Predictors of Lower Endoscopy Use Among Patients at Three Inner-City Neighborhood Health Centers

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ABSTRACT Although colorectal cancer (CRC) is the second leading cause of cancer death in the U.S., screening rates are low. Understanding the predictors of CRC screening is needed. In 2003, a random sample of patients aged 50 and over from three inner-city health centers was surveyed by computer-assisted telephone interview concerning CRC screening. The questionnaire was based on the Transtheoretical Model and the Theory of Reasoned Action. Factor analysis with Varimax rotation and logistic regression analyses were conducted. Of 319 surveys with data about endoscopy, 148 (46%) met guidelines (19 reported sigmoidoscopy within 5 years, 105 reported colonoscopy within 10 years, and 24 reported both within 5 years). Factor analysis identified three factors associated with increased likelihood of lower endoscopy within guidelines: Social Influence for CRC Screening (Eigenvalue 1.73), Barriers to Lower Endoscopy (Eigenvalue 2.00), and Lower Endoscopy Benefit/Ease (Eigenvalue 1.19). Variables in logistic regression associated with a lower rate of endoscopy include being African American (Odds Ratio (OR) = 0.35, 95% confidence interval = 0.13–0.96), being a current smoker (OR = 0.13, CI = 0.03–0.60), and having a higher score on the Barriers to Lower Endoscopy factor (i.e., viewed the inconvenience and unpleasant aspects as more troubling, OR = 0.33, CI = 0.18–0.60). The perceived inconvenience and unpleasant aspects of lower endoscopy are substantial barriers to screening. Advances in colon preparation procedures and better educational campaigns might lessen this perceived barrier and may be particularly important in disadvantaged and African American communities.

KEYWORDS Cancer screening, Colorectal cancer, Health services research.

INTRODUCTION

Colorectal cancer (CRC) is the second leading cause of cancer-related deaths in the United States, resulting in an estimated 56,808 deaths in 2001. Death rates were 20 per 100,000 in 2001,¹ substantially higher than the Healthy People 2010 target of 13.9 per 100,000. Furthermore, racial disparities exist in CRC mortality rates at 27.6 per 100,000 for African Americans versus 19.5 per 100,000 for whites.¹

Despite the availability of national recommendations for screening,^{2,3} low screening rates prevail. According to results of the 2002 Behavioral Risk Factor

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Surveillance System (BRFSS) in the U.S., 48.1% reported ever having a sigmoidoscopy or colonoscopy, and 44.8% reported having ever used FOBT, of whom only 48.7% had used FOBT in the last year and 19.4% within 2 years.⁴ These rates are below the Healthy People 2010 target for adults aged 50 years and older of 50% for ever having received a screening sigmoidoscopy and 50% for receipt of a fecal occult blood test (FOBT) within the preceding 2 years.

A number of barriers to CRC screening have been identified. Patient-related barriers include a lack of knowledge about CRC,⁵⁻⁷ confusion about which screening test to use,⁵ discomfort discussing tests with physicians,^{5,8-10} pain of testing,⁸⁻¹² embarrassment,⁷ reluctance to be tested if feeling well,^{7,13} concern about ability to perform the test properly (e.g., FOBT),⁵ fear of test results,^{5,7,14} and cancer fatalism.¹⁵ Physician recommendation is related to CRC screening or stage of screening,¹⁶⁻¹⁸ whereas lack of perceived physician recommendation is a barrier¹⁹ as is lack of trust in physicians.¹⁵ System barriers include cost⁵ and difficulty in making an appointment for screening.⁹

The purpose of this paper was to identify determinants of patient-reported receipt of CRC screening within the recommended guidelines, using factor analysis to account for collinearity, among patients from three inner-city health centers that serve large numbers of minority and socioeconomically disadvantaged patients.

MATERIALS AND METHODS

Sample and Recruitment

In 2003, patients from three inner-city health centers were surveyed by telephone to assess their CRC screening status and attitudes regarding CRC screening. The patients were part of a panel selected based on a random sample (from billing records) of patients aged >50 years as of October 1, 2001, who had been seen at one of the health centers in the past year.²⁰ Persons who had died, moved out of state, moved to a nursing home, or could not complete a telephone interview were excluded.

A personalized introductory letter accompanied by a letter from the health center endorsing the project and encouraging participation were sent to each of the sampled patients. An honorarium of \$10 was offered to encourage participation. Patients were contacted by telephone within several days after presumed receipt of the introductory letter. The project was approved by the University of Pittsburgh Institutional Review Board, Pittsburgh, Pennsylvania.

Survey Questionnaire and Conduct of the Interview

The theoretical frameworks that guided the development of the questionnaire were the Transtheoretical Model and the Triandis Model which is an elaboration of the Theory of Reasoned Action.^{21,22} These two models are compatible in that the former allows one to categorize respondents according to where they are on a continuum of behavior. That is, have they ever heard of an endoscopy, have they ever had one, and do they plan to have one in the future. The Triandis model emphasizes the contributions of cognitive beliefs to behavioral intention (including the likelihood of consequences), the value of those consequences, and normative beliefs. The Triandis model for consumer decision-making refines the theory of reasoned action by including facilitating conditions (e.g., ease of getting to a place to receive CRC screening) and behavioral intention, which consists of attitudes

about the activity, social influences (e.g., physician or family member recommends CRC screening), and the value placed on the consequences of the activity. The questionnaire was designed by a multidisciplinary team using an iterative process. Some questions came from a previous study in a similar population.¹⁸ Face validity was evaluated by four persons with experience in survey design. Depending on the “skip” patterns, the final questionnaire included approximately 30 multiple-choice and three-point Likert-scale questions that were specific to CRC (See questionnaire at www.pitt.edu/AFShome/f/a/familymd/public/html/immunization/questionnaires/patient-questionnaire-disparities-2003.pdf).

Trained interviewers conducted telephone surveys of the patient sample using computer-assisted telephone interviewing (CATI) between August and October 2003.²³ Use of the CATI system permitted direct data entry during the interview and managed the sample of persons to be contacted, directed the question sequence, reduced the incidence of unintentionally skipped questions, and provided automatic range checks. A recent study has shown that the CATI is reliable for collecting self-reported CRC screening behavior.²⁴

Statistical Analysis

The ACS guidelines for colon cancer screening include flexible sigmoidoscopy every 5 years and colonoscopy every 10 years.³ The variable “Lower Endoscopy” was created to include sigmoidoscopy within 5 years, colonoscopy with 10 years, or both within guidelines.

At the 95% confidence level, with an estimated population of 3,000, the sample size needed for a confidence interval of 5% was determined to be 341.

Chi-square tests (or Fisher exact tests in the cases of small cell counts where $n < 5$) were used to evaluate relationships between demographic, health-related, and behavioral variables and CRC screening. High multicollinearity was found among the independent variables specific to the opinions about CRC screening and lower endoscopy; therefore, factor analysis with Varimax rotation was conducted.²⁵ Three factors were identified: 1) Social Influence for CRC Screening; 2) Barriers to Lower Endoscopy; and 3) Lower Endoscopy Benefit/Ease (see Table 1). Eigenvalues represent the variance of components resulting from the factor analysis; the larger the value, the more explanatory variance is extracted.

Multivariate logistic regression was conducted with lower endoscopy as the outcome variable. Age, race, and the three factors were entered a priori. Other variables were entered into the model if they were associated ($P \leq 0.10$) with the outcome variable in bivariate analyses. All statistical analyses were performed using SAS version 8.2 (SAS Inc., Cary, North Carolina). Statistical significance was set at $P \leq 0.05$.

RESULTS

Introductory letters were sent to 289 new patients from one site, and letters requesting repeat participation were sent to 374 patients from the other two sites. Of these 663 patients, 11 had died, 215 did not respond to the mailing (33%) 19 refused when telephoned (2.9%) and 90 (13.8%) could not be contacted (i.e., disconnected phone, no answer after multiple attempts to call) and three completed the interview with unusable data. This resulted in 325 completed interviews with usable data (response rate = 50%, excluding ineligible patients).

TABLE 1. Factor analysis of Triandis model variables predicting reported receipt of lower endoscopy

Variables (loading from Varimax rotation)	Eigenvalue ^a	Variance accounted for by this factor (%)
Opinions on Colorectal Cancer (CRC) Screening*		
<i>Factor #1 “Social Influence for CRC Screening”</i>	1.73	63
My relatives and/or close friends think I should be checked for colon cancer (0.93)		
My doctor thinks that I should be checked for colon cancer (0.92)		
Opinions on Lower Endoscopy**		
<i>Factor #1 “Barriers to lower endoscopy”</i>	2.00	33
How much trouble it would be to prepare for lower endoscopy (0.80)		
How time consuming it would be to have lower endoscopy (0.75)		
How inconvenient it would be to have lower endoscopy every 5 years (0.65)		
How unpleasant it would be to have lower endoscopy (0.60)		
<i>Factor #2 “Lower Endoscopy Benefit/Ease”</i>	1.19	20
How good is lower endoscopy for finding colon cancers (0.75)		
How easy is it to get lower endoscopy (0.66)		

*“Agree” and “Sometimes” responses were combined into one category versus “Disagree.”
**“Somewhat” and “A lot/Very” responses were combined into one category versus “Not at all.”
^aEigenvalues represent the variance of the components resulting from the factor analysis.

Demographics

As shown in Table 2, the majority of respondents were female (69%), had an education level of high school or less (56%), had incomes <\$20,000 per year (58%), had a physical examination within the last year (72%), and had been vaccinated against influenza (66%).

Fecal Occult Blood Test (FOBT)

Almost all (87%) of respondents had heard of the “stool card test” and the majority (61%) reported that someone had recommend that they do it. A little over half (58% [184/318]) reported that they had received such cards. However, of these, only half (54%) received FOBT cards within 2 years and used them, 11% received cards within 2 years but did not use them, 32% received the cards over 2 years ago and used them and 3% received the cards over 2 years ago but did not use them. When analyzed according to American Cancer Society (ACS) guidelines of receipt of an annual FOBT, only 50 patients in our overall sample (15%) met this criterion.³ These facts and the skip patterns in our questionnaire resulted in small sample sizes regarding the rate of on-time FOBT. Thus, meaningful analyses could not be conducted on the predictors of on-time FOBT and it is not further discussed herein.

Lower Endoscopy

Most (87%) of the 325 patients were aware of lower endoscopy and the majority (59%) reported that someone had recommended that they get endoscopy. When all

TABLE 2. Demographics and health characteristics of respondents overall and by receipt of lower endoscopy within guidelines*

Variable	Overall** (n = 319)	Not receiving lower endoscopy (n = 171)	Receiving lower endoscopy (n = 148)	P
Age (%)				
50–64	50	48	54	0.277
65+	50	52	46	
Female (%)	69	75	63	0.020
Race (%)				
African American	43	47	39	0.137
Caucasian	57	53	61	
Marital status (%)				
Married	31	27	36	0.119
Widowed	26	30	32	
Never married	31	12	13	
Separated/divorced	12	31	20	
Level of education (%)				
≤ High school diploma/ vocational school	56	58	53	0.002
Some college	19	25	13	
College graduate	9	6	12	
Graduate school	16	11	22	
Household Income (%)				
<\$10,000	30	36	24	0.152
\$10,000–\$19,999	28	25	29	
\$20,000–\$39,999	20	19	20	
\$40,000+	23	20	27	
Self-rated health (%)				
Excellent/very good	43	40	45	0.246
Good	31	30	33	
Fair/poor	26	30	22	
Physical exam within the last year (%)	72	65	78	0.011
Smoking status (%)				
Current smoker	22	28	14	0.006
Never smoked	39	37	42	
Once smoked, but quit	40	35	45	
Received influenza vaccine last season (%)	66	60	71	0.041
Have problem paying for medical care (%)	27	28	24	0.431
Have health insurance (%)	90	89	91	0.503
My doctor thinks I should be checked for colon cancer ^b (%)	69	52	86	<0.001
My relatives/friends think I should be checked for colon cancer ^b (%)	56	40	74	<0.001
I feel that getting a colon cancer test is a wise thing to do ^b (%)	94	88	99	<0.001 ^a

TABLE 2. *Continued*

Variable	Overall** (n = 319)	Not receiving lower endoscopy (n = 171)	Receiving lower endoscopy (n = 148)	P
I feel that getting a colon cancer test is more trouble than it is worth ^b (%)	11	19	5	<0.001
I feel that getting a regular colon cancer test will help find cancer early when it is easier to treat ^b (%)	98	96	99	0.065 ^a

*Receipt of sigmoidoscopy within 5 years or colonoscopy within 10 years.

**May not add to 100% due to rounding.

^aBy Fisher's Exact Test.

^bAgree/Sometimes versus Disagree.

who had heard of lower endoscopy were asked if they intended to have one of these tests in the future, 3% indicated within 1 month, 14% indicated within 6 months, 41% indicated in more than 6 months, and 43% said they did not intend to have one. There was no information on when lower endoscopy was conducted for six individuals, reducing the sample to 319. Of these, 171 (54%) were classified as "not receiving lower endoscopy within guidelines" (162 reported never having lower endoscopy and nine had sigmoidoscopy more than 5 years ago or colonoscopy more than 10 years ago). The remaining 148 (46%) respondents were classified as "receiving lower endoscopy within guidelines"³ (19 individuals reported receiving sigmoidoscopy, 105 reported receiving colonoscopy and 24 reported receiving both). Variables associated in bivariate analyses with receipt of lower endoscopy within guidelines included female sex, higher education level, receipt of a physical examination within the last year, being a non-smoker or previous smoker, and receiving influenza vaccine in the last immunization season (Table 2). Difficulty paying for medical care was not associated with receipt of lower endoscopy.

TABLE 3. Predictors of receiving lower endoscopy within guidelines by logistic regression

Variables	Odds ratio (95% confidence interval)	P value
Age 50–64 years (ref., 65+ years)	0.82 (0.30–2.24)	0.690
Female (ref., male)	0.83 (0.25–2.79)	0.766
African American (ref., Caucasian)	0.35 (0.13 – 0.96)	0.041
Highest level of education (ref., Graduate school)		
≤ High school diploma/vocational	1.42 (0.39–5.14)	0.598
Some college	0.67 (0.17–2.70)	0.574
College graduate	0.26 (0.05–1.27)	0.095
Had a physical within the last year	0.54 (0.17–1.71)	0.291
Smoking status (ref., never smoked)		
Current smoker	0.13 (0.03–0.60)	0.009
Once smoked, but quit	1.01 (0.35–2.93)	0.985
Influenza vaccination last season	0.78 (0.28–2.20)	0.637
Social Influence for CRC Screening Factor	1.13 (0.66–1.94)	0.666
Barriers to Lower Endoscopy Factor	0.33 (0.18–0.60)	<0.001
Lower Endoscopy Benefit/Ease Factor	1.11 (0.69–1.80)	0.660

The results of the logistic regression analyses predicting receipt of lower endoscopy within guidelines are shown in Table 3. Lower likelihood of lower endoscopy was associated with being African American (Odds Ratio (OR) = 0.35, 95% confidence interval (CI) = 0.13–0.96), being a current smoker (OR = 0.13, 95% CI = 0.03–0.60), and score on the Barriers to Lower Endoscopy factor (i.e., those who viewed the inconvenience and unpleasant aspects as more a problem were less likely to receive lower endoscopy, OR = 0.33, 95% CI = 0.18–0.60).

DISCUSSION

This study found that reported lower endoscopy rate was moderate at 46% (2003 data) in three inner-city health care centers. This rate is similar to 48% rate reported by the 2002 Behavioral Risk Factor Surveillance System (BRFSS) for our state of Pennsylvania²⁶ and close to the Healthy People 2010 goal of 50%. Given the fact that these centers serve largely socioeconomically disadvantaged populations, these results are encouraging. Reaching the 2010 objective of 50% seems achievable among these centers although a higher objective might be quite challenging.

This study found collinearity among survey items and consequently, used factor analysis to address this issue. The factor “Barriers to Lower Endoscopy” was powerful in both factor analysis and regression analysis in predicting self-reported lower endoscopy. This factor encompasses inconvenience, unpleasantness, time lost, and perceived trouble in preparing for lower endoscopy. The literature notes related concepts of embarrassment,⁷ discomfort,¹⁹ “looking for trouble,”¹⁹ “more trouble than it’s worth,”¹⁸ and the pain of testing,^{8–12} as barriers to CRC screening.

The preparation for lower endoscopy requires thorough colon cleansing. Traditionally, drinking 4 l of polyethylene glycol (PEG) electrolyte solutions has been recommended. Although safe because the solution is not generally absorbed, the large volume can cause nausea, vomiting and abdominal fullness. Furthermore, preparation may impinge upon normal activities in addition to the time required for the procedure itself and recovery. More recently, 2 l of PEG with bisacodyl tablets have been found as effective as 4 l but with reduced side effects.^{27,28} Such advances in bowel cleansing preparation for colonoscopy may decrease the perception of unpleasantness and inconvenience of the procedure as a barrier to CRC screening.

In the past, patients have reported concerns about payment for CRC screening to be a factor preventing their participation.⁵ However, as noted in Table 2, trouble paying for medical care was not associated with receipt of lower endoscopy in our data. In July 2001, Medicare reimbursement for screening colonoscopy was approved for persons at average risk for CRC. Therefore, the importance of cost as a barrier to CRC screening should wane especially among Medicare eligible patients. This is of particular importance to disadvantaged inner-city patients.

This study found that African Americans and smokers were less likely to have received lower endoscopy than Caucasians or nonsmokers. Others have observed the same association of lower endoscopy screening among smokers,^{17,18} suggesting a clustering of resistance to preventive health behaviors. Conversely, some research has found positive associations between CRC screening and prostate specific antigen use¹⁶ and influenza vaccination.²⁹ With regard to racial disparities, one study has found that increasing overall adult immunization rates eliminated racial disparities in this area of health promotion.²⁰ It remains to be seen if overall increases in CRC screening similarly eliminate racial disparities. Of note, 2000

National Health Interview Survey data indicate that national rates for either FOBT or colorectal endoscopy between Caucasian and African American men are similar (42.5 versus 40.3%) although the racial gap between women is larger (39.3 versus 32%).³⁰

Given these findings, the authors suggest several approaches to increasing CRC screening.

- 1) Patients have preferences regarding particular tests;³¹ therefore, patient preference for type of screening test should be considered.
- 2) Education and awareness campaigns should address an array of issues in addition to the need for screening and those who are most at risk. Topics might include newer preparation techniques, coverage by Medicare, time commitment, inconvenience factors, amount of discomfort and the acknowledgement that the benefits far outweigh the negative aspects, especially given the infrequency with which the procedure is performed. Also, FOBT, although less accurate, is an option for those declining sigmoidoscopy and colonoscopy.
- 3) Clinicians should provide information about the procedure before offering it to the patient to increase receptivity to what is perceived as inconvenient and unpleasant.

Strengths and Limitations

Although this study benefited from inclusion of an inner-city population that is traditionally more difficult to reach, the survey response rate was modest (50%). It was not possible to compare characteristics of respondents and nonrespondents, in part because 215 persons to whom letters were sent did not respond with contact information and in part because Health Insurance Portability and Accountability Act (HIPAA) provisions limit the release of nonrespondent data. Participants attended an inner-city health care center and had a working phone and thus were not representative of all inner-city persons. We suspect that the respondents were somewhat more likely to have higher income and education levels than nonrespondents; factors that are likely to be associated with having a telephone. This study's reliance on cross-sectional data limits our ability to draw causal inferences. A fourth limitation is the use of self-report, although this is used in national surveys such as the BRFSS. Montano and Phillips,³² found that the correlation for sigmoidoscopy between the medical record and patient surveys was high at 0.9, and Schoen et al.³³ found that 83% of self-reports of endoscopy were validated by the medical record. Fifth, FOBT use was modest. Finally, as this study included only two racial groups (African Americans and Caucasians), results cannot be generalized to other racial or ethnic groups. Strengths of this study include the use of computer-assisted telephone interviewing, responses from a racially diverse population that ordinarily are more difficult to reach, than socioeconomically advantaged groups, and factor analysis to account for collinearity.

CONCLUSIONS

The perceived inconvenience and unpleasant aspects of lower endoscopy are substantial barriers to screening. Advances in colon preparation procedures and

better educational campaigns might lessen this perceived barrier and may be particularly important in disadvantaged and African American communities.

ACKNOWLEDGEMENT

This project was funded by P01 HS10864 from the Agency for Healthcare Research and Quality and 1 P60 MD000207-01 from the National Institutes of Health.

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