pain do you order the following?

X-ray \_\_\_\_\_ MRI \_\_\_\_\_ Physical therapy \_\_\_\_\_ Tylenol/NSAIDs \_\_\_\_\_ Opioids \_\_\_\_\_

11. For what percentage of patients with mild-to-moderate sinusitis do you order the following?

Antibiotics \_\_\_\_\_ Imaging \_\_\_\_\_ Nasal irrigation \_\_\_\_\_ Intranasal glucocorticoids \_\_\_\_\_

12. For what percentage of patients with life expectancy of less than 10 years do you order the following?

Mammogram \_\_\_\_\_ PSA \_\_\_\_\_ Colonoscopy \_\_\_\_\_ Pap smear \_\_\_\_\_

13. For what percentage of patients with syncope do you recommend the following?

ECG in office \_\_\_\_\_ ER referral \_\_\_\_\_ Echocardiogram \_\_\_\_\_ At-home ECG monitoring \_\_\_\_\_

14. For what percentage of asymptomatic patients do you recommend the following?

Annual physical \_\_\_\_\_ ECG \_\_\_\_\_ Exercise stress test \_\_\_\_\_ Imaging stress test \_\_\_\_\_

15. For what percentage of low risk patients with possible venous thromboembolism do you recommend the following?

D-dimer \_\_\_\_\_ Lower extremity doppler \_\_\_\_\_ CT study for PE \_\_\_\_\_ Observation \_\_\_\_\_

16. How does your practice style compare to your physician colleagues?

1.  A lot more cost conscious
2.  Somewhat more cost conscious
3.  About the same
4.  Somewhat less cost conscious
5.  A lot less cost conscious

### Overtreatment Guidelines

Overtreatment guidelines (such as the Choosing Wisely Campaign) focus on tests and procedures that are considered overused in healthcare. The following questions ask about your views on costs of care and overtreatment guidelines.

17. Please indicate your degree of agreement or disagreement with the following statements.

	Strongly disagree	Moderately disagree	Moderately agree	Strongly agree
17a. Helping contain healthcare costs is within the scope of my professional obligations as a physician.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
17b. I am familiar with overtreatment guidelines in my specialty.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
17c. Overtreatment guidelines are useful in my practice.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
17d. I am comfortable bringing up overtreatment guidelines in my discussions with patients.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
17e. I am comfortable discussing costs of care with my patients.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
17f. I am comfortable making a patient unhappy by denying a request for unnecessary tests or treatments.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
17g. In general, my practice style is cost conscious.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>

18. Please check the appropriate box:

	Never	Rarely	Occasionally	Frequently	Always
18a. How often do you discuss costs of care with patients?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
18b. How often do you bring up overtreatment guidelines in your discussions with patients?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
18c. How often do you find overtreatment guidelines useful in your practice?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
18d. How often do your patients initiate discussions with you about cost of their care?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>

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## eAppendix B. Development of Overtreatment Guidelines Adoption Subscale

We used descriptive statistics to evaluate distributions of physician responses to survey items pertaining to overtreatment guidelines and costs of care. Missing responses ranged between 0.7-1.3% of observations. Items were examined for inclusion in the Overtreatment Guidelines Adoption (OGA) scale in an iterative process using inter-item and item-total correlations, Cronbach alpha coefficients, and factor analysis with varimax orthogonal rotation. Factor analysis considered 1, 2, 3, 4, and 5 factor solutions.

The question 18d “How often do your patients initiate discussions with you about cost of their care?” was conceptually distinct from the other questions, which was reflected in low correlations, and not well coherent with *a priori* objective (to evaluate physician attitudes toward overtreatment guidelines). Dropping this item resulted in a slight increase in internal consistency of the scale with a Cronbach alpha of 0.84 and item total correlations of 0.5-0.7. Principal components analysis supported a 2-factor solution with an Overtreatment Guidelines domain (Cronbach alpha 0.82) and a Cost-consciousness domain (Cronbach alpha 0.76). Items 17b, 17c, 17d, 18b and 18c had rotated loadings 0.44-0.75 on the first factor. Items 17e, 17f, 17g, and 18a had rotated loadings 0.51-0.70 on the second factor. The item 17a “Helping contain healthcare costs is within the scope of my professional obligations as a physician” did not load well on either domain and was not included in either subscale. The Eigenvalues for each of the 5 items in the final Overtreatment Guidelines Adoption subscale are shown below:

	Eigenvalue	Difference	Proportion	Cumulative
1	2.33749	2.14396	1.0605	1.0605
2	0.19353	0.14756	0.0878	1.1483
3	0.04597	0.17791	0.0209	1.1691
4	-0.13194	0.10887	-0.0599	1.1093
5	-0.24082	.	-0.1093	1

**eAppendix Table 1.** Evaluating for Response Bias: Comparing Early vs Late Responders

	<b>Early (n = 304)</b>	<b>Late (n = 70)</b>	<b>P</b>
Gender (n = 370)			
Male	159 (52.7)	37(54.4)	.07
Female	143 (47.4)	31(45.6)	
Region current practice (n = 366)			
South	99 (33.2)	25 (36.8)	.94
Midwest	61 (20.5)	14 (20.6)	
Northeast	74 (24.8)	15 (22.1)	
West	64 (21.5)	14 (20.6)	
Age, mean (SD)	40.5 (8.5)	39.7 (4.9)	.31
Race (n = 452)			
Asian or Asian-American	73 (24.3)	26 (37.7)	<.006
Black or African-American	16 (5.3)	3 (4.4)	
White or Caucasian	186 (61.8)	28 (40.6)	
Other	26 (8.6)	12 (17.4)	
Hispanic/Latino	18 (6.0)	5 (7.1)	.72
Primary compensation (n = 455)			
Billing only	78 (25.7)	22 (31.4)	.58
Salary only	65 (21.5)	14 (20.0)	
Salary plus bonus	155 (51.2)	34 (48.6)	
Other	5 (1.7)	0 (0)	
Compensation linked to			
Quality of care measures	188 (61.8)	47 (67.1)	.41
Patient satisfaction	131 (43.1)	33 (47.1)	.54
Utilization review	60 (19.7)	15 (21.4)	.75
Productivity measures	203 (66.8)	44 (62.9)	.53
Organization of practice			
Solo practice	30 (9.9)	7 (10.0)	.97
Group private practice	86 (28.4)	19 (27.1)	
Group or staff model HMO	30 (9.9)	7 (10.0)	
Academic faculty practice	43 (14.2)	7 (10.0)	
Hospital-owned practice	93 (30.7)	26 (37.1)	
Other (VA, nursing home, public clinic)	21 (6.9)	4 (5.7)	
Outpatient vs. Inpatient			
Exclusively outpatient	120 (39.5)	29 (41.4)	.85
Mostly (>50%) outpatient	77 (25.3)	17 (24.3)	
50% outpatient/50% inpatient	19 (6.3)	2 (2.9)	
Mostly (>50%) inpatient	68 (22.4)	17 (24.3)	
Exclusively inpatient	20 (6.6)	5 (7.1)	
Patients insured by ...			
Medicaid, mean (SD)	17.5(16.6)	14.6(14.9)	.18
Medicare, mean (SD)	38.6 (20.9)	40.1(22.2)	.62
Dual coverage (Medicare/Medicaid)	14.4(16.2)	14.2(10.6)	.93
Uninsured	9.3(13.7)	6.2(9.2)	.05
Private, mean (SD)	30.1(28.0)	32.9(27.5)	.46

Agreement with following statements...			
My enjoyment of the practice of medicine is substantially lessened because of the threat of lawsuits	177 (58.2)	36 (51.4)	.30
I am worried about patients leaving my practice	45 (14.8)	12 (17.1)	.62
I usually have enough time to address most patient concerns during a typical patient visit	183 (60.2)	41 (58.6)	.80
I am generally satisfied with practicing medicine	249 (81.9)	58 (82.9)	.85
I find the uncertainty involved in patient care disconcerting	167 (54.9)	40 (57.1)	.74

HMO indicates health maintenance organization; SD, standard deviation; VA, Veterans Affairs.

**eAppendix Table 2.** Incidence Rate Ratios from Poisson Models Estimating the Association of OTA Scale Scores With Self-Reported Practice

	Imaging for Low Back Pain		Antibiotics for Sinusitis	Cancer Screening at End-of-Life			EKG for Asymptomatic Patients	Imaging for Low-risk VTE
	X-rays	MRI		Mammogram	PSA	Colonoscopy		
OGA scale score (ref: bottom third)								
Middle third	0.81 (0.62-1.06)	0.81 (0.59-1.11)	<b>0.80 (0.65-0.98)</b>	1.15 (0.81-1.64)	0.99 (0.58-1.67)	1.21 (0.76-1.92)	<b>0.59 (0.37-0.95)</b>	0.83 (0.48-1.42)
Top third	<b>0.61 (0.43-0.85)</b>	<b>0.57 (0.38-0.85)</b>	0.88 (0.69-1.13)	1.02 (0.63-1.64)	0.54 (0.23-1.24)	0.64 (0.31-1.30)	<b>0.52 (0.29-0.94)</b>	0.66 (0.29-1.47)
Cost-consciousness scale score (ref: bottom third)								
Middle third	1.02 (0.79-1.32)	1.28 (0.92-1.79)	0.92 (0.74-1.14)	<b>0.62 (0.43-0.89)</b>	0.75 (0.41-1.38)	0.83 (0.50-1.37)	1.10 (0.74-1.65)	0.80 (0.49-1.32)
Top third	1.15 (0.83-1.61)	1.18 (0.77-1.81)	<b>0.77 (0.59-1.00)</b>	<b>0.44 (0.27-0.72)</b>	0.70 (0.31-1.57)	0.77 (0.38-1.56)	1.13 (0.62-2.07)	0.65 (0.31-1.39)
Male	1.04 (0.83-1.30)	0.94 (0.69-1.29)	0.97 (0.80-1.16)	1.17 (0.86-1.58)	1.43 (0.86-2.36)	1.17 (0.77-1.78)	1.35 (0.93-1.96)	1.01 (0.67-1.51)
Age >40	0.97 (0.79-1.19)	0.81 (0.61-1.09)	0.99 (0.83-1.18)	1.40 (0.99-1.97)	1.40 (0.85-2.33)	<b>1.62 (1.06-2.48)</b>	1.26 (0.86-1.84)	0.74 (0.48-1.15)
Race (ref: Asian or Asian-American)								
Black or African-American	1.09 (0.64-1.86)	1.30 (0.57-2.97)	1.00 (0.63-1.58)	0.72 (0.06-8.24)	0.58 (0.02-21.1)	0.51 (0.02-11.2)	1.17 (0.50-2.73)	1.66 (0.13-21.8)
White or Caucasian	0.87 (0.69-1.11)	1.21 (0.80-1.81)	0.83 (0.67-1.02)	0.92 (0.79-1.74)	0.92 (0.52-1.66)	0.70 (0.44-1.10)	0.92 (0.59-1.44)	0.88 (0.54-1.45)
Other	1.22 (0.86-1.72)	<b>2.00 (1.18-3.39)</b>	1.01 (0.72-1.42)	1.05 (0.66-1.67)	1.59 (0.69-3.68)	1.49 (0.77-2.88)	0.91 (0.47-1.76)	1.58 (0.81-3.08)
Region (ref: South)								
Midwest	0.85 (0.64-1.14)	1.06 (0.72-1.56)	1.05 (0.82-1.35)	0.72 (0.43-1.18)	0.61 (0.28-1.30)	0.76 (0.40-1.45)	<b>0.48 (0.27-0.84)</b>	0.77 (0.42-1.42)
Northeast	0.87 (0.65-1.18)	1.03 (0.65-1.63)	1.06 (0.83-1.34)	0.92 (0.62-1.37)	0.63 (0.31-1.25)	0.96 (0.55-1.65)	0.74 (0.47-1.18)	0.78 (0.45-1.35)
West	0.88 (0.66-1.18)	1.14 (0.78-1.67)	0.97 (0.75-1.25)	1.05 (0.66-1.67)	1.25 (0.67-2.36)	1.01 (0.55-1.88)	0.62 (0.35-1.11)	1.12 (0.62-2.02)
Compensation type (ref: Billing only)								
Salary only	0.90 (0.61-1.32)	0.88 (0.56-1.40)	0.77 (0.59-1.01)	1.63 (0.97-2.75)	1.43 (0.57-3.57)	1.51 (0.79-2.89)	0.94 (0.49-1.82)	0.73 (0.38-1.39)

Salary plus bonus or other	1.12 (0.84-1.50)	1.32 (0.95-1.84)	0.82 (0.66-1.03)	1.13 (0.76-1.70)	1.50 (0.78-2.86)	0.90 (0.49-1.66)	1.26 (0.80-2.00)	0.86 (0.51-1.45)
Pay linked to quality of care	0.92 (0.70-1.20)	0.79 (0.55-1.13)	0.98 (0.79-1.21)	1.04 (0.67-1.60)	0.77 (0.40-1.47)	1.31 (0.71-2.42)	0.92 (0.56-1.52)	0.75 (0.45-1.26)
Pay linked to patient satisfaction	1.23 (0.93-1.62)	1.04 (0.75-1.45)	0.92 (0.74-1.15)	0.95 (0.62-1.45)	0.75 (0.39-1.43)	0.79 (0.46-1.35)	1.03 (0.63-1.68)	1.02 (0.64-1.65)
Pay linked to utilization review	0.90 (0.68-1.18)	0.90 (0.57-1.41)	1.12 (0.86-1.46)	1.17 (0.74-1.85)	1.62 (0.82-3.19)	1.35 (0.80-2.26)	0.99 (0.56-1.76)	1.34 (0.75-2.41)
Pay linked to productivity	1.08 (0.84-1.38)	1.02 (0.75-1.39)	1.14 (0.93-1.39)	1.46 (0.98-2.19)	1.62 (0.88-2.97)	1.38 (0.83-2.28)	1.06 (0.71-1.60)	1.08 (0.68-1.72)
Accepts Medicaid	1.03 (0.69-1.52)	1.45 (0.85-2.47)	<b>0.76 (0.59-0.97)</b>	0.83 (0.54-1.27)	<b>0.51 (0.28-0.95)</b>	1.29 (0.59-2.79)	<b>0.55 (0.35-0.87)</b>	<b>2.60 (1.12-6.08)</b>
Practice setting (ref: only outpatient)								
Some, but <50% inpatient	1.13 (0.83-1.53)	1.00 (0.68-1.46)	0.82 (0.67-1.01)	1.11 (0.77-1.59)	1.46 (0.82-2.59)	1.07 (0.62-1.84)	0.93 (0.60-1.45)	0.85 (0.49-1.50)
50% inpatient (50% outpatient)	1.53 (0.96-2.46)	<b>1.97 (1.11-3.48)</b>	0.74 (0.49-1.10)	0.95 (0.44-2.03)	0.99 (0.37-2.66)	0.80 (0.24-2.65)	1.17 (0.45-3.04)	0.91 (0.35-2.39)
Mostly (>50%) inpatient	<b>2.32 (1.76-3.07)</b>	<b>2.81 (2.02-3.92)</b>	<b>0.69 (0.52-0.90)</b>	<b>0.44 (0.25-0.76)</b>	0.78 (0.38-1.62)	0.96 (0.58-1.59)	1.05 (0.62-1.77)	1.06 (0.63-1.80)
Practice type (ref: Small/Solo)								
Group/HMO/hospital-owned	0.64 (0.41-1.01)	0.83 (0.48-1.43)	0.85 (0.62-1.16)	0.74 (0.43-1.29)	<b>0.39 (0.19-0.81)</b>	0.66 (0.31-1.40)	0.61 (0.35-1.04)	1.06 (0.51-2.22)
Other (e.g. VA, nursing home)	0.76 (0.41-1.41)	0.77 (0.35-1.72)	0.75 (0.49-1.15)	0.99 (0.45-2.15)	0.45 (0.06-3.11)	1.19 (0.42-3.31)	0.33 (0.08-1.26)	0.94 (0.30-2.96)
Agreement with following statements...								
My enjoyment of the practice of medicine is substantially lessened because of the threat of lawsuits.	1.17 (0.92-1.47)	1.03 (0.77-1.38)	1.05 (0.86-1.28)	0.95 (0.68-1.32)	1.01 (0.61-1.70)	1.26 (0.80-1.98)	1.17 (0.80-1.72)	1.27 (0.83-1.92)
I am generally satisfied with practicing medicine.	1.18 (0.87-1.60)	1.00 (0.64-1.55)	0.93 (0.74-1.16)	0.91 (0.62-1.33)	0.82 (0.46-1.45)	1.02 (0.57-1.81)	0.69 (0.46-1.02)	<b>2.11 (1.22-3.68)</b>
I find the uncertainty involved in patient care disconcerting.	0.93 (0.74-1.16)	1.22 (0.91-1.64)	0.98 (0.81-1.18)	1.03 (0.74-1.43)	1.09 (0.62-1.89)	1.00 (0.65-1.55)	0.96 (0.65-1.42)	0.99 (0.66-1.50)

EKG indicates electrocardiogram; HMO, health maintenance organization; MRI, magnetic resonance imaging; OGA, Overtreatment Guidelines Adoption Scale; PSA, prostate-specific antigen; VA, Veterans Affairs; VTE, venous thromboembolism.