

# More Comprehensive Discussion of CRC Screening Associated With Higher Screening

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**C**olorectal cancer (CRC) is the third-most common cancer and the second-leading cause of cancer-related death in the United States.<sup>1</sup> Recent estimates suggest that CRC will be newly diagnosed in about 112,340 people annually, resulting in over 52,180 deaths per year.<sup>2</sup> Total direct costs associated with treating CRC are \$17 billion annually, with 9.8 million work days lost annually to hospitalization for colon cancer.<sup>2</sup>

The early detection of high-risk lesions, or CRC itself, through appropriate screening is associated with decreased incidence of and mortality from CRC.<sup>3-5</sup> The US Preventive Services Task Force recommends that men and women of average risk begin screening for CRC starting at age 50 years,<sup>6</sup> and specialty care guidelines provide recommendations for higher-risk groups.<sup>7</sup> Currently, recommended CRC screening modalities for average-risk patients include annual fecal occult blood testing (FOBT), colonoscopy every 10 years, or flexible sigmoidoscopy every 5 years, with or without interval FOBT.<sup>6</sup> In addition, as a result of improved test performance and usability, in 2008 multiple professional societies endorsed the use of 4 types of fecal immunochemical tests (FITs) for CRC screening to replace FOBT.<sup>8,9</sup>

Despite the proven benefits of CRC screening, screening rates remain suboptimal. Although more than half of adults 50 years and older in the United States have ever received a CRC screening test, less than half receive screening tests at recommended intervals.<sup>10-17</sup>

While demographics (age, gender)<sup>12,18</sup> and specific health-system characteristics are associated with receipt of CRC screening (having usual sources of care,<sup>12</sup> access to endoscopy services,<sup>19</sup> and assistance with scheduling of colonoscopy),<sup>20</sup> less is known about how provider-patient interactions and comprehensiveness of CRC discussion by primary care physicians (PCPs) influence CRC screening. Previous studies indicate that physician recommendation for screening<sup>12,21,22</sup> and good provider communication skills<sup>23</sup> may increase CRC screening. However, less is known about how the comprehensiveness of discussion by PCPs about testing options, screening intervals, and potential test complications may influence actual CRC screening. Study of the association of

the comprehensiveness of CRC discussion by PCPs with receipt of CRC screening can inform the development of quality-improvement interventions.

**Objectives:** Examine association of comprehensiveness of colorectal cancer (CRC) screening discussion by primary care physicians (PCPs) with completion of CRC screening.

**Study Design:** Observational study in Kaiser Permanente Northwest, a group-model health maintenance organization.

**Methods:** A total of 883 participants overdue for CRC screening received an automated telephone call (ATC) between April and June 2009 encouraging CRC screening. Between January and March 2010, participants completed a survey on PCPs' discussion of CRC screening and patient beliefs regarding screening. Primary outcome measure: receipt of CRC screening (assessed by electronic medical record [EMR], 9 months after ATC). Primary independent variable: comprehensiveness of CRC screening discussion by PCPs (7-item scale). Secondary independent variables: perceived benefits of screening (4-item scale assessing respondents' agreement with benefits of timely screening) and primary care utilization (EMR; 9 months after ATC). The independent association of variables with CRC screening was assessed with logistic regression.

**Results:** Average scores for comprehensiveness of CRC discussion and perceived benefits were 0.4 (range 0-1) and 4.0 (range 1-5), respectively. A total of 28.2% (n = 249) completed screening, 84% of whom had survey assessments after their screening date. Of screeners, 95.2% completed the fecal immunochemical test. More comprehensive discussion of CRC screening was associated with increased screening (odds ratio [OR] = 1.51, 95% confidence interval [CI] = 1.03-2.21). Higher perceived benefits (OR = 1.46, 95% CI = 1.13-1.90) and 1 or more PCP visits (OR = 5.82, 95% CI = 3.87-8.74) were also associated with increased screening.

**Conclusions:** More comprehensive discussion of CRC screening was independently associated with increased CRC screening. Primary care utilization was even more strongly associated with CRC screening, irrespective of discussion of CRC screening.

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### Take-Away Points

- More comprehensive discussion of CRC screening by PCPs was associated with higher screening rates among adults aged 51 to 80 years who were overdue for screening.
- Higher perceived benefits of CRC screening by patients was also associated with increased CRC screening.
- 1 or more PCP visits was strongly associated with increased CRC screening, irrespective of discussion of CRC screening.

The primary objective of this study was to determine the independent association of comprehensiveness of CRC screening discussion by PCPs, as reported by patients, with receipt of CRC screening.

## METHODS

The protocol for this study was approved by the institutional review board within the study health maintenance organization (HMO).

### Study Site, Survey, and Electronic Data Sources

The study was conducted at Kaiser Permanente Northwest (KPNW), a not-for-profit HMO with about 485,000 members in southwest Washington and the Portland, Oregon, metro area. The members' demographic characteristics (age, gender, race/ethnicity) are similar to those of the area population.<sup>24</sup> KPNW regional electronic databases provided data on patient membership, demographics, primary care assignment, clinical data (including weight and height, laboratory results, and other healthcare utilization, including CRC screening), and clinician data. These data capture over 95% of all medical care and pharmacy services members receive, and data are linked through each member's health record number.

### Patient Selection

We included HMO members aged 50 to 80 years who were at average risk for developing CRC, were overdue for CRC screening, and received an automated telephone call as part of a CRC screening-outreach program between March and June 2009.<sup>25</sup> The specifics of the automated call program, including the definition of "average risk," have been described previously.<sup>25</sup> Essentially, the average-risk population includes those who are overdue for CRC screening and do not meet any of the following criteria: (1) active colon cancer/risk factors that would indicate need for non-routine screening, (2) ever diagnosed with adenomatous polyps or human immunodeficiency virus/acquired immunodeficiency syndrome, (3) referred for colonoscopy or sigmoidoscopy in previous 3 months, or (4) receipt of plavix or warfarin medications in previous 4 months that may increase risk of false-positive FIT. The brief automated telephone calls

(ATCs) included information about the benefits of CRC screening, encouraged FOBT as a relatively simple and low-risk method of screening, and allowed patients to request an FOBT by pushing a number on their telephone. The date of the telephone call was defined as the intervention index date.

Of the population receiving automated telephone calls, a random sample of 2000 adults were mailed a survey in January 2010. We chose to begin survey outreach efforts in January 2010 in order to have the most time for those efforts, while still ensuring that sufficient time elapsed (6-9 months) for patients who received ATCs between March and June 2009 to complete screening.

The process flow of the survey administration process is described in the **Figure**.<sup>25</sup> We sent initial surveys to study respondents on January 15, 2010. Next, we sent a reminder postcard to non-responders 2 weeks after the initial mailing. Finally, we mailed the survey a second time to non-responders about 3 weeks after the reminder postcard. Survey enrollment was completed by March 31, 2010. Of the whole population, 1816 (90.8%) were contacted. A total of 184 participants were not contacted due to incorrect addresses. Of those contacted, 883 completed the survey, for a response rate of 48.6% (883/1816). Compared with non-respondents, respondents were more likely to be white (respondents = 95.3% vs non-respondents = 87.5%,  $P < .0001$ ), female (respondents = 58.3% vs non-respondents = 48.4%,  $P < .0001$ ), and taking more medications (respondents [mean  $\pm$  standard deviation (SD)] = [3.1  $\pm$  3.8]). Responders and non-responders did not differ in age or length of health plan membership.

### Patient Survey Design and Measures

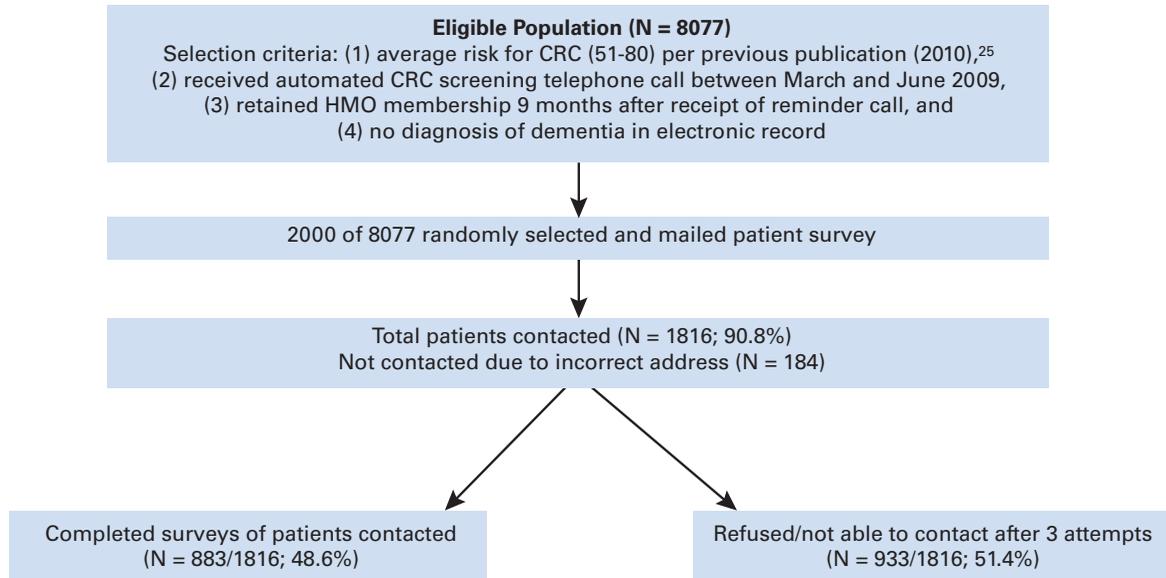
This survey was designed to better understand the barriers and facilitators that patients encountered in their efforts to complete CRC screening. We focused on 2 patient-reported domains: (1) patients' perceptions of clinician-patient counseling, such as comprehensiveness of CRC screening discussion by the PCP, and (2) patient beliefs; namely, perceived benefits of CRC screening. Comprehensiveness of CRC discussion was the primary independent variable, while primary care utilization and perceived benefits of CRC screening were the secondary independent variables.

### Comprehensiveness of CRC Screening Discussion, Based on Patient Self-Report

**Comprehensiveness of CRC screening discussion.** These items were based on previous work from Braddock and colleagues<sup>26,27</sup> that assessed levels of informed decision making

## More Comprehensive Discussion of CRC Screening

■ **Figure.** Patient Survey Process Flow



CRC indicates colorectal cancer; HMO, health maintenance organization.

occurring during patient-provider communications regarding CRC screening. Informed decision making, a means for facilitating patient participation in decision making, includes (1) providing relevant information about the clinical situation, alternatives, and risks and benefits; (2) assessing the patient's understanding; and (3) giving the patient a clear opportunity to voice a preference.<sup>26,27</sup> Seven yes/no items measured the content of patients' discussions with their PCPs. We asked patients whether their PCPs did each of the following at any time in the 2 years prior to survey: (1) explained benefits of CRC screening, (2) discussed how often each screening test should be done, (3) provided information on how to do various tests, (4) explained the accuracy of each screening test, (5) explained potential test complications from screening tests, (6) asked if the patient understood or had any questions about CRC screening, and (7) asked if the patient had the information he or she wanted about CRC screening. These 7 items had high internal consistency (Cronbach's alpha = 0.92). To calculate an average score, each of the 7 items was summed together (0.0 = no, 1.0 = yes) and divided by 7. A score of 1 indicates that patients answered "yes" to all 7 questions, while a score of 0 indicates a "no" answer to all 7 questions. Only the responses of patients who answered all 7 questions were included in the variable describing this scale.

### Perceived Benefits of CRC Screening, Based on Patient Self-Report

**Perceived benefits scale.** Four items measured perceived benefits of CRC screening, scored on a 5-point

Likert scale (1 = strongly disagree, 5 = strongly agree). Similar to the scale for comprehensiveness of CRC discussion, the perceived-benefits scale also had good internal consistency (Cronbach's alpha = 0.80). To calculate an average score, each of the 4 items was summed together (1 = strongly disagree, 5 = strongly agree) and divided by 4. A score of 5 indicates that the respondent answered "strongly agree" to all 4 questions, and a score of 1 indicates an answer of "strongly disagree" to all 4 questions. Only the responses of patients who answered all 4 questions were included in the variable describing this scale. These questions were adapted from Myers and colleagues<sup>28-30</sup> and measured general agreement with the following statements: (1) CRC screening is necessary even if no family history exists, (2) getting screening for CRC can protect health, (3) when colon polyps are found and removed, CRC can be prevented, and (4) when CRC is found early, it can be cured. The rationale for selecting perceived benefits is that beliefs about colon cancer have been identified in the literature as an important characteristic associated with CRC screening.<sup>28-30</sup>

### Measures Identified From the EMR

All patients were due for screening at the time of the ATC; the primary outcome measure was whether the patient completed CRC screening in the 9 months following the ATC. CRC screening included any of the following: 1 sample FIT, receipt of colonoscopy, and receipt of flexible sigmoidoscopy. The distribution of first completed CRC

■ **Table 1.** Study Population Characteristics

Population Characteristics	N = 883
<b>Demographics and clinical characteristics (identified from EMR)</b>	
Age (mean ± SD)	59.1 ± 5.2
Gender (%)	
Female N (%)	515 (58.3)
Male N (%)	368 (41.7)
Race/ethnicity (N = 879)	
White N (%)	838 (95.3)
Non-white N (%)	41 (4.7)
Length of membership, y	14.3 ± 10.6
Number of medications taken at baseline (6 months prior to call; mean ± SD)	3.1 ± 3.8
<b>Comprehensiveness of CRC screening discussion scale (identified from survey)<sup>a,b</sup></b>	
Mean ± SD (no = 0, yes = 1)	0.4 ± 0.4
% missing	28.0%
<b>Perceived benefits scale (identified from survey)<sup>2</sup></b>	
Mean ± SD (lowest = 1, highest = 5)	4.0 ± 0.7
% missing	10.5%
<b>Utilization characteristics (identified from EMR)</b>	
≥1 primary care visits, 9 months after reminder call <sup>c</sup>	536 (60.7)
<p>CRC indicates colorectal cancer; EMR, electronic medical record; SD, standard deviation.</p> <p><sup>a</sup>Higher score indicates PCPs were more likely to discuss CRC screening. The percent answering yes to each question included:</p> <ul style="list-style-type: none"> <li>• Explained benefits of CRC screening (61.1%, 22.1% missing).</li> <li>• Discussed how often each screening test should be done (47.4%, 23.0% missing).</li> <li>• Provided information on “how to do” various test (45.8%, 23.8% missing).</li> <li>• Explained accuracy of each test (30.9%, 24.1% missing).</li> <li>• Explained potential test complications from screening test (25.3%, 23.3% missing).</li> <li>• Asked if patient understood or had any questions about CRC screening (48.5%, 22.9% missing).</li> <li>• Asked if patient had the information he or she wanted to know about CRC screening (42.9%, 24.7% missing).</li> </ul> <p><sup>b</sup>Higher score indicates agreement with general statements regarding benefits of CRC screening</p> <p><sup>c</sup>Primary care utilization—9 months post reminder call.</p>	

screening test for this study population was FIT (95.2%), colonoscopy (2.8%), and sigmoidoscopy (2.0%).

We identified patient age in relation to the intervention index date, and we identified gender from member eligibility files. We also determined length of KPNW membership. Individual racial categories were obtained from electronic databases for 267 (30.4%) participants, and missing data were imputed using the census tract block corresponding to each subject’s mailing address. Patient race was categorized as white or non-white (African American, Pacific Islander, Asian, and Native American). In addition, as a measure intended to reflect disease burden,<sup>31</sup> we determined the mean number (± SD) of unique generic drugs dispensed within the 6 months prior to index date for each participant. We also determined whether survey respondents had any primary care visits (internal medicine, family practice; ≥1

visits vs none) in the 9 months after the intervention index date.

**Statistical Methods**

We used logistic regression to model CRC screening during the 9 months following index date (receipt of ATC). Final variables were entered simultaneously and included age (continuous, by 10 years), gender (female vs male), number of medications (continuous), comprehensiveness of CRC discussion scale (continuous), perceived benefits scale (continuous), and having any primary care visit during the follow-up period. With the exception of age and gender, all variables with significant bivariate associations with CRC screening completion were included in the final multivariable model. Although not significant in bivariate analysis, age and gender were retained in final logistic models to adjust for demographics, given that age and gender have been associated with CRC screening in previous research. We lacked complete data on some of the central variables (ie, PCP discussion scale, perceived benefits scale), and we imputed missing data by multiple imputation (MI). Multiple imputation is considered a scientifically rigorous approach to handle missing data.<sup>32</sup> The MI and MIANALYZE procedures in SAS used 5 replications. All analyses were conducted using SAS version 9.2 (SAS Institute, Cary, North Carolina).

**RESULTS**

**Table 1** presents the population characteristics of patients who completed the patient survey. The mean age was 59 years, nearly 60% were female, 95% were white, and the average number of years with KPNW was 14. The average number of medications taken at baseline was 3.1. The average score on the comprehensiveness of CRC discussion scale was less than 0.5 (mean = 0.4, SD = 0.4, possible range 0 to 1), indicating that patients, on average, answered “yes” to fewer than 4 of the 7 screening discussion questions. In addition, the average score on the perceived benefits scale was high (mean = 4.0, SD = 0.7; possible range 1 to 5), suggesting that most believed in the benefits of CRC screening. Most (60%) reported 1 or more primary care visits in the 9 months after the intervention index date.

**Table 2.** Logistic Regression Results: Association of Population Characteristics With CRC Screening

Population Characteristics	Unadjusted		Adjusted	
	OR (95% CI)	P	OR (95% CI)	P
<b>Demographics (identified from EMR)</b>				
Age (by 10 years)	1.12 (0.85-1.49)	.4178	1.12 (0.82-1.52)	.4690
Gender Female	1.20 (0.89-1.62)	.2386	1.00 (0.72-1.38)	.9893
Race/ethnicity Non-white	1.05 (0.53-2.09)	.8901	—	—
Length of membership, y	0.99 (0.95-1.03)	.4973	—	—
Number of medications	1.05 (1.01-1.09)	.0119	0.99 (0.95-1.03)	.6625
<b>Comprehensiveness of CRC screening discussion scale (identified from survey)</b>	1.84 (1.20-2.81)	.0053	1.51 (1.03-2.21)	.0349
<b>Perceived benefits scale (identified from survey)</b>	1.70 (1.32-2.18)	<.0001	1.46 (1.13-1.90)	.0042
<b>Utilization characteristics (identified from EMR)</b>				
Primary care utilization ≥1 visits	6.16 (4.16-9.14)	<.0001	5.82 (3.87-8.74)	<.0001

CI indicates confidence interval; CRC, colorectal cancer; EMR, electronic medical record; OR, odds ratio; PCP, primary care physician.

### Associations With CRC Screening

Table 2 presents unadjusted and adjusted logistic regression results. Patients' perceptions of the comprehensiveness of CRC screening discussions and perceived benefits had independent significant ( $P < .05$ ) associations with completion of CRC screening, after simultaneous adjustment. A higher score on the comprehensiveness of CRC screening discussion scale was associated with greater odds of completing CRC screening in both unadjusted (OR, 1.84; 95% CI, 1.20-2.81,  $P = .005$ ) and adjusted (OR, 1.51; 95% CI, 1.03-2.21,  $P = .035$ ) analyses. A higher score on the perceived benefits scale was associated with greater odds of completing CRC screening in both unadjusted (OR, 1.70; 95% CI, 1.32-2.18,  $P < .0001$ ) and adjusted (OR, 1.46; 95% CI, 1.13-1.90,  $P = .004$ ) analyses.

Of patient-demographic and clinical-characteristic covariates, 1 or more primary care visits in the follow-up period (9 months after ATC) was associated with greater odds of completing CRC screening in both unadjusted (OR, 6.16; 95% CI, 4.16-9.14,  $P < .0001$ ) and adjusted (OR, 5.82; 95% CI, 3.87-8.74,  $P < .0001$ ) analyses. Having more medications (OR, 1.05; 95% CI, 1.01-1.09,  $P = .012$ ) was associated with greater odds of completing CRC screening in the unadjusted analysis; however, this finding did not remain significant in multivariable analysis.

## DISCUSSION

We found that patients who reported that their PCPs engaged in more comprehensive discussion of CRC screening had significantly greater odds of completing screening. We also found that when patients perceived greater benefits from

CRC screening, they had significantly greater odds of completing screening. This study is the first that we know of to find that the more aspects of CRC screening discussed by PCPs (as perceived by patients), the more likely patients were to screen.

We found that 1 or more primary care visits was even more strongly associated with completion of CRC screening, irrespective of discussion of CRC screening. This finding is similar to those of previous studies that found primary care utilization to be associated with increased CRC screening.<sup>12,19,33,34</sup> Specifically, contact with primary care in an integrated system, such as KPNW, can facilitate the scheduling of needed screening services. However, our study was able to determine the relative contribution of primary care utilization relative to other measures examined, as self-reported by patients; namely, discussion of CRC screening by PCP and perceived benefits of CRC screening. Having 1 or more primary care visits was independently associated with increased CRC screening (OR, 5.82; 95% CI, 3.87-8.74), irrespective of comprehensiveness of CRC screening discussion by PCPs (OR, 1.51; 95% CI, 1.03-2.21), and perceived benefits of CRC screening (OR, 1.46; 95% CI, 1.13-1.90).

Our findings are similar to those from previous research examining the association between patient-provider communication and receipt of CRC screening. Lafata and colleagues (2006) found that a provider recommendation for CRC screening was strongly associated with receipt of cancer screening. In addition, in a study of Medicare beneficiaries, O'Malley and colleagues<sup>23</sup> found that patients who rated their physicians as having better information-giving skills were more likely to receive CRC screening, compared with patients who rated their physicians as having worse information-giving

skills. Similarly, a study by Maxwell and colleagues<sup>35</sup> found that patient-provider communication was the most important mediator of CRC-screening completion among a population of Filipino Americans. In their study, 20% of the total intervention effect size was explained by patient-provider communication, the highest of any factor studied. Last, Lafata and colleagues<sup>20</sup> found that patients of providers who arranged to discuss test results in a follow-up visit were more likely to receive CRC screening. These findings reinforce the importance of physician-provider communication in influencing screening decisions. A unique finding of our study is that the more elements patients reported their PCPs discussing, the greater the likelihood of those patients completing screening. Previous studies have shown that *any* recommendation by PCPs, and provider communication style, can both influence likelihood of screening receipt; our study suggests that the content and variety of CRC screening discussions—including the number of elements discussed—is also an important predictor of screening.

Our finding that general agreement with the benefits of CRC screening was associated with increased CRC screening is consistent with findings from previous studies. Myers and colleagues<sup>28-30</sup> found that positive beliefs regarding the benefits of screening and perceived salience and coherence (ie, that screening is important and sensible) were associated with increased CRC screening.

The results of our study can be used to improve care delivery. Our findings suggest that the breadth and content of discussion about CRC screening by PCPs can improve screening rates. However, development of quality improvement interventions to increase discussion of screening should be mindful of PCPs' limited time to see patients and the need to discuss other preventive and chronic illness topics. With the movement toward team-based care and the primary care medical home (PCMH), non-MDs (eg, care managers and health educators) could counsel patients on CRC screening in these redesigned care settings. As a result, enhanced discussion of CRC screening could occur in the primary care setting, without further burdening PCPs.

Our study had several limitations. First, the measure of comprehensiveness of CRC screening discussion was self-reported by patients. As a result, participant responses may have been limited by recall bias, and participant responses may not have matched the PCP encounter. Moreover, because assessment of CRC discussion happened after screening (for most patients that were screened), screeners may have been more likely to remember aspects of CRC screening discussion, compared with non-screeners. In addition, it is possible that discussion of CRC screening may have occurred with non-PCP providers. In addition, the CRC discussion mea-

sure had some level of missing information. However, this limitation is mitigated through use of multiple imputation, a robust statistical approach<sup>32</sup> to handle the level of missing information reported in this study. In addition, men were less likely to respond to the survey, limiting external validity. In addition, the results may not be generalizable beyond a group model HMO setting, such as to small private medical practices. We believe this last limitation is not significant because the target age demographic (50-80 years)—even in non-group-model HMO settings—regularly see PCPs for ongoing routine care. Thus, PCPs in these alternative care delivery settings can have an equally important role in discussion of CRC screening. Finally, the study included few racial/ethnic minorities; however, the study population was representative of the HMO membership from which the study population was selected.

Our study results suggest several areas of future research. First, more research is needed to better understand whether the association of comprehensive discussion of CRC screening with completion of CRC screening is similar in other delivery systems where FIT is not the primary screening method. Second, innovative care interventions are needed to understand how to incorporate discussion of CRC screening into new team-based care delivery models (eg, PCMH) and to determine whether these models improve CRC screening rates. Similarly, more research is needed to understand whether different providers (PCPs, non-PCPs) are more likely to discuss CRC screening and whether provider type influences completion of screening. Next, more work is needed to understand whether discussion of CRC screening affects completion of specific screening tests differently (eg, FIT vs colonoscopy). Finally, more research is needed on the association of comprehensiveness of discussion of CRC screening with completion of CRC screening in ethnically diverse populations.

We suggest that our results, and results from other research on factors influencing receipt of CRC screening, be used to develop interventions to improve patient-provider communication regarding CRC screening and to examine whether such interventions improve CRC screening rates overall. Interventions that target factors known to have strong associations with screening completion likely have the best chance of raising the persistently low rates of colon cancer screening in the United States.

## CONCLUSIONS

We found that patients' self-report of more comprehensive discussion of CRC screening by PCPs and a greater perceived level of benefit were independently associated with receipt of CRC screening. This suggests that CRC screening efforts may

be usefully directed toward increasing the intensity of screening discussion by PCPs and other care providers. Such efforts may also increase the perceived benefits of CRC screening by patients, further augmenting the approach's effect.

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