Variation in Primary Care Physicians' Colorectal Cancer Screening Recommendations by Patient Age and Comorbidity

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BACKGROUND: Screening patterns among primary care physicians (PCPs) may be influenced by patient age and comorbidity. Colorectal cancer (CRC) screening has little benefit among patients with limited life expectancy.

OBJECTIVE: To characterize the extent to which PCPs modify their recommendations for CRC screening based upon patients' increasing age and/or worsening comorbidity

DESIGN: Cross-sectional, nationally representative survey.

PARTICIPANTS: The study comprised primary care physicians (n=1,266) including general internal medicine, family practice, and obstetrics-gynecology physicians.

MAIN MEASURES: Physician CRC screening recommendations among patients of varying age and comorbidity were measured based upon clinical vignettes. Independent variables in adjusted models included physician and practice characteristics.

KEY RESULTS: For an 80-year-old patient with unresectable non-small cell lung cancer (NSCLC), 25 % of PCPs recommended CRC screening. For an 80-year-old patient with ischemic cardiomyopathy (New York Heart Association, Class II), 71 % of PCPs recommended CRC screening. PCPs were more likely to recommend fecal occult blood testing than colonoscopy as the preferred screening modality for a healthy 80-year-old, compared to healthy 50- or 65-year-old patients (19 % vs. 5 % vs. 2 % p<0.001). For an 80-year-old with unresectable NSCLC, PCPs who were an obstetrics-gynecology physician were more likely to recommend CRC screening, while those with a full electronic medical record were less likely to recommend screening.

CONCLUSIONS: PCPs consider comorbidity when screening older patients for CRC and may change the screening modality from colonoscopy to FOBT. However, a sizable proportion of PCPs would recommend screen-

ing for patients with advanced cancer who would not benefit. Understanding the mechanisms underlying these patterns will facilitate the design of future medical education and policy interventions to reduce unnecessary care.

KEY WORDS: cancer screening; health services; colorectal cancer; primary care physicians.

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INTRODUCTION

Colorectal cancer (CRC) screening is recommended by multiple organizations for patients age 50 and older.^{1,2} However, patients with advanced age and high severity of illness are less likely to benefit from early detection.³ Most clinical guidelines account for clinical judgment and patient choice in the recommendation of whether and how to screen.

The majority of cancer screening tests are initiated within primary care physician (PCP) offices. From a nationwide survey that administered clinical vignettes to PCPs, we set out to answer the question of how CRC screening decisions are influenced by a patient's age and comorbidity. We also tested what physician and practice characteristics are associated with CRC screening recommendations.

METHODS

Sample

We surveyed a nationally representative sample of PCPs between September 2006 and May 2007 in the National Survey of Primary Care Physicians' Recommendations and Practices for Breast, Cervical, Colorectal, and Lung Cancer Screening. The American Medical Association's Physician

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Masterfile, which contains demographic and practice information on all allopathic and nearly all osteopathic physicians in the U.S., was used as the sampling frame. Eligible respondents were office-based family physicians, general practitioners, general internists, and obstetrician/gynecologists aged ≤ 75 years.

A systematic, stratified random sample of 2,576 physicians was selected from the Masterfile, with the four specialty types used as sampling strata. Sampling was designed to provide national estimates of physicians' cancer screening recommendations for the four specialties combined with a margin of error of $\pm 3\%$ at a 95% CI. The sample was selected after sorting the sampling-frame database by physicians' age, gender, urban versus rural practice location, and U.S. census region. Physicians were then excluded who had requested on the Masterfile that they not be contacted (4%), for whom current contact information could not be obtained (7%), or who were reclassified as ineligible after a screening telephone call. Physicians were reclassified as ineligible if they reported not providing primary care, providing clinical care for < 1 day per week, practicing in a federal healthcare facility, or practicing outside the U.S. Physicians were also ineligible if retired or deceased.

Survey

A total of 1,975 physicians were mailed a packet including a questionnaire on colorectal and lung cancer screening; support letter from the American Academy of Family Physicians, the American Society of General Internal Medicine, or the American College of Obstetricians and Gynecologists, depending on the physician's specialty; and \$50 honorarium check. Three physicians completed a telephone interview. The survey's absolute response rate was 69.3%; the cooperation rate, which excludes physicians lacking valid contact information, was 75.0%. Full survey administration details have been reported elsewhere.⁴

Clinical Vignettes

We assessed CRC screening recommendations with nine clinical vignettes that varied the patient's age and comorbidity (Text box 1). Clinical vignettes are a useful method for understanding how physicians respond to specific clinical situations^{5,6} and have been employed by other investigators to study CRC screening decisions.^{7,8}

Text Box 1. Clinical vignettes

Which (single) screening test or test combination would you be most likely to recommend for the following patients? Assume they are asymptomatic and at average risk; treated in ideal setting, without systemic or financial barriers to receiving care; and without previous screening or expressed preferences for colorectal cancer.

- a. A healthy 50-year-old
- b. A healthy 65-year-old
- c. A healthy 80-year-old
- d. A 50-year-old with ischemic cardiomyopathy who experiences dyspnea with ordinary activity (NY Heart Association Class II) treated with appropriate medication
- e. A 65 year old with ischemic cardiomyopathy who experiences dyspnea with ordinary activity (NY Heart Association Class II) treated with appropriate medication
- f. A 80 year old with ischemic cardiomyopathy who experiences dyspnea with ordinary activity (NY Heart Association Class II) treated with appropriate medication
- g. A 50-year-old with unresectable non-small cell lung cancer
- h. A 65-year-old with unresectable non-small cell lung cancer
- i. A 80-year-old with unresectable non-small cell lung cancer

Response options, in order: Both FOBT and flexible sigmoidoscopy, FOBT only, Flexible sigmoidoscopy only, Both FOBT and colonoscopy, Colonoscopy only, Other (specify), No screening

Age was varied across three categories: age 50, 65, and 80. Comorbidity was varied across the following categories: "healthy" patient (no comorbidity), patient "with ischemic cardiomyopathy who experiences dyspnea with ordinary

activity (NY Heart Association Class II) treated with appropriate medication" (congestive heart failure (CHF), moderate comorbidity), and patient "with unresectable non-small cell lung cancer" (NSCLC, severe comorbidity). For

each vignette, physicians were asked to indicate which of the following they would recommend: both fecal occult blood test (FOBT) and flexible sigmoidoscopy, FOBT only, flexible sigmoidoscopy only, both FOBT and colonoscopy, colonoscopy only, or no screening.

The order of the vignettes progressed from less to more severe comorbidity, then within comorbidity categories, progressed from younger to older patients; the order of the vignettes or response choices was not varied between surveys. Regarding consistency of the vignette items among our respondents, the value of the Cronbach's alpha for the nine items was 0.73, with the outcome of interest dichotomized as 'recommends screening' vs. 'Does not recommend screening'. This result indicates that there was good consistency (vs. randomness), in physicians' responses to these items. An open-ended "other" response was also possible from which the category CT colonography (virtual colonoscopy) was coded as a separate category, but a rare one (0.5 % of all vignettes). Otherwise, the unstructured data was recoded into one of the available categories when appropriate.

Physician/Practice Characteristic Measurements

Physician sociodemographic characteristics were assessed. Physician attitudes included the influence of (1) patient preferences and (2) guidelines from the United States Preventive Services Task Force (USPSTF) or American Cancer Society (ACS) upon their CRC screening recommendations. Measured by physician self-report, practice characteristics included type of practice, ownership, location, percentage of uninsured patients, type of medical record system, use of physician and patient computer reminder systems, and receipt of reports on CRC screening rates. The complete survey instrument is available online.⁹

Data Analysis

Descriptive statistics characterized the physicians surveyed. The proportions of physicians who recommended different types of CRC screening tests were described, and stratified by patient age and comorbidity. Categorical comparisons of different CRC screening recommendations for patients with varying levels of comorbidity, or between different test choices, were performed with chi-squared tests. Logistic regression models were used to test the association between physician or practice characteristics and a positive recommendation for CRC screening (of any type). The models focused on responses to the vignettes describing 80-year-old patients of varying comorbidity because we wanted to assess PCPs' screening recommendations among the elderly. A sample weight that adjusted for undercoverage, nonresponse to telephone-screener calls, and survey nonre-

sponse was assigned to each respondent. Sample weights were applied in the statistical analyses to obtain national estimates. SAS version 9.1.3 was used to obtain unweighted sample sizes. SUDAAN version 9.0.1, which accounted for the complex survey design, was used to apply the sampling weights in calculating percentages and 95 % CIs in the descriptive statistics and for regression models.

RESULTS

Physician/Practice Characteristics

Most physicians were either general internists (37 %) or family/general practice physicians (45 %); fewer were obstetrics/gynecology physicians (18 %). For medical record systems, 18 % of physicians reported a full electronic medical record (EMR), 26 % either a partial EMR or transitioning to an EMR, and 56 % a paper chart. Table 1 describes additional physician and practice characteristics, including physician sociodemographics and attitudes.

Age/Comorbidity/Screening Recommendation

The recommendations for CRC screening tests based on clinical vignettes, stratified by age and comorbidity, are visualized in Figure 1. Among patients age 50, physicians were very likely to recommend screening if the patient was healthy (99.6 %) or had CHF (98.4 %). Recommendations were similar for patients age 65, with physicians very likely to recommend screening if the patient was healthy (100 %) or had CHF (97 %). Among patients age 80, physician recommendations differed more markedly between patients who were healthy and those who had CHF (90 % vs. 71 %; $p < 0.001$). Among patients with unresectable NSCLC, physician recommendations for screening declined with advancing age: age 50 (42 %), age 65 (38 %), and age 80 (25 %); $p < 0.001$ for trend. Across all age groups, physicians were less likely to recommend any screening among patients with unresectable NSCLC (34 %) than among those who were healthy (96 % vs. 34 %, $p < 0.001$) or had CHF (89 % vs. 34 %, $p < 0.001$).

Age/Comorbidity/Choice of Test

Among physicians who recommended any type of screening test, we examined the association between the patient's age and the type of screening test, including FOBT alone, colonoscopy (with or without FOBT), and all other tests. Among patients who were healthy, physicians less often recommended FOBT alone than colonoscopy (with or without FOBT) for patients who were age 50 (5 % vs.

Table 1. Physician and Practice Characteristics

	Number (unweighted) Percentage (weighted)
PHYSICIAN CHARACTERISTICS	
Age	
<40	251 (20.1 %)
40-49	385 (30.7 %)
50-59	398 (31.9 %)
≥60	232 (17.4 %)
Gender	
Female	400 (31.2 %)
Race/Ethnicity	
White, Non-Hispanic	925 (72.1 %)
Black, Non-Hispanic	46 (3.9 %)
Hispanic	66 (5.5 %)
Asian	184 (14.7 %)
Other (AIAN, Hawaiian/Pacific Island, Multiple, Other)	45 (3.8 %)
Specialty	
General Internal Medicine	415 (36.9 %)
Family Practice	481 (41.6 %)
General Practice	66 (3.6 %)
Obstetrics/Gynecology	304 (17.9 %)
Board certified	
Yes	999 (80.2 %)
International Medical Graduate	
Yes	265 (21.7 %)
Medical school affiliation	
Yes	441 (35.1 %)
Patient Preferences for CRC screening	
Very Influential	323 (26.2 %)
Somewhat Influential	659 (52.5 %)
Not Influential/Not Applicable/Not Familiar with/Missing	284 (21.2 %)
U.S. Preventive Services Task Force guidelines	
Very Influential	799 (63.7 %)
Somewhat Influential	354 (28.2 %)
Not Influential	22 (1.7 %)
Not Applicable/Not Familiar with/Missing	91 (6.4 %)
American Cancer Society guidelines	
Very Influential	859 (67.3 %)
Somewhat Influential	357 (28.6 %)
Not Influential	18 (1.5 %)
Not Applicable/Not Familiar with/Missing	32 (2.7 %)
PRACTICE CHARACTERISTICS	
Solo Practice	328 (26 %)
Practice Size (2-100+), Single specialty	614 (48.1 %)
Practice Size (2-100+), Multi-specialty	292 (23.3 %)
Rural/urban location	
Urban	1032 (81.8 %)
Large rural city/town	133 (10.2 %)
Small/isolated small rural town	101 (8 %)
Geographic region	
Northeast	246 (20.1 %)
Midwest	318 (23.1 %)
South	420 (33.2 %)
West	264 (22.6 %)
Main primary care practice location	
Full owner, part owner, or employee of a physician owned practice	827 (64.5 %)
Employee of a large medical group, health care system, group or staff model HMO	197 (16.5 %)
Employee of a university or non-university hospital or clinic or other practice	235 (18.4 %)
Percentage of patients uninsured	
0-5 %	759 (60.3 %)
6-25 %	366 (28.8 %)
26 %+	82 (6.4 %)
Number of patients seen in main primary care practice location in a typical week	
25 or fewer	62 (5 %)
26-50	155 (12 %)

Table 1. (continued)

	Number (unweighted) Percentage (weighted)
51-75	224 (17.3 %)
76-100	404 (31.9 %)
101-125	245 (20 %)
126 or more	154 (12.2 %)
Type of medical record system used in the practice	
Paper charts	709 (55.7 %)
Transitioning from paper to EMR	196 (15.5 %)
Partial EMR	133 (10.3 %)
Full EMR	218 (17.7 %)
Physician computer reminders: Computer prompt or computer-generated flow sheet	
Yes	156 (13.3 %)
Patient computer reminders: Reminder by email	
Yes	10 (0.8 %)
Receive reports on rates of CRC screening	
Yes	146 (11.9 %)

*percentages may not sum to 100 % because of item non-response

†CRC colorectal cancer; AIAN American Indian or Alaska Native, EMR electronic medical record

85 %), age 65 (2 % vs. 91 %), or age 80 (19 % vs. 73 %), with a chi-square p value of <0.001. Among patients who had CHF, physicians still less often recommended FOBT alone than colonoscopy for patients who were age 50 (16 % vs. 66 %) or age 65 (19 % vs. 64 %), although physicians more often recommended FOBT alone than colonoscopy for patients age 80 (54 % vs. 32 %), $p < 0.001$. Among patients with unresectable NSCLC, physicians recommended FOBT alone with the same frequency or more often than colonoscopy for patients who were age 50 (46 % vs. 46 %), age 65 (50 % vs. 41 %), and age 80 (65 % vs. 28 %), $p < 0.001$.

Physician/Practice Characteristics Associated with Screening Recommendation

Several physician and practice characteristics were associated with a positive recommendation for CRC screening (of any type) for 80-year-old patients who were healthy, had CHF, or NSCLC (table available online). In adjusted models for an 80-year-old patient with NSCLC, physicians who were OB-GYN or female were more likely to recommend CRC screening, while patients who were board-certified or had a full EMR were less likely to screen.

DISCUSSION

Using data from a large, nationally representative survey of PCPs, we showed that physician screening decisions were sensitive to both patient age and comorbidity. Almost all PCPs recommended some type of screening for patients age 50 or age 65 who were either healthy or had CHF. However,

Figure 1. Recommendation for CRC screening test stratified by patient age and comorbidity. *FOBT* fecal occult blood test; *flex sig* flexible sigmoidoscopy; *CHF* congestive heart failure; *NYHA* New York Heart Association; *NSCLC* non-small cell lung cancer.

the proportion of PCPs who recommended screening declined among 80-year-old patients across all clinical categories.

USPSTF guidelines recommend against screening patients with limited life expectancy,¹ and the 5-year survival for a

population with unresectable NSCLC (Stage III or greater) is 7 % or less.¹⁰ PCPs recommended CRC screening among patients with limited life expectancy (unresectable NSCLC) less often than for patients with less severe illness (CHF). Nonetheless, 25 % of PCPs still recommended CRC screening for an 80-year-old patient with unresectable NSCLC; among physicians who recommended screening in this case, most (65 %) recommended FOBT only.

Other studies, largely conducted in VA settings, have reported how often PCPs recommend screening for patients with severe illness. A claims-based VA study reported high rates of CRC screening among patients with metastatic tumors or severe comorbidity.¹¹ In a survey of 183 VA PCPs, 10 % of PCPs recommended screening for an 80-year-old patient with an “active malignancy outside the colon”, and 7 % recommended screening among patients “with limited life expectancy”.⁸ Compared to the VA survey, our study suggests an even higher percentage of PCPs (≥ 25 %) recommend CRC screening among patients who are unlikely to benefit. Our results are more broadly generalizable to the U.S. health care system because our survey population represents a nationally representative sample of practicing PCPs. Ultimately, recommendations to perform CRC screening among patients of any age with unresectable NSCLC can be described as having no demonstrable clinical benefit,¹² or even being harmful. Harms related to unnecessary cancer screening may include false positives, anxiety, and procedural risks, for example, if a positive FOBT were to lead to colonoscopy. Harms from therapy may result from the treatment of pseudodisease, i.e., cancers that would never cause problems during a person’s lifetime even if left untreated.¹³

PCPs with a full electronic medical record (EMR) were less likely to screen an 80-year-old patient with NSCLC than those with less developed EMR capability; this finding suggests that health information technology, in addition to increasing guideline-concordant care,¹⁴ may have the potential to reduce unnecessary care. PCPs identified as OB-GYN physicians were significantly more likely to recommend screening among patients with moderate or severe comorbidity; OB-GYN physicians are also more likely to recommend inappropriate Pap tests.¹⁵ More research to understand the mechanisms of how such factors influence the over-recommendation of CRC screening may inform future medical education and policy interventions.¹⁶

It is unclear why physicians would recommend CRC screening among patients with unresectable NSCLC when there is no clear clinical benefit. Quality measures that promote CRC screening, without regard to comorbidity, may contribute to overscreening.¹⁷ Clinical considerations relevant to the patient–physician relationship may also influence such recommendations, specifically, PCPs may not wish to withdraw hope and so continue to offer screening to patients with limited life expectancy.¹⁸ This explanation is consistent with low-risk FOBT (compared to

colonoscopy) being the predominant screening modality recommended by PCPs for patients with unresectable NSCLC. Such non-invasive screening may have the unintended consequence of delaying clear, informed discussions regarding prognosis. Further research is needed to better understand how physicians can develop more comfort in stopping screening when there is no clinical benefit, as well as quantifying the impact of overscreening upon patient outcomes through the exposure to procedural risks. This work should be done while balancing the need to make certain that healthy patients with the highest likelihood of benefit from screening still have access to services that reduce mortality.

Limitations of our study include the lack of direct measurement of health care utilization; nonetheless, responses to clinical vignettes are often consistent with clinical practice.^{5,6} Another limitation is that our physician survey was fielded in 2006–7, prior to the change in the USPSTF guidelines (2008) which recommended against routine CRC screening in adults 76 to 85 years of age. With the change in guidelines, physicians may be less likely to recommend screening among healthy 80-year-old patients.

Most physicians appear to shift their recommendations in an appropriate manner in response to varying patient age and comorbidity. Yet there were a significant proportion of outliers who recommend CRC screening among patients with limited life expectancy for whom screening tests have no benefit and possible harm. Health care systems should be organized to provide a realistic amount of time¹⁹ for physicians to have meaningful discussions with patients and their families about comorbidity, prognosis, and the utility of screening. While the majority of Americans trust information about medical topics provided by a doctor or health care professional,²⁰ improvement in medical education and professionalism curricula may help to promote honest, compassionate physician communication around issues of unnecessary care¹⁶ and policy changes to reduce over-utilization.²¹

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Conflict of Interest: The authors declare that they do not have a conflict of interest.

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