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The Relative Importance of Patient-Reported Barriers to Colorectal Cancer Screening

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Abstract

Background—Colorectal cancer (CRC) screening rates are suboptimal. The most important barriers identified by patients are poorly understood. A comprehensive assessment of barriers to all recommended modalities is needed.

Methods—In 2007, a questionnaire was mailed to 6,100 patients, aged 50–75 years, from 12 family medicine practices in the Virginia Ambulatory Care Outcomes Research Network. People aged 65–75 years and African Americans were oversampled. Patients were asked to rate 19–21 barriers to each of four recommended tests. In 2008, responses were coded on a 5-point scale; higher scores reflected stronger barrier endorsement.

Results—The response rate was 55% ($n=3,357$). Approximately 40% of respondents were aged ≥ 65 years, 30% were African-American, and 73% were adherent to screening. A clinician's failure to suggest screening and not knowing testing was necessary received the highest mean scores as barriers. Financial concerns and misconceptions were also cited. Barrier scores differed depending on whether respondents were never-screened, overdue for screening, or adherent to guidelines. The top five barriers for each modality included test-specific barriers (e.g., handling stool, bowel preparation), which often outranked generic barriers to screening. Not knowing testing was necessary was a top barrier for all tests but colonoscopy.

Conclusions—Although physician advice and awareness of the need for screening are important, barriers to screening are not homogenous across tests, and test-specific barriers warrant consideration in designing strategies to improve screening rates. Barrier scores differ by screening status, highlighting the need to address prior screening experience. Evidence that patients are more familiar with colonoscopy than with other modalities suggests an opportunity to improve screening rates by educating patients about alternative tests.

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Introduction

Colorectal cancer (CRC) is the second-leading cause of cancer deaths in the U.S.¹ Early detection can reduce CRC mortality by 15%–33%.² and screening is widely recommended for average-risk adults beginning at age 50 years.^{3,4} Since the mid-1990s, the U.S. Preventive Services Task Force, American Cancer Society, and other groups have recommended four modalities for screening: fecal occult blood testing (FOBT), flexible sigmoidoscopy, colonoscopy, and barium enema. In recent years, some groups have also proposed newer screening technologies, such as stool DNA and computed tomographic colonography.³ However, as of 2006, only 60.8% of U.S. adults aged ≥ 50 years reported having received recent CRC screening.⁵

Uptake of CRC screening is limited by many factors, including barriers faced by health systems, clinicians, and patients. Patients' barriers include: failure of a physician to recommend screening, scheduling difficulties, cost, lack of access to healthcare or insurance coverage, gaps in knowledge, disinterest, fear, embarrassment, perceived pain, and a lack of current symptoms or health problems.^{6–14} Knowledge of what barriers matter most is helpful to prioritize strategies to improve screening rates. However, the relative importance patients assign to CRC screening barriers, in general or to specific recommended tests, has not been adequately studied.

Most studies do not quantify the relative importance of barriers to patients.^{7–9,15–23} To our knowledge, no study has asked patients to review an extensive list of potential barriers to all recommended modalities and to rate the importance of each. Some studies have taken this systematic approach, but with a narrow focus, examining a limited number of barriers, focusing on a particular test (e.g., FOBT or sigmoidoscopy), or examining barriers to CRC screening generally without alluding to specific tests. Few studies have involved diverse populations^{17, 21,22,24–26} or individuals with different past experience with CRC screening tests.^{24,25,27,28}

This study addresses this gap in the literature by systematically measuring the factors that a diverse group of primary care patients identified for not being screened for CRC, and the relative importance. In a sample of patients with heterogeneous CRC screening experiences and a robust representation of minorities and older adults, the following questions were addressed: (1) What are the leading patient-reported barriers for four recommended CRC screening modalities (FOBT, flexible sigmoidoscopy, colonoscopy, and barium enema)? Specifically, what is the relative importance that patients assign to (1a) barriers that are common to all four tests and to (1b) test-specific barriers given item mean scores? (2) Do the barriers differ for patients with different screening histories (i.e., never-screened, up-to-date, overdue)?

Methods

Study Population

Twelve family medicine practices affiliated with the Virginia Ambulatory Care Outcomes Research Network, a practice-based research network, participated in this study. The practices were located in rural, suburban, and urban areas of Central Virginia, the Shenandoah Valley, and Northern Virginia. The study was approved by the IRBs of Virginia Commonwealth University and Riverside Medical Center.

A sampling frame of 26,032 patients who were in the target age group for screening (50–75 years) and had an office visit in the last 2 years was established from the practices' administrative data. The date of birth, gender, and 5-digit ZIP code were available for all but 378 patients, yielding a final sampling frame of 25,654 patients. Because administrative data were not available for race, ZIP codes corresponding to census ZIP code tabulation areas (based

on the U.S. Census 2000 Summary File) where the African-American population constituted at least 30% of the total area population were identified. Data were used to stratify the sampling frame by age (50–64, 65–75 years) and by African-American concentration (less than 30%, 30% or more).

A total of 6,100 adults were randomly selected from the sampling frame to receive a postal questionnaire regarding CRC screening barriers. A probabilistic sampling scheme was used to oversample African Americans and patients aged 65–75 years, producing four strata: 1,550 patients in the low age/low African-American stratum (sampling rate = 10.7%), 2,250 in the low age/high African-Americans stratum (sampling rate = 51.7%), 950 in the high age/low African-American stratum (sampling rate = 19.9%), and 1,350 in the high age/high African-American stratum (sampling rate = 66.4%). This strategy assured adequate statistical power for comparisons.

Questionnaire Development

A three-stage iterative process was used to inform the development of the postal questionnaire. First, a systematic review of the CRC screening barriers literature was performed, and previously administered (published and unpublished) instruments assessing CRC screening barriers were collected to identify relevant questions and response options. Second, on a health assessment questionnaire mailed to 660 patients aged ≥ 50 years, respondents were asked to state in their own words “the most important reason people do not have these screening tests.”¹⁴ A total of 317 adults responded (30% African-American). Third, seven gender- and largely race-specific focus groups were conducted to gather additional information on perceived barriers to each test and to screening generally.¹⁴ Further details about the iterative process are reported elsewhere.¹⁴

Insights from this iterative process guided development of the postal questionnaire. A total of 19–21 barrier questions were drafted for each of four recommended screening modalities. The most infrequently identified barriers in the formative phase (e.g., homosexual sensitivities, history of sexual abuse) were omitted to limit respondent burden. The set of questions for each test included 15 items that were asked for all four tests (generic barriers). These items are similar to, but more extensive than the barriers and “cons” reported in previous studies.^{26–29–31} Additional barrier questions were developed for each test (test-specific barriers). Wherever possible, previously validated questions and response options were used.

A total of 14 individuals participated in four cognitive interview rounds to assess whether the questionnaire and its instructions were easily understood and could be completed by those with low literacy. Face validity was assessed by asking interviewees to ‘think aloud’ while reading instructions and survey items, hence giving insight into the source and nature of any confusion. Different response formats were tested, including: (1) a binary “yes/no” response, (2) 5-point verbal response anchors (“strongly agree” to “strongly disagree”) and (3) 5-point numeric scaling. All interviewees in the first three rounds examined at least two response formats. Pretesting results favored the verbal response format, which provided more variability than a “yes/no” response and was easier for respondents to understand than numeric scaling. Based on insights from the iterative process about the barriers that patients ascribe to “people” (third person) who forego CRC screening, the barrier questions in the final instrument were framed in second person (e.g., “How much would you agree or disagree that the following reasons **would make it difficult for you to have a FOBT?**”). The questionnaire also asked respondents to select the most important barrier for each test and to answer questions about CRC screening history, using NCI-recommended measures,³² and about demographics. The final questionnaire (see Appendix A, available online at www.ajpm-online.net) was written to be understood by those with poor health literacy (i.e., REALM-R score=5) and a 6th grade reading level.

Data Collection

Beginning in February 2007, the questionnaire was mailed to 6,100 randomly selected adults using a modified Dillman sequential protocol with a \$2 incentive.^{33,34,35} One week after mailing the questionnaire, a postcard was mailed to all participants; 3 weeks after the first mailing, nonrespondents were mailed another copy of the questionnaire.

Statistical Analysis

All analyses were performed using SAS/STAT® software (version 9.1.3, SAS Institute Inc, Cary, NC, 2007) beginning in 2008. Given the probabilistic sampling scheme, procedures SAS/STAT SurveyFreq, SurveyMeans, and SurveyReg were used. The item responses about the importance of screening barriers (e.g., strongly agree) were coded on a 5-point Likert scale, where higher scores reflected stronger barrier endorsement. Finite population adjustments were made to SEs using the sampling rates. Sampling weights were adjusted for nonresponse. Weighted means (and CIs) were computed for all respondents and for three subgroups: (1) ever-screened respondents currently adherent to guidelines, (2) ever-screened respondents overdue for screening, and (3) never-screened respondents. Respondents were classified as overdue if they did not report a FOBT within the last year, flexible sigmoidoscopy or barium enema within the last 5 years, or colonoscopy within the last 10 years.³⁶ An ANCOVA was used to compare the adjusted mean scores. Adjustment was based on covariates that have been identified as confounders in similar research. These include: age (<55; 55–59; 60–64; 65–69; 70–75 years), race (white; African-American; and other), gender, income (<\$20,000; ≥ \$20,000), education (≤high school; >high school), insurance status (insured; not insured), and whether the clinician discussed CRC screening options with the patient. The relative importance of barrier items was rank ordered by investigators based on mean item scores (respondents did not rank order the barriers).

Results

A total of 3,357 patients (55%) completed the questionnaire (51% among residents in concentrated African-American ZIP codes and 62% among residents of less-concentrated areas). Respondents were likely to be older, to be female, and to be white, but 30% were African-American (Table 1). More than one third reported no education beyond high school, and 22% reported an annual household income under \$20,000. More than 90% reported some type of health insurance coverage. About half reported having discussed CRC screening with their healthcare provider. Based on self-report, about three quarters of the respondents were adherent to guidelines, 12% had been screened but were currently overdue, and 15% had never been screened (Table 1). This represents slightly greater exposure to CRC screening than existed in the general population. As of 2006, 66.7% of respondents in Virginia aged ≥50 years reported receiving a FOBT within the past year or lower endoscopy within the past 10 years (parameters for adherence that are not fully analogous to those used here; i.e., lower endoscopy was assessed collectively for flexible sigmoidoscopy and colonoscopy while barium enema was not assessed).⁵

Generic barriers to CRC screening

Of the 15 generic barriers that were assessed for each screening test, failure of a clinician to suggest screening and not knowing testing was necessary were identified as the two most important overall barriers to CRC screening (Table 2). These were also the top two barriers for never-screened and non-adherent respondents. The top five generic barriers also included misconceptions (testing is unnecessary because “I feel fine”) and a financial concern (excessive costs). Additional barriers, with lower mean item scores than the top five, included other misconceptions (testing is less important without a family history of CRC), other financial concerns (health insurance coverage, insurance deductibles), and competing demands (other

medical problems, lack of time). Lack of social support (discomfort discussing screening with others, not knowing others who had experienced CRC screening) and bad experiences with previous testing were ranked as least important.

With two exceptions, the rank order of barriers by adherence status was similar (Table 2). First, for any given barrier, a significant “dose effect” by screening status was observed. Specifically, never-screened respondents assigned greater importance (i.e., higher barrier scores) to a barrier than did overdue respondents (whose scores were intermediate) and adherent respondents (whose scores were lowest). Second, certain barriers changed position in rank order by adherence status. For example, six barriers were ranked as more important for overdue respondents than for adherent respondents (Table 2). However, due to the SEs surrounding the point estimates, differences in some rankings could represent chance variations.

Test-specific barriers

Test-specific barriers assumed considerable importance (Table 2). For example, two of the top five FOBT barriers were concerns about handling stool and stool cards. All top five barriers reported for colonoscopy, and many of the barriers for flexible sigmoidoscopy and barium enema, were test-specific and involved apprehensions about the bowel preparation, laxatives, the insertion of a tube/air, and discomfort. The top barriers for colonoscopy also included concerns about anesthesia and being injured by the test; however, unlike any other test, being unfamiliar with the test was not a top barrier.

The relative importance of test-specific barriers differed significantly by screening status. For example, among never-screened respondents, the bowel preparation ranked third in importance as a barrier to colonoscopy (based on mean item scores), but it ranked first as a barrier among previously screened respondents. Similar to generic barriers, adherent respondents generally had lower scores compared with non-adherent and never-screened respondents for test-specific barriers.

Discussion

Consistent with other research,^{5–7,11,16,19,21,24–28,37–38} this study found that patients' most important global reasons for not undergoing CRC screening were the failure of clinicians to suggest testing and patients' lack of knowledge that testing is necessary. Similarly, lack of a physician recommendation was among the top five barriers for all modalities except colonoscopy.

Interestingly, in formative research to develop the questionnaire (the open-ended question about CRC screening and the focus groups) in a similar population, the failure of a physician to recommend the test was infrequently cited as a barrier (only five of 317 open-ended responses listed this as a barrier).¹⁴ However, the questions had different reference points; the formative work asked respondents about “the **most important** reason people do not have these screening tests” whereas the comprehensive barrier instrument asked respondents what “**would make it difficult for you...**” Individuals may be cued by the framing (“people” versus “you”) and/or response options (open-ended or fixed) to consider external explanations for their own behavior but otherwise cite personal opinions and factors within their control as barriers to screening.

A key finding of this study is that barriers to screening are not homogenous across tests and that test-specific barriers warrant consideration in designing strategies to promote screening. For example, concerns about bowel preparation/laxatives, discomfort, and having a tube inserted in the rectum were the leading barriers to undergoing endoscopy, and distaste for handling stool and stool cards were among the top five barriers to FOBT.

The finding that barriers are perceived differently by patients who have never been screened for CRC and those who have had CRC tests calls attention to the need to address prior experience with screening in messages and interventions. A “dose effect” in barrier scores was observed: highest among never-screened respondents, intermediate among ever-screened respondents who were overdue for retesting, and lowest among people adherent with guidelines. Whether low barriers are the cause or consequence of prior exposure to CRC screening cannot be determined from these data, which are cross-sectional in nature. The rank order of barriers also differed by adherence status, suggesting that strategies for maintaining adherence to screening should emphasize different priorities than those for promoting testing among patients who are overdue and for convincing individuals to undergo their first test. For example, the notion of having a tube inserted in the rectum (for flexible sigmoidoscopy, colonoscopy, or barium enema) was a leading barrier among those who were never screened and less a barrier among those who had undergone the tests, suggesting a greater need to mitigate anxiety on this point to reach the never-screened population. While the rank order varied, the mean item scores for any barrier did not exceed 3.0 on the 5-point scale, suggesting that people did not overwhelmingly invoke any single listed barrier. Thus, attention to the relative importance of multiple barriers is perhaps even more meaningful. Intervention strategies to increase CRC screening should not solely address one screening barrier but should deal holistically with the tableau of barriers that patients confront.

These findings raise a question about whether colonoscopy is being recommended perhaps to the exclusion of other test options. The failure of clinicians to recommend testing and not knowing that testing was necessary were cited among the top five barriers for FOBT, flexible sigmoidoscopy, and barium enema, but not for colonoscopy, suggesting that physicians may present colonoscopy as the only screening option. This finding is consistent with national data showing that colonoscopy rates are increasing while FOBT and sigmoidoscopy rates are decreasing.^{5,39,40} While the success of the medical and public health community in increasing colonoscopy screening may be beneficial, it may ultimately restrict the number of patients who are screened for CRC if alternative options are not offered to patients with other preferences.⁴¹

Unlike colonoscopy, FOBT is the only screening test that has been demonstrated to reduce CRC mortality in randomized trials,^{42–45} but it is often viewed as inferior by both physicians and patients. Modeling studies suggest that a program of high-sensitivity FOBT screening rivals the capacity of colonoscopy screening to reduce mortality and has lower risks;^{46,47} all major national guidelines promote FOBT as a recommended option.^{3,4}

Consistent with other studies, these findings underscore the importance of access barriers such as cost, limited health insurance coverage, and high insurance deductibles. The survey was administered in 2007, which was followed by a major recession, increased cost-shifting of insurance premiums and copayments to patients, higher unemployment rates, and a larger number of uninsured families. Inadequate access to care and financial challenges may now pose a more prominent barrier to CRC screening than when this study was conducted.

Finally, results indicate that misconceptions continue to prevail as barriers to CRC screening, indicating a continued need to educate patients that screening is necessary in the absence of symptoms or a family history of CRC.

These findings should be considered in the context of several possible limitations. First, their generalizability may be limited. Respondents were patients from 12 family medicine practices in Virginia who returned a mailed questionnaire and a large proportion were adherent with CRC screening guidelines. This patient sample may not fully represent the perspectives of the general population, particularly those who lack access to healthcare, a major barrier to CRC

screening, or those who are non-adherent to screening guidelines. However, although the rank order differed, the same top five barriers were reported by all three subgroups in this study, regardless of adherence status. Additionally, these barrier estimates, in a relatively well-screened population, are potentially different compared to barriers in a nonpatient, general population. Second, all possible barriers may not have identified; barriers that were infrequently mentioned during questionnaire development were excluded due to concern about respondent burden. Third, despite extensive cognitive testing of the instrument, responses may have been influenced by the specific wording or sequence of the questions and uncertainty about response options. The relative importance of barriers based on the analysis of mean scores may differ from the ranking respondents might assign if asked to rank order the barriers themselves. Fourth, significant differences in barrier scores may have limited clinical significance.

To our knowledge, this is the most extensive examination of the barriers to CRC screening reported by patients. Heterogeneity in barriers to CRC screening carries obvious practice and policy implications. The approach taken by clinicians in counseling patients about CRC screening and by public health programs in encouraging CRC screening should consider the barrier profile of the patient or target population. Interventions to increase screening must take special note of the modalities being promoted and the composition of the target population with respect to screening status, and their effectiveness should be tested in prospective studies. The data suggest the need for initiatives to increase the promotion of CRC screening by physicians and, in particular, to make patients aware of the options available for testing in addition to colonoscopy.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1
Descriptive Characteristics of Study Participants (aged 50–75 years)

Variables	Screening Status per Recommendations ^d						Respondent Sample (N=3,357, 100%)	
	Never-Screened (n=498, 15%)		Overdue (n=412, 12%)		Up-to-Date (n=2,447, 73%)		n	%
	n (%)	n	%	n	%			
Female	323 (64.9)	279	67.7	1,421	58.1	2,023	60.3	
African-American	166	119	28.9	731	29.9	1,016	30.3	
Aged ≥65 years	152	153	37.1	1,040	42.5	1,345	40.1	
Employed for pay	226	171	41.5	1,067	43.6	1,464	43.6	
Income less than \$20,000/year	169	122	29.6	450	18.4	741	22.1	
Educational attainment no greater than high school	246	172	41.8	825	33.7	1,243	37.0	
Insured	405	361	87.6	2,290	93.6	3,056	91.0	
Married	237	204	49.5	1,537	62.8	1,978	58.9	
Previous history of polyps	19	25	6.1	1,020	41.7	1,064	31.7	
Previous history of colon cancer	3	1	0.24	40	1.6	44	1.3	

^aScreening status is represented by three categories where “overdue” represents the subgroup that did not undergo any of the four screening modalities according to recommendations (i.e., no FOBT in the last year, no flexible sigmoidoscopy in the last 5 years, no colonoscopy in the last 10 years and no barium enema in the last 5 years) and “up-to-date” represents the subgroup that did report at least one of the four screening modalities according to recommendations.

Table 2
Adjusted^a Mean Scale Scores^b for Barriers Common to the Four Recommended CRC Screening Modalities and Top Five Barriers to the Each of Four Recommended Colorectal Cancer Screening Modalities by Screening Status (N=3,357)

	Adjusted rank order Respondent Sample (N=3,357)	Screening Status per Recommendations ^c		
		Never Screened (n= 498)	Overdue (n= 412)	Up-to-Date (n= 2,447)
		Rank ^d [M Score] ^e		
Barriers Common to all Modalities:				
It would be difficult to have colorectal cancer screening because... ^f				
<i>My healthcare provider has never suggested I get this test.</i>	1 [2.51]	1 [2.93]	1 [2.54]	1 [2.42]
<i>I did not know if I should have this test.</i>	2 [2.35]	2 [2.77]	5 [2.39]	2 [2.25]
<i>This test costs too much.</i>	3 [2.25]	3 [2.73]	2 [2.41]	3 [2.11]
<i>I do not need the test because I feel fine.</i>	4 [2.16]	4 [2.67]	4 [2.40]	4 [2.00]
<i>The test is too embarrassing.</i>	5 [2.12]	7 [2.57]	7 [2.36]	5 [1.98]
<i>My health insurance does not cover this test.</i>	6 [2.12]	6 [2.58]	8 [2.33]	6 [1.98]
<i>No one in my family has had colorectal cancer.</i>	7 [2.10]	5 [2.64]	3 [2.41]	7 [1.93]
<i>I have a high insurance deductible.</i>	8 [2.06]	9 [2.50]	10 [2.25]	8 [1.93]
<i>I have other medical problems that are more important.</i>	9 [2.05]	10 [2.46]	6 [2.39]	9 [1.90]
<i>I am afraid of having this test.</i>	10 [1.99]	8 [2.53]	9 [2.25]	10 [1.82]
<i>I am worried about what this test might find.</i>	11 [1.93]	12 [2.29]	13 [2.06]	11 [1.82]
<i>I do not have time.</i>	12 [1.91]	11 [2.33]	11 [2.21]	12 [1.76]
<i>I do not feel comfortable talking to anyone about this test.</i>	13 [1.86]	13 [2.20]	12 [2.08]	13 [1.75]
<i>I have had other bad experiences with tests.</i>	14 [1.80]	15 [2.02]	14 [2.00]	14 [1.71]
<i>I do not know anyone who has had colon cancer testing.</i>	15 [1.76]	14 [2.05]	15 [1.95]	15 [1.66]
Top Five Barriers to FOBT:				
It would be difficult to have a FOBT because... ^f				
<i>My healthcare provider has never suggested I get this test</i>	1 [2.53]	1 [3.05]	1 [2.38]	1 [2.44]
<i>I did not know if I should have this test</i>	2 [2.37]	2 [2.85]	2 [2.33]	2 [2.27]
<i>I do not want to handle my stool</i>	3 [2.23]	4 [2.52]	4 [2.18]	3 [2.17]
<i>I do not need this test because I feel fine</i>	4 [2.16]	3 [2.68]	3 [2.29]	5 [2.03]
<i>I do not want to keep my stools on a card in the house</i>	5 [2.15]	5 [2.48]	5 [2.15]	4 [2.08]
Top Five Barriers to Flexible Sigmoidoscopy:				
It would be difficult to have a flexible sigmoidoscopy because... ^g				
<i>I do not want to do the preparation (prep) and take laxatives</i>	1 [2.72]	3 [3.05]	1 [3.03]	2 [2.59]
<i>My healthcare provider has never suggested I get this test</i>	2 [2.70]	4 [2.85]	4 [2.57]	1 [2.68]
<i>I am worried that the test is uncomfortable or painful</i>	3 [2.57]	2 [3.09]	3 [2.90]	3 [2.40]
<i>I do not want a tube inserted in my rectum</i>	4 [2.57]	1 [3.23]	2 [2.91]	5 [2.36]
<i>I did not know if I should have this test</i>	5 [2.45]	5 [2.72]	5 [2.42]	4 [2.40]
Top Five Barriers to Colonoscopy:				
It would be difficult to have a colonoscopy because... ^f				
<i>I do not want to do the preparation (prep) and take laxatives</i>	1 [2.74]	3 [3.00]	1 [2.99]	1 [2.63]

	Adjusted rank order Respondent Sample (N=3,357)	Screening Status per Recommendations ^c		
		Never Screened (n= 498)	Overdue (n= 412)	Up-to-Date (n= 2,447)
Rank ^d [M Score] ^e				
<i>I do not want a tube inserted in my rectum</i>	2 [2.40]	1 [3.19]	2 [2.94]	2 [2.13]
<i>I do not want to have anesthesia or be “put under”</i>	3 [2.30]	4 [2.87]	4 [2.75]	3 [2.10]
<i>I am worried that the test is uncomfortable or painful</i>	4 [2.30]	2 [3.13]	3 [2.91]	4 [2.01]
<i>I might get injured by this test</i>	5 [2.18]	5 [2.73]	5 [2.62]	5 [1.98]
Top Five Barriers to Barium Enema: It would be difficult to have a barium enema because...^f				
<i>My healthcare provider has never suggested I get this test</i>	1 [2.79]	2 [3.14]	3 [2.88]	1 [2.70]
<i>I do not want to do the preparation (prep) and take laxatives</i>	2 [2.76]	3 [3.05]	1 [3.02]	2 [2.65]
<i>I do not want a air inserted in my rectum</i>	3 [2.65]	1 [3.22]	2 [3.01]	3 [2.46]
<i>I did not know if I should have this test</i>	4 [2.54]	5 [2.95]	5 [2.58]	4 [2.44]
<i>I am worried that the test is uncomfortable or painful</i>	5 [2.51]	4 [2.98]	4 [2.82]	5 [2.35]

^a Adjusted for: age, race, gender, income, education, insurance status, and discussion with healthcare providers.

^b Mean scale scores for each item are on a scale from 1 to 5 where 1 is strongly disagree and 5 is strongly agree that each individual item would be a barrier to screening.

^c Screening status is represented by three categories where “overdue” represents the subgroup that did not undergo any of the four screening modalities according to recommendations (i.e., no FOBT in the last year, no flexible sigmoidoscopy in the last 5 years, no colonoscopy in the last 10 years and no barium enema in the last 5 years) and “up-to-date” represents the subgroup that did report at least one of the four screening modalities according to recommendations.

^d The rank order of the fifteen barriers common to all modalities and the top five barriers within each screening status group for each modality where 1 is the highest-ranked barrier given the ordering of the individual item mean scale scores for each modality.

^e SEs for mean scores can be found in Appendix B (available online at www.ajpm-online.net).

^f Each comparison of barriers by screening status is significant; p-value <0.001.

^g Each comparison of barriers by screening status is significant; p-value <0.001 except for “My healthcare provider has never suggested I get this test”; p-value = 0.074.