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Perceptions of Colon Cancer Screening by Stage of Screening Test Adoption

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Abstract

Colorectal cancer remains the second leading cause of cancer death in the United States. To fully realize the benefits of early detection of colorectal cancer, screening rates must improve. This study assessed differences in beliefs (from the Health Belief Model) by stage of screening behavior adoption (based on the Transtheoretical Model of Change) as a foundation for intervention development. More people were in the precontemplation stage (not thinking about having the screening test) for fecal occult blood test and sigmoidoscopy versus contemplation (thinking about having the test) or action (adherent with screening). Those in precontemplation stage for fecal occult blood test had lower perceived risk than those in contemplation, lower perceived benefits than those in action, and higher barriers than both those in contemplation and those in action. For sigmoidoscopy stage of readiness, again, precontemplators had lower perceived risk and self-efficacy than contemplators and higher barriers than both contemplators and actors. Given the popularity of the transtheoretical model and the success of stage-based interventions to increase other cancer screening, especially mammography, we should begin to translate such effective interventions to colorectal cancer screening. As such, this study is one of very few to quantify beliefs across stages of colorectal cancer and identify significant differences across stages, laying the foundation for the development and testing of stage-based interventions.

Keywords

Colorectal cancer screening; Early detection; Health belief model; Stages of change

Colorectal cancer (CRC) is the third most common cancer in men and women in the United States. About 145,290 new cases are expected this year, with an estimated 56,290 deaths.¹ Survival from CRC is inversely related to stage at diagnosis; late-stage diagnosis is related to lower survival. Regular screening could offset this by facilitating early detection, leading to early-stage diagnosis. However, current screening rates remain suboptimal. Recent data indicate that fecal occult blood test (FOBT) screening rates were 17% for men and women and 5-year screening rates for sigmoidoscopy/colonoscopy were less than 33.5% for men and 27% for women.^{2,3} To realize fully the benefits of early detection, screening rates must increase considerably. Clearly, there is a need for interventions to facilitate participation in screening. Indeed, early-stage diagnosis is associated with a 90% 5-year survival rate, but

only 38% of all cancers are discovered at this stage, owing, at least in part, to suboptimal screening.⁴ When CRC is diagnosed later, regional and distant metastases can decrease survival rates up to 9%.⁴

According to several major medical organizations, those at average risk—those with no family or personal history of CRC, adenomatous polyps, or inflammatory bowel disease—should start screening at age 50 years. About 90% of CRC is diagnosed in people 50 years or older.³ Screening options include (1) annual FOBT, (2) flexible sigmoidoscopy every 5 years, (3) annual FOBT plus flexible sigmoidoscopy every 5 years, (4) colonoscopy every 10 years, or (5) double contrast barium enema every 5 years.

Behavior-change interventions must have a strong theoretical basis if they are to be effective and replicable. Although there are several behavior-change models and theories, among the most popular are the Health Belief Model (HBM) and the Transtheoretical Model (TTM) of Change. To facilitate intervention development, this study assessed differences in beliefs (from the HBM) by stage of screening behavior adoption (based on the TTM) and identified specific beliefs at each stage of behavior adoption. Research objectives guiding analysis were the following:

1. Describe the distribution of people in the various stages of screening behavior adoption and demographic differences between stages of adoption for FOBT and sigmoidoscopy.
2. Assess if beliefs (perceived susceptibility, benefits, barriers, and self-efficacy) and knowledge are significantly different by stage of behavior adoption for FOBT and sigmoidoscopy.
3. Identify specific beliefs significant to stage of behavior adoption for FOBT and sigmoidoscopy.

The TTM, which states that behavior change occurs in a series of incremental stages, has been used extensively to study health promotion behaviors such as exercise, smoking cessation, and mammography use^{5–8} but is less used in CRC screening research. The HBM, which posits that behavior change is influenced by a certain combination of beliefs, has been used extensively in cancer screening research, including CRC screening. Combined, these models form a framework that addresses behavior change through incremental movement in stages by focusing on specific beliefs at each stage. Frameworks based on the TTM and the HBM have been used successfully in mammography screening, smoking cessation, nutritional intake, exercise behavior, and addiction counseling.^{5,6,9–11} Researchers have supported use of these theoretical models in CRC screening. A review by Vernon¹² demonstrated that beliefs such as benefits, barriers, and health motivation are related to FOBT and sigmoidoscopy use among people at average risk. Past studies also identified that beliefs such as benefits and barriers differ significantly by stage of behavior adoption.^{13,14} Rawl and colleagues¹⁵ found similar differences in benefits and barriers by behavior adoption stage for FOBT, flexible sigmoidoscopy, and colonoscopy among high-risk individuals with a family history of CRC. Although some studies in CRC screening were based on HBM variables, research in this area, although promising, is sparse; most studies only assessed benefits and barriers, not the full range of HBM beliefs. The current study will add to the knowledge base by identifying not only the differences in perceived susceptibility, benefits, barriers, and self-efficacy across stages of FOBT and sigmoidoscopy adoption but also the specific beliefs at each stage for most of those who get CRC—those at average risk. Such information may help inform intervention development targeted to stage and specific individual beliefs at each stage.¹⁵

Methods

The primary study from which these data are drawn was an institutional review board–approved, randomized controlled trial to assess the effectiveness of 2 tailored interventions for increasing FOBT and sigmoidoscopy use.

Procedures

A letter introducing the study was sent to eligible members of a large Midwestern health maintenance organization (HMO), which was followed by a telephone call from a research assistant. Participants were 50 years or older, with no previous CRC diagnosis, and not adherent with screening recommendations. If an eligible person agreed to participate in the study, an interview was conducted either immediately or at a more convenient time to identify HBM-related beliefs and stage of screening behavior adoption. Those randomly assigned to the control group received no intervention (ie, usual care from the HMO); the tailored communication group received a tailored letter and newsletter in the mail; and the letter-only group received a generic letter encouraging CRC screening. Postintervention telephone interviews were conducted at 6 weeks. Data for this report were taken from the postintervention interview. Briefly (because the purpose of this study is not to describe intervention effectiveness), the tailoring was computer based, with messages delivered tailored to individual beliefs identified in the baseline interview. Each person received a cover letter addressing risk and stage of readiness and a newsletter tailored to their individual perceived susceptibility, benefits, barriers, and self-efficacy assessed at baseline.

Measures

Belief measures were previously validated for internal consistency reliability.¹⁶ All beliefs were measured using Likert scales, with response sets ranging from “strongly disagree” to “strongly agree.” We used simple summation to create total belief scores. Definitions of beliefs (derived from the HBM) and internal consistency reliability were the following:

Perceived susceptibility to CRC: perceived risk of developing CRC (Cronbach $\alpha = .68$).

Perceived barriers: perceived obstacles that inhibit or prevent an individual from completing a screening test (Cronbach $\alpha = .76$ for FOBT and $.71$ for sigmoidoscopy).

Perceived benefits: perception of positive outcomes associated with each test (Cronbach $\alpha = .62$ for FOBT and sigmoidoscopy).

Perceived self-efficacy: confidence in one’s ability to perform FOBT or have a sigmoidoscopy (Cronbach $\alpha = .83$ for FOBT and $.89$ for sigmoidoscopy).

The multidimensional knowledge measure included questions on cognitive information about CRC risk, screening recommendations, causes, treatment, and cure.

Definitions of stage of screening behavior for the various CRC screening modalities were the following:

FOBT

Precontemplation: never had an FOBT or last FOBT was more than a year ago and not thinking about having an FOBT in the next 2 months.

Contemplation: never had an FOBT or last FOBT was more than a year ago but thinking about having an FOBT in the next 2 months.

Action: FOBT was within the last year.

Sigmoidoscopy

Precontemplation: never had a sigmoidoscopy was more than 5 years ago and not thinking about having a sigmoidoscopy in the next 2 months.

Contemplation: never had a sigmoidoscopy or last sigmoidoscopy was more than 5 years ago but thinking about having a sigmoidoscopy in the next 2 months.

Action: Sigmoidoscopy was within the past 5 years.

Results

Sample

Because the initial response rate was low, we added a site in the Western United States. The study sample was combined because no changes were made to the study design between sites. Despite this, the response rate remained low overall at 25%: 20% in the Midwest versus 97% in the West. Implications and reasons for the low response rate are addressed in the “Discussion” section. Sample characteristics are detailed in Table 1. Mean age was 61 years ($SD = 8$); 57% were female, 81% were white, 62% worked for pay, 64% reported having graduated high school or had some college education, and 75% were married or living with a partner.

Data Analysis

Data were analyzed using SPSS 12.1 and SAS/STAT 7.0 software.^{17,18} Descriptive statistics were used to assess the distribution of sociodemographic beliefs regarding CRC screening. Chi-square tests assessed the relationship between stage of screening behavior adoption and sociodemographic and health belief variables. We used analysis of variance and post hoc comparisons (least significant difference) to assess differences in beliefs and knowledge by stage and to identify specific belief and knowledge items commonly associated with each stage.

Multinomial ordinal logistic regression was used to examine the relationship between sociodemographic variables, health beliefs regarding CRC and screening, and stage of screening behavior adoption. We ran separate models for each ordered response category (precontemplation, contemplation, and action) related to FOBT and sigmoidoscopy. Variables predictive of stage in bivariate analyses at $P \leq .10$ were included in multiple multinomial logistic regression models for FOBT and sigmoidoscopy to assess the relative influence of sociodemographic and health beliefs on stage. A backward selection procedure was applied. Variables remaining significant at $P \leq .05$ were then considered predictive of stage of screening behavior adoption (FOBT or sigmoidoscopy).

RESEARCH OBJECTIVE 1—The first objective of this study was to describe the distribution of people in the various stages of screening behavior adoption and demographic differences between stages of adoption for FOBT and sigmoidoscopy (Table 2).

For FOBT use, more participants were in precontemplation (43%), followed by action (20%) and contemplation (19%). Race/ethnicity was significantly related to stage ($\chi^2 = 9.35$, $P < .01$). As might be expected from the low numbers of nonwhites in the study, there were more whites in all 3 stages (Table 2).

For sigmoidoscopy, more than half were in precontemplation (53%), followed by contemplation (21%) and a small group in action (7%). No demographic differences were detected other than race/ethnicity ($\chi^2 = 12.20$, $P < .01$). Within-race differences indicated that more whites were in precontemplation (58%) compared with 8% of nonwhites; 16% in contemplation versus 10%; and 7% versus 1% in action.

RESEARCH OBJECTIVE 2—The second objective was to assess if beliefs (perceived susceptibility, benefits, barriers, and self-efficacy) and knowledge are significantly different by stage of behavior adoption for FOBT and sigmoidoscopy (Table 3).

For FOBT, mean perceived susceptibility, benefits, and barriers significantly differed by stage ($F = 4.09, P < .05$; $F = 4.90, P < .01$; $F = 15.05, P < .001$, respectively).

Precontemplators had lower mean perceived risk than contemplators, lower perceived benefits than actors, and higher barriers than both contemplators and actors.

For sigmoidoscopy, mean perceived risk, barriers, and self-efficacy were significantly different by stage ($F = 3.03, P < .05$; $F = 18.22, P < .001$; $F = 5.56, P < .01$, respectively).

Again, precontemplators had lower mean perceived risk and self-efficacy than contemplators and higher barriers than both contemplators and actors.

RESEARCH OBJECTIVE 3—The third objective was to identify specific beliefs significant to stage of behavior adoption for FOBT and sigmoidoscopy (Table 4).

In addition to scale means, we investigated item differences by stage of screening behavior adoption for FOBT and sigmoidoscopy using analysis of variance. Perceived susceptibility and knowledge items did not differ by stage for either FOBT or sigmoidoscopy. For FOBT, only 1 benefit item (“help me not worry as much about CRC”) was significantly different. Individuals in the action stage were significantly more likely to agree with this statement. Two barrier items were significant for FOBT: “not knowing how to do the test” and “not having symptoms.” Individuals in precontemplation had higher means for both items. Two self-efficacy items had higher means for those in contemplation compared with the other 2 stages: “can complete the test even if I don’t know what to expect” and “can find a store to buy an FOBT kit.”

For sigmoidoscopy, the same benefit item as FOBT (“not worry as much about CRC”) had a slightly higher mean for those in action. Six barrier items differed significantly by stage. Precontemplators were more likely to agree that time, pain, cost, not having symptoms, and the clear liquid diet were more likely to keep them from having a sigmoidoscopy. All but 2 self-efficacy items were different by stage. Those in action were consistently more likely to agree that they could make an appointment for a sigmoidoscopy, go without eating solid foods, get the test even if they are worried, get the test even if they do not know what to expect, find a way to cover the cost, talk to their provider about the test, follow instructions to prepare, arrange other things in their lives to get the test, have the test if they really want to, find time to cleanse their bowels, and deal with the fear of having the test.

Discussion

For the most part, there were no significant demographic differences by stage of adoption for FOBT or sigmoidoscopy. Greater proportions of African Americans were in action and precontemplation than were whites. This result is similar to that of previous studies, although the 2 previous studies that assessed stage of adoption had primarily white samples also.^{15,19} Neither study reported on employment status, which was a significant predictor in our study. Those who were unemployed were more likely to be precontemplators. This may be related to lack of health insurance and, subsequently, lack of access to healthcare because of unemployment.

For sigmoidoscopy, 71% of whites were in precontemplation, and a higher percentage of African Americans (55%) were in contemplation. Surprisingly, given the lower screening rates among African Americans,³ a greater percentage of them were in contemplation

(55%), that is, thinking about having the test. This could be partly attributed to social desirability with African Americans giving the answer they thought researchers wanted to hear. However, these results warrant further investigation because we do not know if African Americans are more likely to give socially desirable responses than are whites.

When considering all beliefs, barriers remained the only significant predictor of FOBT stage: those with low barriers were more likely to be in the action stage. These results were echoed in the logistic regression model for sigmoidoscopy: those with low barriers were more likely to be in action. Although the HBM has not been extensively tested with CRC screening behavior, these results open the door to discussion that barriers may be the singular set of beliefs that need to be altered to move a person from precontemplation or contemplation to action. These data are similar to those of Rawl et al,¹⁵ who found barriers to be a significant predictor of stage among first-degree relatives of CRC patients.

When looking at individual belief items, only one held significance for both tests: having the FOBT or sigmoidoscopy will help a person not worry as much about CRC. When intervening to change beliefs, educational messages may need to emphasize this point. Providers could also focus on alleviation of worry after the test as a take-home message about the positive outcomes of screening.

Two barriers stood out for FOBT: not having symptoms and not knowing how to do the test. Education should emphasize that screening is necessary even with a lack of symptoms and should provide instruction on how to complete the FOBT. A quick assessment of 2 popular FOBT kits found instructions in the kit to be written at higher than fourth-grade level and somewhat confusing.

Significant barriers for sigmoidoscopy were more prevalent for those in the precontemplation stage. Those in precontemplation were more likely to agree that time, pain, cost, clear liquid diet, not having symptoms, and fear of finding something wrong might stop them from having a sigmoidoscopy. Education could emphasize that medicines can be given before the test to relax the patient and decrease potential pain. Most people in this sample were HMO members for whom a screening sigmoidoscopy was covered under their health insurance plan. Patients may need help understanding the screening benefits covered for CRC and other cancers. Education could also incorporate information about most tests not finding cancer as a way to allay fears and emphasize that lack of symptoms does not mean that one is cancer-free.

Respondents in action for FOBT were more likely to be confident that they could obtain the test, whereas those in contemplation were significantly more likely to agree that they were confident in their ability to complete the test even if they did not know what to expect and they could find a store to buy the kit. It should be noted that the mean differences for these 2 items were only marginally different between contemplators and actors. However, results point to precontemplators feeling less confident in their ability to complete these steps of the FOBT test. Again, these results speak to the utility of testing interventions targeted to stage of behavior adoption.

Most of the self-efficacy items had significantly higher means for those in action. Persons in the action stage for sigmoidoscopy were more likely to report feeling confident that they could perform the various steps of having a sigmoidoscopy. In educational interventions directed to different stages, we may need to increase self-efficacy by focusing on each step of completing the sigmoidoscopy for those in precontemplation and contemplation.

This study has several limitations. A low response rate probably resulted in having data collectors from a different state call HMO members. Members of HMO are probably

familiar with the local university conducting research but may have been wary of a university affiliation from another state. The small sample size in this study precluded division of people into all the 5 stages as delineated by the TTM. However, the popularity of the TTM and the success of stage-based interventions for other cancer screening, especially mammography,^{7,20–22} seem to easily translate to the development of effective interventions to CRC screening. As such, this study is one of the first attempts to quantify beliefs across stages of CRC, laying the foundation for the development and testing of stage-based interventions.

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Table 1

Sample Characteristics

Demographic Variable	Frequency (%)
Sex	
Male	88 (43)
Female	118 (58)
Race/ethnicity	
White	167 (81)
Nonwhite	39 (19)
Education	
Less than high school	9 (4)
High school or some college	132 (64)
Bachelor's or some graduate studies	35 (17)
Master's or higher	29 (14)
Employment	
Working for pay	127 (62)
Not working for pay	79 (38)
Marital status	
With partner (married or living together)	154 (75)
No partner (widowed, divorced, or separated)	52 (25)

Table 2

Demographics by Stage of Preparation for FOBT and Sigmoidoscopy (N = 169)

	Precontemplation	Contemplation	Action
FOBT			
Age, mean (SD)	61.2 (8.2)	60.1 (6.2)	61.0 (8.7)
Sex			
Male (41%)	60	20	20
Female (59%)	47	25	28
Race			
White (83%)	58	20	22*
Black (17%)	24	41	34
Income			
\$15,000–30,000 (18%)	50	38	12
\$30,000–50,000 (31%)	55	20	25
\$50,000–75,000 (24%)	53	21	26
>\$75,000 (27%)	50	24	26
Marital status			
Married (77%)	55	23	22
Divorced (11%)	32	26	42
Single (5%)	38	25	37
Widowed (7%)	58	17	25
Education			
High school (29%)	55	30	15
College (55%)	46	22	31
More than college (16%)	67	15	18
Employment			
Unemployed (40%)	58	25	25 [†]
Part time (9%)	67	33	33
Full time (51%)	44	32	23
Treatment group			
Control (35%)	55	20	25
Education (35%)	46	25	29
Intervention (30%)	56	24	20
Sigmoidoscopy			
Age, mean (SD)	60.8 (8.2)	59.8 (6.2)	65.4 (10.9)
Sex			
Male (41%)	72	19	9
Female (59%)	62	30	8
Race			
White (83%)	71	20	9*
Black (17%)	41	55	3

	Precontemplation	Contemplation	Action
Income			
\$15,000–30,000 (18%)	58	34	8
\$31,000–50,000 (31%)	70	21	9
\$51,000–75,000 (24%)	67	24	9
>\$75,000 (27%)	66	29	5
Marital status			
Married (77%)	67	25	8
Divorced (11%)	61	28	11
Single (5%)	37	38	25
Widowed (7%)	83	17	0
Education			
High school (29%)	61	28	11
College (55%)	67	26	7
More than college (16%)	70	19	11
Employment			
Unemployed (40%)	69	19	12
Part time (9%)	72	21	7
Full time (51%)	63	31	6
Treatment group			
Control (35%)	69	20	10
Education (35%)	66	29	5
Intervention (30%)	61	29	10

Values are given in percentage, unless otherwise indicated. FOBT indicates fecal occult blood test.

* $P < .005$.

† $P < .05$.

Table 3

Beliefs and Knowledge by Stage of Adoption for FOBT and Sigmoidoscopy (N = 169)

	Mean (SD)		
	Precontemplation	Contemplation	Action
FOBT			
CRC	2.1 (1.0)	1.9 (1.1)	2.0 (0.9)
Knowledge			
Susceptibility	7.2 (3.1)	9.0 (3.0)	7.7 (3.3)*
Barriers	15.5 (5.6)	11.8 (4.8)	10.7 (3.9) [†]
Self-efficacy	35.4 (4.1)	36.4 (4.1)	36.3 (3.7)
Benefits	12.7 (2.1)	13.4 (1.9)	13.8 (1.7)*
Sigmoidoscopy			
CRC Knowledge	2.1 (0.9)	1.9 (1.1)	2.2 (1.0)
Susceptibility	7.3 (3.2)	8.6 (3.9)	8.9 (3.8)
Barriers	15.9 (5.1)	11.5 (3.5)	10.7 (3.6) [†]
Self-efficacy	57.5 (6.4)	60.8 (5.3)	61.2 (5.1) [‡]
Benefits	12.7 (2.2)	13.3 (2.8)	13.0 (2.3)*

FOBT indicates fecal occult blood test; CRC, colorectal cancer.

* $P < .05$.[†] $P < .0001$.[‡] $P < .005$.

Table 4

Belief Items by Stage of FOBT and Sigmoidoscopy

Item	Precontemplation Mean	Contemplation Mean	Action Mean
FOBT			
Benefits			
Find CRC early	4.6	4.6	4.8
Not worry as much about CRC	4.2	4.3	4.6*
Treatment may not be as bad if cancer is found early	4.4	4.6	4.7
Barriers			
Fear of finding something wrong	2.1	1.9	1.6
Being embarrassed	1.9	1.7	1.8
Not having enough time	2.0	2.0	1.9
Not knowing how to do the test	2.1	1.7	1.7*
Not having privacy	2.24	2.0	1.7
Having to handle stool	2.0	1.7	1.8
Not having symptoms	2.9	2.6	2.0*
Self-efficacy			
Can obtain the test	4.2	4.6	4.3*
Can follow the instructions	4.5	4.7	4.6
Can collect 3 stool samples	4.5	4.7	4.6
Can mail sample back	4.5	4.8	4.5
Can complete test even if don't know what to expect	4.4	4.7	4.6*
Can complete test if really want to	4.7	4.8	4.7
Can find a store to buy FOBT	3.3	4.2	3.4
Can complete test	4.5	4.8	4.8
Knowledge			
Do people with CRC have to have colon removed	1.4	1.4	1.4
Can people have CRC without feeling any pain	1.2	1.3	1.2
When polyps found, how many are cancerous	2.3	2.6	2.5
How often should people over 50 have a sigmoidoscopy	1.9	2.0	2.1
Perceived risk			
Likely to get CRC in 10 years	2.1	2.2	2.1
Likely to get CRC in 10 years compared to others of same age	2.1	2.1	2.0
Rate chance of getting CRC from 1 to 10	3.3	3.1	3.1
Sigmoidoscopy			
Benefits			
Find CRC early	4.6	4.7	4.9
Decrease chances of dying from CRC	4.2	3.9	3.6
Not worry as much about CRC	4.54.1	4.5	4.6*
Barriers			
Fear of finding something wrong	2.0	1.5	1.1*

Item	Precontemplation Mean	Contemplation Mean	Action Mean
Time	2.0	1.9	1.1*
Anxious because don't understand what will be done	2.3	1.7	1.7
Pain	2.3	1.7	1.6*
Cost	2.1	1.6	1.3*
Not having symptoms	3.4	2.5	2.1*
Clear liquid diet	1.8	1.5	1.1*
Self-efficacy			
Can make appointment	3.9	4.6	4.5*
Can take laxative	4.4	4.6	4.8
Can go without eating solid foods	4.3	4.5	4.9*
Can find transportation	4.6	4.7	4.8
Can get sigmoidoscopy even if worried	4.5	4.7	4.9*
Can get sigmoidoscopy even if don't know what to expect	4.4	4.6	4.9*
Can find a way to cover cost	4.1	4.6	4.9*
Can talk to healthcare provider about sigmoidoscopy	4.6	4.8	4.9*
Can follow instructions to prepare for test	4.6	4.8	4.9*
Can arrange other things in life to get test	4.5	4.7	4.9*
Can have the test if really want to	4.5	4.8	4.9*
Can find time to cleanse bowel	4.4	4.7	4.9*
Can deal with fear of having test	4.3	4.7	4.9*
Knowledge			
Do people with CRC have to have colon removed	1.4	1.4	1.3
Can people have CRC without feeling any pain	1.2	1.3	1.4
When polyps found, how many are cancerous	2.4	2.5	2.5
How often should people over 50 have a sigmoidoscopy	2.0	1.9	1.9*
Perceived risk			
Likely to get CRC in 10 years	2.0	2.3	1.9
Likely to get CRC in 10 years compared to others of same age	2.4	2.0	2.1
Rate chance of getting CRC from 1 to 10	3.1	3.4	2.2

FOBT indicates fecal occult blood test; CRC, colorectal cancer.

* $P \leq .05$.