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Analysis of Barriers to and Patients' Preferences for CT Colonography for Colorectal Cancer Screening in a Nonadherent Urban Population

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Abstract

OBJECTIVE—The aim of this study was to evaluate patients' barriers against colorectal cancer screening tests and to assess patients' preferences and cost influences for CT colonography (CTC) in a nonadherent urban subpopulation.

SUBJECTS AND METHODS—Patients who had been offered colorectal cancer screening but were nonadherent were asked to participate in this questionnaire study. Patients' demographic information was obtained, and patients' reasons for not being screened were explored. Subjects were given an information sheet that described a CTC procedure and then were asked about their willingness to undergo CTC and about other relevant factors, such as fees.

RESULTS—One hundred seventy-five patients were invited to participate; 53 declined and 54 did not respond, which left 68 subjects to be included in the analysis. After being informed about CTC screening, most (83%) subjects stated that they would be willing to undergo a CTC study. However, 70% stated that they would not be willing to pay out-of-pocket fees if insurance did not cover the study, and even among the 30% who were willing to pay the fees, the average amount they were willing to pay (mean, \$244; median, \$150) was well below currently charged rates.

CONCLUSION—Our study suggests that most nonadherent patients would be willing to undergo CTC as long as out-of-pocket fees are reasonable.

Keywords

colorectal cancer screening; CT colonography; patient preferences

Although colorectal cancer is the third most common cancer and the second leading cause of cancer deaths in the United States [1], screening rates are significantly lower than those for cervical and breast cancer [2]. CT colonography (CTC), also known as virtual colonoscopy, is a new technology that is increasingly being considered for colorectal cancer screening [3]. It uses CT imaging and computers to produce 2D and 3D images of the colon [4]. The patient undergoes bowel preparation before the procedure, and during the procedure, a rectal tube is inserted for air insufflation of the colon. Images are obtained with the patient supine and prone.

In March 2008, the Joint Guideline from the American Cancer Society, the U.S. Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology added CTC to the list of recommended options for colorectal cancer screening [5, 6]. Although some third-party private payers reimburse for screening CTC examinations, the U.S. Centers for Medicare & Medicaid Services currently do not. The addition of CTC to the colorectal cancer screening guidelines has the potential to increase overall colorectal cancer screening rates. If patients who choose CTC are merely patients who would have been adherent to colorectal cancer screening recommendations using another screening technique, then overall adherence would not increase. However, if the availability of CTC encourages patients who are currently or would be nonadherent to undergo screening, then colorectal cancer screening rates would improve.

Although numerous studies have queried patients regarding colorectal cancer screening technique preferences, these surveys included participants who had already undergone at least one colorectal cancer screening study [7–10]. As a consequence, the impact of CTC on patient adherence to colorectal cancer screening recommendations is unknown.

The aim of this study was to evaluate patients' barriers against colorectal cancer screening tests and, specifically, patients' preferences for CTC in a nonadherent population. In addition, a second aim was to explore the influence of out-of-pocket costs on the decision. We hoped that our study would provide data that would either strengthen or weaken the hypothesis that the availability of CTC would increase colorectal cancer screening rates.

Subjects and Methods

Patients

Patients older than 50 years within selected primary care practices who had been offered any form of colorectal cancer screening (e.g., fecal occult blood test, barium enema, flexible sigmoidoscopy, or colonoscopy) by their physician but who were nonadherent were eligible for study participation. Exclusion criteria included being up to date on colorectal cancer screening and an inability to complete the survey because of cognitive or language barriers.

Eligible patients were initially identified using an electronic medical record system. After obtaining permission from their primary care physicians to contact them for possible enrollment, these patients who were not up to date on their colorectal cancer screening were mailed a questionnaire and invited to participate. We contacted patients from nine different primary care physicians' practices at two different practice locations that were part of the Massachusetts General Hospital, a large urban academic hospital in Boston, Massachusetts.

A letter of introduction signed by their primary care physician and the study's principal investigator accompanied the survey. A stamped self-addressed return envelope was included with each survey. Patients were given the option to decline participation and to opt out of all subsequent contact by mailing back a stamped self-addressed postcard. If the patients did not return either the postcard or survey within 1 month, it was re-sent, and if it

was not returned after 2 months, they were contacted by telephone and given the option to complete the survey by telephone. Patients were not compensated for completing the survey. The study was approved by the institutional review board, and informed consent was implied when a questionnaire was returned.

Survey Questionnaire

Along with the survey questionnaire, subjects were also provided a separate handout, printed on yellow paper for highlight, which summarized CTC and virtual colonoscopy. This patient summary information (Appendix 1) was obtained from the National Institutes of Health's Website and can be found along with the complete questionnaire (Appendix 2) in the *AJR* electronic supplement to this article, available at www.ajronline.org.

The questionnaire confirmed that the subject was nonadherent to screening recommendations by inquiring about prior colorectal cancer screening. Other potentially relevant patient information, such as family history of colorectal cancer, demographic characteristics, and adherence to other cancer screening recommendations, was collected. Subjects were asked questions exploring reasons and important factors for their nonadherence. The participants were then directed to carefully read the separate sheet describing virtual colonoscopy and were asked to answer how willing they would be to have this procedure. They could answer "Very Willing," "Somewhat Willing," or "Not Willing." The next question asked whether they would be willing to pay out of pocket if their insurance would not cover the CTC and, if so, how much.

Statistical Analysis

Fisher's exact test was used to analyze categorical data, and the Wilcoxon's signed rank test was used to analyze continuous data; $p = 0.05$ was considered significant.

Results

A total of 175 patients were identified who met inclusion criteria for the study and were invited to participate. Of these patients, 68 agreed to participate and completed the survey questionnaire, 53 declined to participate, and 54 did not respond.

Table 1 presents patients' demographic characteristics. All patients were at least 50 years old, because subjects needed to be nonadherent to colorectal cancer screening that had been offered, with most (96%) patients 50–64 years old. Most subjects were white (88%) and had graduated from high school or beyond (97%). Notably, most (65%) of the patients who were nonadherent to colorectal cancer screening had undergone either breast or prostate cancer screening in the past.

Subjects were asked to read a single-page description of CTC that we provided (Appendix S1, available at www.ajronline.org) and then were asked, "How willing would you be to have a virtual colonoscopy to test for colon cancer?" Forty-six percent stated "Very Willing," 37% stated "Somewhat Willing," and 16% stated "Not Willing" (Table 2). When the two "Willing" categories are combined, 83% affirmatively responded that they would be willing to undergo a CTC study. In the next survey question, participants were asked whether they would be willing to "pay out of their own pocket" and, if so, how much, if their insurance would not pay for the test (Table 2). Among those subjects who stated that they were willing to have a CTC examination, 30% said they would be willing to pay out of pocket for the test. Within this subgroup, the mean amount was \$244 and the median amount was \$150 (range, \$50–\$1,000). We attempted to identify patient characteristics that were associated with a willingness to undergo a screening CTC examination (Table 1); however, no characteristic was significantly predictive.

In Table 3, the reasons for not having undergone colorectal cancer screening to date are presented within subgroups. The questionnaire presented these possible reasons and did not limit the number of answers that could be checked off. The most frequently stated reason for not being screened to date was procrastination (38%), and an additional 12% of subjects reported that they were too busy. Bowel cleansing was a barrier for 24% of subjects, 15% thought colorectal cancer screening was too embarrassing, and 13% thought it was too invasive. Sixteen percent were afraid of what the test results would be, and reports of negative experiences from friends and family discouraged 19% of patients.

In Table 4, the results of our exploration into aspects of colorectal cancer screening procedures that patients found important are presented. The invasiveness of the test and the need for sedation was reported by 81% of patients surveyed. The pain and embarrassment of the study were considered important by 71% and 59%, respectively. Forty-eight percent of respondents reported the length of the test as an important factor. No statistically significant differences in important factors were found between participants who were willing and unwilling to have a CTC or virtual colonoscopy study.

Discussion

When patients who had been recommended to undergo colorectal cancer screening but who were nonadherent were asked in this small subsample study whether they would be willing to have a CTC study, the substantial majority (83%) reported that they would be willing. These findings may indicate that adherence to colorectal cancer screening could be increased along with the widespread availability of CTC as a colorectal cancer screening technique. However, among subjects who stated that they were willing to have a CTC study, the majority (70%) were not willing to pay out-of-pocket expenses if their insurance did not cover the cost of the examination; even for the minority who would pay the expenses, the average quoted amount they were willing to pay (mean, \$244; median, \$150) was well below currently charged rates (\$500–\$1,500). Although these values could have been widely influenced by the relatively small size of the study, it is nevertheless interesting to note that these values are consistent with the cost-effectiveness analysis by the Agency for Healthcare Research and Quality's analysis performed for the Centers for Medicare & Medicaid Services, which found that CTC could become a cost-effective screening strategy when its cost was approximately \$200 or less. Unless third-party reimbursement is expanded and becomes widespread (e.g., by Centers for Medicare & Medicaid Services), the cost to patients will likely be a significant barrier to widespread CTC implementation.

Notably, most (65%) of the patients who were not adherent to colorectal cancer screening recommendations reported having had breast and prostate cancer screening in the past. Our finding is consistent with previous analyses suggesting that there are significant barriers that may be specific to colorectal cancer screening (e.g., bowel cleansing preparation) [11].

Numerous published studies have surveyed patients who had undergone both a CTC and a colonoscopy to determine their preference. For such patients, some studies have suggested that patients prefer CTC [8, 10, 12], others stated that patients prefer colonoscopy [7], and others have found that patients were indifferent [9]. It could be argued that the patient group analyzed in those other studies is the most relevant factor, because all subjects had undergone both procedures and should have been able to provide valuable preferences. However, by definition, those subjects were compliant with colorectal cancer screening recommendations and are not representative of the nonadherent portion of the population, who need to be encouraged to undergo colorectal cancer screening to improve overall screening rates. A study by Angtuaco et al. [13] analyzed "potential" patients identified and recruited at a local video store. They reported that, after providing information regarding

both CTC and colonoscopy, the majority of subjects preferred CTC (60.2%), and more than 80% stated that they would be more likely to comply with colorectal cancer screening if CTC was available. A limitation to the study was that 80% of the participants were younger than 50 years. A study performed in Australia randomly selected individuals to undergo colonoscopy, CTC, or a choice of these tests and found that a choice did not significantly increase screening participation [14]. Notably, the overall participation rate was low (< 18.1%) for all three strategies, which is substantially lower than that for other colorectal cancer programs, raising concerns about the external generalizability of the results.

Our study specifically targeted patients who were known to have been offered colorectal cancer screening and were not adherent to these recommendations. We think that studying this specific group of subjects provides the best information regarding how CTC availability might affect colorectal cancer screening rates.

Our study had several limitations. First, we attempted to enroll 175 patients, but only 68 (39%) completed the survey, because 53 actively declined and 54 did not respond. We made the best efforts possible to maximize enrollment rates, as described in the Subjects and Methods section. We hypothesize that part of the difficulty in achieving a higher rate was because the targeted group of patients are, by definition, noncompliant. Second, although the majority of those surveyed said they would be willing to undergo a CTC, we did not confirm that these individuals went through with their stated intentions. Ideally, we would follow this cohort of patients over time and see how many of them actually undergo CTC. However, because CTC is not universally reimbursed by third-party payers for screening, confirmation is not possible. Third, our attempts to identify patient factors that predict willingness to undergo a CTC study were all statistically negative. Our study was underpowered to examine predictors because only 11 patients were unwilling to undergo CTC. Fourth, the patients studied may not be representative of the general U.S. population or even of the populations of other cities, because our study was performed in practices affiliated with a large academic hospital in a particular urban environment and because the patients in our study are predominantly white. A suggestive marker is that only 4% of participants reported a family history of colorectal cancer, which is lower than the rate in the general population. This finding could also indicate that patients with a negative family history of colorectal cancer are more likely to be nonadherent to colorectal cancer screening recommendations.

Although noncathartic bowel preparations for CTC studies are a focus of active research, most CTC examinations continue to require a clear liquid diet and cathartic bowel preparation before the procedure, similar to that required for optical colonoscopy. A CTC study also has the potential to generate extracolonic findings that could require further evaluation and follow-up. The cathartic bowel preparation and the potential for extra-colonic findings were not included in the description of CTC provided to patients, which potentially biased the subject responses in favor of CTC.

After being informed about CTC as a screening technique for colorectal cancer, a majority of currently nonadherent patients stated that they would be willing to have a CTC screening study, suggesting that CTC availability could improve screening rates. However, the majority of participants were not willing to pay out-of-pocket expenses, and even among those who were willing, most were not willing to pay currently charged fees. Exploration into factors affecting patient adherence found that a procedure's invasiveness and need for sedation were the most important.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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TABLE 1

Characteristics of Subjects Who Were Willing and Not Willing to Have Virtual Colonoscopy

Characteristic	All Subjects (n = 68)	Willing to Have Virtual Colonoscopy		p
		Yes (n = 56)	No (n = 11)	
Male sex	40/68 (59)	33/56 (59)	6/11 (55)	0.3366
Age (y)				0.8374
50–54	18/68 (27)	16/56 (29)	2/11 (18)	
55–59	25/68 (37)	19/56 (34)	5/11 (45)	
60–64	22/68 (32)	18/56 (32)	4/11 (36)	
65	3/68 (4)	3/56 (5)	0/11 (0)	
Race ^a				0.1035
White	59/67 (88)	51/56 (91)	8/10 (80)	
African American or black	2/67 (3)	1/56 (2)	1/10 (10)	
Asian	2/67 (3)	1/56 (2)	1/10 (10)	
Hispanic or Latino	4/67 (6)	2/56 (4)	1/10 (10)	
Education				0.3264
Elementary school	2/68 (3)	1/56 (2)	1/11 (9)	
High school graduate	44/68 (65)	36/56 (64)	7/11 (64)	
College graduate	14/68 (21)	11/56 (20)	3/11 (27)	
Postgraduate	8/68 (12)	8/56 (14)	0/11 (0)	
Employment status ^a				0.4303
Employed	43/67 (64)	36/55 (65)	7/11 (64)	
Retired	10/67 (15)	7/55 (13)	3/11 (27)	
Unemployed	14/67 (21)	12/55 (22)	1/11 (9)	
Annual income (\$U.S.) ^b				0.9440
< 50,000	33/65 (51)	28/54 (52)	5/10 (50)	
50,000–100,000	12/65 (18)	9/54 (17)	2/10 (20)	
100,000–200,000	15/65 (23)	13/54 (24)	2/10 (20)	
> 200,000	5/65 (8)	4/54 (7)	1/10 (10)	
Out-of-pocket medical expenses paid in last year (\$U.S.) ^a				0.9423
< 500	41/67 (61)	35/56 (63)	6/10 (60)	
500–999	16/67 (24)	12/56 (21)	3/10 (30)	
> 1,000	10/67 (15)	9/56 (16)	1/10 (10)	
Reported family history of colon cancer	3/68 (4)	3/56 (5)	0/10 (0)	0.7822
Had breast or prostate cancer screening in past	44/68 (65)	36/56 (64)	7/11 (64)	1.0

Note—Data are no. of subjects/total (%). The denominators vary because not all subjects answered all the questions.

^aOne respondent declined to answer this question.^bThree respondents declined to answer this question.

TABLE 2

Willingness to Have CT Colonography (CTC) and Pay Out-of- Pocket Expenses

Parameter	Value
Willingness to have CTC to screen for colorectal cancer, no. of subjects/total (%) ^a	
Very willing	31/67 (46)
Somewhat willing	25/67 (37)
Not willing	11/67 (16)
Willing to pay out-of-pocket expenses, no. of subjects/total (%)	17/56 (30)
Amount patients are willing to pay (\$U.S.) ^b	
Mean	244
Median	150
Range	50–1,000

^aOne respondent declined to answer this question, resulting in 67 total patient responses.

^bValues are based on the 17 patients willing to pay out of pocket.

TABLE 3**Reasons for Not Undergoing Colorectal Cancer Screening**

Reason	Subjects (%)
Personal factors	
I've been planning to, but I just haven't gotten to it	38
I've heard about bad testing experiences from friends or family	19
I am afraid of what the test results will be	16
I am too busy	12
I can't afford to miss work	6
My doctor didn't spend enough time discussing testing with me	3
I do not have health insurance	3
Personal preference	
I don't want to do the bowel cleansing	24
It is too embarrassing	15
It is too invasive	13
It is too painful	7
It is too risky	6
Misinformation	
My doctor never told me to be screened	7
Didn't know I needed to be tested	4
I don't have any symptoms	4
I am too sick to have the tests	4
I am not at risk for colon cancer	3
I'm not sure	7
Other	7

TABLE 4

Importance of Factors to Subjects Who Were Willing and Not Willing to Have Virtual Colonoscopy

Factor in Considering Colorectal Cancer Screening Test	All Subjects (<i>n</i> = 63)	Willing to Have Virtual Colonoscopy		<i>p</i> ^a
		Yes (<i>n</i> = 52)	No (<i>n</i> = 10)	
Invasiveness of test	51/63 (81)	43/52 (83)	7/10 (70)	0.3908
Need for sedation	50/62 (81)	42/51 (82)	7/10 (70)	0.3965
Perceived associated pain	45/63 (71)	38/52 (73)	7/10 (70)	1.0
Perceived associated embarrassment	37/63 (59)	31/52 (60)	6/10 (60)	1.0
Length of test	30/63 (48)	26/52 (50)	4/10 (40)	0.7331

Note—Data are no. of subjects/total (%). The denominators vary because not all subjects answered all questions.

^aFisher's exact test.