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Assessing Colorectal Cancer Screening Barriers by Two Methods

Mira L. Katz[1,2,3], **Gregory S. Young**[2], **Barret J. Zimmermann**[1,2], **Cathy M. Tatum**[2], **Electra D. Paskett**[1,2,3]

[1]College of Public Health, The Ohio State University, Suite 525 1590 North High Street, Columbus, OH 43201, USA

[2]Comprehensive Cancer Center, The Ohio State University, Suite 525 1590 North High Street, Columbus, OH 43201, USA

[3]College of Medicine, The Ohio State University, Suite 525 1590 North High Street, Columbus, OH 43201, USA

Abstract

Colorectal cancer (CRC) is commonly diagnosed in the USA despite screening tests that have decreased CRC incidence and mortality. Finding the best method to identify patient-level screening barriers is important to improve CRC screening rates. A group-randomized trial was conducted among ten primary-care clinics. Clinics were randomized to a multi-level (clinic, provider, patient) CRC screening intervention or usual care (2007–2013). Subsequent to clinic- and provider-level interventions, a three-step, patient-level intervention was conducted. One step of the patient-level intervention was a CRC screening barriers counseling call conducted by a lay health advisor (LHA). During the call, two methods were used to identify CRC screening barriers. An open-ended question was used first to determine why participants had not completed screening (without probes). Subsequently, the LHA read a list of additional potential screening barriers and asked participants whether each barrier was applicable (with probes). A generalized estimating equation approach was used to compare the two methods. Participants (n = 109) were female (59%), had a mean age of 57.2 years, and were white (67%) or black (31%). Most participants had some college education or a college degree (79%), annual household income $30,000+ (60%), and health insurance (80%). The number of CRC screening barriers increased with probing compared to the open-ended question format (OR 2.10, 95% CI 1.92–2.31; $p < 0.01$). The ranking of reported CRC screening barriers did not vary by assessment method. However, the methodology used to document CRC screening barriers may influence the content of patient-directed interventions.

Keywords

Colorectal neoplasms; Early detection of cancer; Screening

Mira L. Katz, Mira.Katz@osumc.edu.

Introduction

Colorectal cancer (CRC) is the second most common cancer diagnosed and the second leading cause of cancer death affecting both men and women in the USA [1]. In 2016, it is estimated that 134,490 men and women will be diagnosed with CRC and 49,190 will die from this disease in the USA [1]. CRC incidence and mortality rates vary among different populations according to gender, age, race, ethnicity, income, insurance status, and geographic location [2]. In Ohio, an estimated 5340 new CRC cases will be diagnosed and 2060 CRC deaths will occur in 2016 [1]. Although screening tests for CRC are widely available, many individuals do not adhere to screening guidelines (2). Ohio ranks 12th highest among US states for CRC mortality and 31st for adherence with CRC screening guidelines [2, 3].

Patient-reported CRC screening barriers are multi-faceted and include many factors and levels identified in a social ecological framework of health [4, 5]. Patient-level CRC screening barriers have been reported using several assessment methods including focus groups [6–9], face-to-face [10, 11] and telephone interviews [12–16], and mailed surveys [17]. Specifically, during telephone interviews, CRC screening barriers have been documented by an open-ended question [12], asking participants to provide the main reason for not completing CRC screening after reading a list of potential barriers [15, 16], or by having participants respond from a list of commonly reported CRC screening barriers [13, 14].

In a recent study [18, 19], we first identified patient-reported CRC screening barriers using an open-ended question. Following the open-ended question, we asked participants about additional potential CRC screening barriers from a list read by a lay health advisor (LHA) during a telephone counseling call. The objective of this study was to determine if patient-reported CRC screening barriers varied depending on how they were assessed during the telephone interview. The method used to identify patient-level screening barriers may be important when planning evaluation strategies and resources for future patient-directed interventions to increase CRC screening rates.

Methods

A multi-level (clinic, provider, patient) stepped intervention to increase CRC screening among average-risk adults was tested in a group-randomized trial from 2007 to 2013. The study's design and results have been previously reported [18, 19]. Briefly, ten primary-care clinics were randomized to intervention or usual care (five clinics per group). All patients recruited into the study were not within CRC screening guidelines. CRC screening completion was assessed from a review of medical records of patients who consented to participate in the study. The study was approved by the Institutional Review Board of The Ohio State University. A brief description of the multi-level intervention follows.

Description of Multi-Level Intervention

The first level of the intervention focused on the clinic environment. CRC screening brochures were put in waiting rooms, and CRC screening posters were placed in

examination rooms in the intervention clinics. The second level was aimed at physicians in the intervention clinics. Educational sessions were conducted and included a standardized PowerPoint presentation focused on current evidence-based CRC screening guidelines and communication strategies to assist in engaging in CRC screening discussions with patients, and current CRC screening scientific literature was distributed.

Subsequent to the clinic- and provider-level interventions, participants still not within CRC screening guidelines progressed to the third level of the intervention that included a three-step, increasingly intensive patient-level intervention. The first step was a personalized letter from the patient's primary-care physician plus an American Cancer Society CRC screening brochure. Step 2 included a CRC screening barrier counseling telephone call conducted by a LHA (explained below), and step 3 was an in-person educational session with a LHA. CRC screening completion for participating patients was assessed after the clinic- and provider-level interventions and after each step of the patient-level intervention.

Assessment of CRC Screening Barriers

Assessment of CRC screening barriers was conducted by the LHAs during the barrier counseling telephone call among patients not adherent to CRC screening guidelines in the intervention clinics. This study does not include patients in the clinics randomized to usual care. Our study included three LHAs who were women, aged 40–50 years old, and with no formal medical training. The LHAs completed training which consisted of a review of the CRC barriers assessment and telephone counseling scripts, assessment techniques, role playing, and several practice counseling sessions. During the telephone call, LHAs assessed CRC screening test barriers and offered counseling and support to address patient-reported barriers.

Assessment of CRC screening barriers was completed using a two-step method. First, participants were asked an open-ended question about why they had not completed a CRC screening test and the LHA marked down all reasons mentioned by the participant. Next, the LHA stated "Now, I am going to list some other reasons people report why they have not completed a colon cancer screening test. Please tell me if any of these are a reason for you not completing a colon cancer screening test." For each CRC screening barrier listed by the LHA, the participant provided a "yes" or "no" response. CRC screening barriers reported by the participant in response to the open-ended question were not included in the list of individual barriers read by the LHA since those were barriers already reported by the participant.

Patient-reported barriers were also categorized into four major barrier groups: (1) test related, (2) knowledge and attitudes, (3) financial concerns, and (4) interpersonal. The probability of reporting one or more of the screening barriers in each of the four barrier groups was also explored.

Patient Participants

Eligibility criteria for patients from the ten clinics who participated in this study were (1) being age 50 or older; (2) having no prior history of familial/hereditary cancer syndrome, polyps, or inflammatory bowel disease; (3) being average risk for CRC; (4) having a visit to

the clinic in the past 2 years; (5) having a current address in their medical record and no definite plans to move within the next year; (6) having a current telephone number; (7) being in good health; (8) not being within CRC screening guidelines; and (9) providing consent.

Baseline Survey

Patient participants completed a baseline survey conducted by telephone prior to start of the multi-level CRC screening intervention. The following domains were included:

Demographic Characteristics—At baseline, patient participants provided information regarding their gender (male/female), age (years), race (white/black or African American/ other), ethnicity (Hispanic), education (less than high school/high school/some college or associates degree/college graduate), marital status (single/never married/married or living together/ separated/divorced/widowed), employment status (full time/part-time/retired/ volunteer/ disabled/unemployed), annual household income (dollars), health insurance (uninsured/public/ private), and smoking status (current/former/never).

General Health—Patient participants were asked to self-rate their health (excellent/very good/good/fair/poor).

CRC Screening Knowledge, Beliefs, and Intention—Participants were asked if CRC screening should begin at age 50 (yes/no; knowledge), and CRC screening beliefs were measured by responses to five statements with responses on a 5-point Likert scale (strongly agree to strongly disagree). Responses were summed (5–25) with higher scores representing more positive CRC screening beliefs. In addition, participants were asked if they would be willing to complete a CRC screening test if their doctor recommended a test (yes/no), if they thought about talking to their doctor about completing a CRC screening test in the next 6 months (yes/no), and if they intended to complete a CRC screening test in the next 6 months (yes/no).

Statistical Analysis

Demographic characteristics were compared using Fisher's exact test for categorical variables and a two-sample t test for age between those who completed the call and those who were screened prior to the call. A Poisson model was used to analyze the number of barriers reported. Participants had two measurements of this outcome, without and with probing. As barriers reported without a probe were not repeated with a probe, a barrier was assumed to be present in the probe condition if it was reported without a probe. A generalized estimating equation (GEE) approach was used to control for the repeated measures on each participant, and empirical standard errors were used [20]. The impact of covariates on the number of barriers was evaluated by including the covariate in the model with the probe indicator. The presence or absence of a barrier in each of the four barrier groups was modeled similarly using a GEE approach for a binary outcome with a logit link. Interactions between each covariate and the probe indicator were also evaluated. All analyses were conducted in SAS v9.4 (SAS Institute, Cary, NC).

Results

There were 280 patient participants in the intervention clinics. After the clinic and provider interventions, 63 patient participants completed a CRC screening test. From the 217 eligible participants for the first step of the patient-level intervention, 10 completed CRC screening prior to step 2 of the patient-level intervention. Of the 207 eligible participants for step 2 of the patient-level intervention, 27 additional participants self-reported completing a CRC screening test at the beginning of the call and 109 participants completed the barrier telephone call (Table 1).

Participants who completed CRC screening prior to the telephone barrier call were compared to those who completed the call to determine if there were differences in demographic characteristics among these two groups. Participants who completed screening that was verified by medical record review prior to the barriers call were younger (mean age 55 vs. 57 years) and more likely to be employed full time (75% vs. 56%) compared to participants who still needed CRC screening and completed the call (both $p < 0.05$). There were no significant differences in gender, race, marital status, and income between the two groups.

Among the 109 participants who completed the telephone barriers call, over half were female (59%) and had a mean age of 57.2 years. Most participants were white (67%) or black (31%); attended some college or college graduates (79%); were employed full time or part-time (56%); had household incomes ≥$30,000 (60%); and 80% had health insurance. Slightly more than a quarter of participants were current smokers, and self-rated health was reported as “excellent/very good” by 53% of participants. Slightly over half (59%) of participants correctly identified that CRC screening should begin at age 50. Additionally, 74% of participants reported that they would be willing to have a CRC screening test based on doctor recommendation, but only 33% stated that they intended to complete a CRC screening in the next 6 months.

The number of screening barriers (mean and standard deviation [SD]) by participant demographic characteristic and CRC screening knowledge, beliefs, and intention using the two assessment formats (without probe and with probe) is shown in Table 2. The mean number of reported barriers doubled with probing from a list of screening barriers (2.10 fold increase, 95% confidence interval 1.92–2.31; $p < 0.001$).

Several participant characteristics had a significant effect in the Poisson GEE model for the number of reported CRC screening barriers. Fewer screening barriers were reported by participants who had less education ($p < 0.001$), were single ($p = 0.002$), had lower household annual income ($p = 0.043$), were currently smokers ($p = 0.017$), were willing to have a CRC screening test if doctor recommended ($p = 0.007$), and intended to complete CRC screening in the next 6 months ($p = 0.008$). Age was modeled continuously and was not a significant predictor of the number of barriers reported ($p = 0.870$). No significant interactions were detected between these predictors and the barriers assessment method in the Poisson model. These results indicated that for a given covariate, the average number of barriers by the levels of that covariate increased at relatively the same rate with the probe.

An example of how the number of CRC screening barriers was different by level of participant characteristic and assessment method is for education. The mean number of barriers reported without probing was 1.2 for participants with high school or less, a mean of 1.7 for those with some college or associates degree, and a mean of 1.7 for college graduates. With probing, the mean number of screening barriers reported by participants increased to 2.3 for high school or less, 3.8 for some college or associates degree, and 3.5 for college graduates.

The number of times each CRC barrier was reported within each barrier group is listed in Table 3. The most frequently reported barriers without probing were (1) not a priority/too much bother or inconvenience, (2) not necessary because no problems/no family history/not at risk, (3) test may be painful or uncomfortable/fear of procedure in general, (4) cost, and (5) my doctor never recommended/different CRC screening test recommendation. Following probing, the most frequently reported CRC screening barriers were the same five barriers reported without probing.

We also explored the effect of demographic characteristics on the probability of the different barrier groups being reported; without probing and with probing, there were relatively few significant results for main effects (ORs ranged from 1.8 to 3.1) and only three significant interactions. For the test-related barriers, current smokers generally were less likely to report a barrier ($p = 0.040$) than never or former smokers, and single/never married participants were less likely to report a barrier than divorced or married participants ($p = 0.024$). For the CRC screening belief scale, higher values (more positive beliefs) decreased the probability of a test-related barrier (OR (for 5-unit increase) 0.47, 95% CI = 0.26–0.85; $p = 0.012$). Financial barriers were more likely to be reported by uninsured participants than those with private or public insurance ($p < 0.001$). Interpersonal barriers were more likely to be reported by participants who did not intend to complete a CRC screening in the next 6 months ($p = 0.027$).

In this model focused on barrier groups, a significant interaction between a given covariate and the assessment method indicated that the odds of reporting a barrier increased differently after the probe according to the level of the covariate. One interaction was observed for test-related barriers for the question “Have you thought about talking to your doctor in the next 6 months about a CRC screening?” Participants who had thought about talking to their doctor did not have as much of an increase in the probability of reporting a test-related barrier when probed as those who had not thought about it ($p = 0.039$). Another significant interaction was for financial barriers on the income predictor. Those making > $70,000 annually did not show an increase in the probability of a financial barrier when probed, whereas those making <$70,000 did show an increase ($p = 0.001$).

Discussion

We examined the relationship between the methodology used (without probe vs. with probe) to document CRC screening barriers and the number of barriers reported by participants. The number of screening barriers (OR = 2.10, 95% CI 1.92–2.31; $p < 0.01$) and odds of reporting a barrier group (test related, knowledge and attitudes, financial concerns, and

interpersonal) roughly doubled when participants were probed about each barrier compared to the open-ended question format. Interestingly, the most frequent CRC screening barriers reported by participants were the same using both methods of assessment. These findings suggest that the methodology used to document CRC screening barriers may influence the number of barriers reported by individuals but does not impact the most frequently reported CRC screening barriers.

Overall, CRC screening barriers occur at and between different levels within a social ecological model of health [4, 5]. CRC screening barriers reported by individuals often relate to their knowledge, beliefs, attitudes, or past experiences. Regardless of whether participants are asked about CRC screening barriers in focus groups, interviews, or by surveys, screening barriers are complex, multi-faceted, and may involve factors from individual to societal levels. Commonly reported barriers usually focus on an individual's CRC screening, knowledge, attitudes, and beliefs [5, 15, 16]. These include, but are not limited to, perceived low risk for CRC because of being asymptomatic and having no family history of CRC [5], lack of a provider recommendation [15], limited knowledge about CRC screening recommendations and/or the different CRC screening test options [7, 15], perceived embarrassment and/or discomfort with completing a screening test [7, 9–11, 14, 17], concerns about screening tests and related bowel preparation [6, 7, 14], fear of a cancer [5, 7, 14], burdening family members [7], the direct (exam cost) and indirect (transportation) costs associated with completing a CRC screening test for uninsured or under-insured populations [6, 7, 9, 16], and distrust and limited access to the health care system [7].

Previously reported CRC screening barriers are consistent with those we documented in the current study. It is interesting to note that in our study, participants with higher levels of education and income reported more CRC screening barriers than those with less education and lower annual household incomes. This finding seems counterintuitive; however, it may be a reflection of a busier lifestyle and/or the type of CRC screening tests (colonoscopy vs. fecal occult blood test) recommended by physicians. Another finding in our study was that single participants reported fewer CRC screening barriers compared to married participants. Since improved CRC screening rates have been shown among married individuals [21, 22] and participants in the current study were not within CRC screening guidelines, this finding may be a reflection that some married participants may have less supportive spouses [22].

Since the barriers counseling call occurred after each participant was sent a letter from their physician recommending CRC screening, an important finding from our study documented fewer reported CRC screening barriers among participants who reported that they would complete a CRC screening test if their physician recommended a test and among those who reported intention to complete CRC screening within the next 6 months. To move these individuals to take action and complete CRC screening may need the additional support of a patient navigator, which has shown to improve completion of CRC screening tests and is cost-effective [23–25].

The strength of this research is that CRC screening barriers were documented among participants using the two methods that are commonly used when conducting intervention research. Although the number of barrier patients reported doubled with probing for

commonly reported screening barriers, the most frequently reported barriers did not change. This finding has implications when conducting evaluation of intervention research and implies the importance of not changing the method of assessing screening barriers within a given study. It also suggests that the activities of patient navigation can focus on patient-reported screening barriers and navigators do not have to probe for additional screening barriers.

Limitations include CRC screening barriers based on self-report, although an individual's perceived barriers are important when they are deciding whether or not to complete a cancer screening test. CRC screening barriers reported by the participant in response to the open-ended question were not repeated in the list read by the LHA; thus, the probed responses could not identify fewer barriers than the open-ended question format. The order of CRC screening barriers listed by the LHA was not randomized, which may have an effect on frequency that each barrier was reported by participants. The study had a modest sample size of 109 participants, the response rate was 53%, and most participants (79%) had some college education or a college degree; thus, patients with less education are not well represented. Participants were also from one geographic location which may also reduce generalizability of the study findings.

Conclusions

To the best of our knowledge, this study is the first to compare two methods to assess CRC screening barriers. First, we assessed screening barriers using an open-ended question allowing participants to report what they thought were their barriers. Subsequent to the open-ended question, we read a list of the most common CRC screening barriers and asked each participant to reply if each barrier was affected by their screening behavior. By using this methodology, we were able to elicit a more comprehensive list of screening barriers. Although the most frequently reported barriers remained the same with both assessment methods, public health practitioners should pay special attention to their method of eliciting cancer screening barriers from patients, since the method used may affect the number of barriers listed or the overall frequency of reported barriers. The results of this study suggest that asking individuals an open-ended question about their CRC screening barriers may save time and resources compared to reading a list of potential barriers. This may have implications for organizations developing health programs and for the design of future interventions to improve CRC screening rates.

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Table 1

Demographic characteristics and colorectal cancer (CRC) screening knowledge and intention of participants completing telephone CRC screening barrier telephone call ($n = 109$)

Characteristic	Level	Participants, *n* (%)
Gender	Female	64 (58.7%)
	Male	45 (41.3%)
Race	Black	34 (31.2%)
	White	73 (67.0%)
	Other	2 (1.8%)
Education	High school or less	23 (21.1%)
	Some college/associates degree	49 (45.0%)
	College graduate	37 (33.9%)
Marital status	Single/never married	26 (23.8%)
	Married/living together	49 (45.0%)
	Separated/divorced/widowed	34 (31.2%)
Employment status	Full time or part-time	61 (56.0%)
	Retired/volunteer	20 (18.3%)
	Disabled/unemployed	28 (25.7%)
Household annual income	<$30,000	41 (40.2%)
	$30,000–69,999	36 (35.3%)
	$70,000+	25 (24.5%)
Insurance status	Uninsured	22 (20.4%)
	Public insurance	32 (29.6%)
	Private insurance	54 (50.0%)
Smoking status	Current	28 (26.2%)
	Former	30 (28.0%)
	Never	49 (45.8%)
Self-rated health	Excellent/very good	58 (53.2%)
	Poor/fair/good	51 (46.8%)
Medical conditions requiring regular doctor visits	Yes	62 (57.4%)
	No	46 (42.6%)

Characteristic	**Level**	**Participants, *n* (%)**
Would you be willing to have a CRC screening test if doctor recommended	Yes	81 (74.3%)
	No	28 (25.7%)
Have you thought about talking to your doctor about completing CRC screening in the next 6 months?	Yes	27 (24.8%)
	No	82 (75.2%)
Do you intend to complete CRC screening in the next 6 months?	Yes	36 (33.3%)
	No	72 (66.7%)
Indicated CRC screening should begin at age 50	Yes	64 (58.7%)
	No	45 (41.3%)

Due to some missing data, total participant number may be lower than 109 in some categories

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Table 2

Number of CRC barriers reported by participants by assessment method

Characteristic	Level	Without probe, mean (SD)	With probe, mean (SD)	*p* value
Gender	Female	1.5 (0.8)	3.1 (1.8)	0.064
	Male	1.8 (1.1)	3.7 (2.1)	
Race	Black	1.5 (0.9)	2.9 (2.2)	0.134
	White	1.7 (0.9)	3.5 (1.8)	
	Other	2.0 (0.0)	4.5 (2.1)	
Education	High school or less	1.2 (0.4)	2.3 (1.3)	<0.001
	Some college/associates degree	1.7 (1.1)	3.8 (2.2)	
	College graduate	1.7 (0.8)	3.5 (1.7)	
Marital status	Single/never married	1.1 (0.3)	2.7 (1.5)	0.002
	Married/living together	1.8 (1.0)	3.5 (2.0)	
	Separated/divorced/widowed	1.7 (1.0)	3.8 (2.0)	
Employment status	Full time or part-time	1.6 (0.8)	3.4 (1.9)	0.914
	Retired/volunteer	1.6 (0.8)	3.3 (1.9)	
	Disabled/unemployed	1.7 (1.2)	3.5 (2.2)	
Household annual income	<$30,000	1.4 (0.8)	2.9 (1.7)	0.043
	$30,000–69,999	1.6 (0.9)	3.5 (2.3)	
	$70,000+	2.0 (1.0)	3.8 (1.6)	
Insurance status	Uninsured	1.5 (0.8)	3.6 (1.7)	0.866
	Public insurance	1.5 (0.9)	3.3 (2.3)	
	Private insurance	1.7 (0.9)	3.4 (1.9)	
Smoking status	Current	1.3 (0.6)	2.7 (1.5)	0.017
	Former	1.7 (1.1)	3.8 (2.3)	
	Never	1.8 (0.9)	3.5 (1.9)	
Medical conditions requiring regular doctor visits	Yes	1.6 (1.0)	3.4 (2.1)	0.791
	No	1.7 (0.8)	3.4 (1.7)	
Indicated CRC screening should begin at age 50	Yes	1.6 (0.9)	3.3 (1.7)	0.783
	No	1.6 (0.9)	3.5 (2.3)	
Self-rated health	Excellent/very good	1.7 (0.9)	3.4 (1.7)	0.608

Characteristic	Level	Without probe, mean (SD)	With probe, mean (SD)	*p* value
	Poor/fair/good	1.5 (0.9)	3.3 (2.2)	
Would you be willing to have a CRC screening test if doctor recommended	Yes	1.5 (0.7)	3.1 (1.7)	0.007
	No	2.0 (1.3)	4.2 (2.4)	
Have you thought about talking to your doctor about completing CRC screening in the next 6 months?	Yes	1.6 (0.9)	2.9 (1.6)	0.210
	No	1.6 (0.9)	3.5 (2.0)	
Do you intend to complete CRC screening in the next 6 months?	Yes	1.4 (0.6)	2.7 (1.5)	0.008
	No	1.7 (1.0)	3.7 (2.1)	

SD standard deviation

Table 3

Patient-reported colorectal cancer screening barriers by assessment method

Barrier	Without probe, *n*	Additional with probe, *n*	Total number
Test-related			
Test may be painful or uncomfortable/fear of procedure in general	20	12	32
Embarrassed about the test	6	11	17
Test (FOBT) is messy	5	14	19
Already had/scheduled another CRC screening test	3	6	9
Transportation problems (colonoscopy)	2	14	16
Tests are inaccurate or not thorough enough	1	4	5
I would have to go to an unfamiliar place	0	7	7
Test causes cancer	0	0	0
Knowledge/attitudes			
Not a priority/too much bother or inconvenience	38	17	55
Not necessary, no problems/no family history/not at risk	35	15	50
Never thought about it	8	14	22
Age	7	16	23
Afraid I might have cancer/worry of results	1	3	4
I do not know where to go get it done	0	5	5
Did not know about it/never heard of it	0	3	3
Financial			
Cost	16	16	32
No health insurance	11	8	19
Insurance does not (or might not) cover it/high deductible	3	12	15
Interpersonal			
Doctor never recommended/different CRC screening test recommendation	15	11	26
Someone recommended not to/heard about bad experience	4	5	9