

## Colorectal cancer screening behavior and willingness: An outpatient survey in China

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### Abstract

**AIM:** To identify the factors influencing colorectal cancer (CRC) screening behavior and willingness among Chinese outpatients.

**METHODS:** An outpatient-based face-to-face survey was conducted from August 18 to September 7, 2010 in Changhai Hospital. A total of 1200 consecutive patients aged  $\geq 18$  years were recruited for interview. The patient's knowledge about CRC and screening was pre-measured as a predictor variable, and other predictors included age, gender, educational level, monthly household income and health insurance status. The relationship between these predictors and screening behavior, screening willingness and screening approach were examined using Pearson's  $\chi^2$  test and logistic regression analyses.

**RESULTS:** Of these outpatients, 22.5% had undergone CRC screening prior to this study. Patients who had participated in the screening were more likely to have good knowledge about CRC and screening (OR: 5.299, 95% CI: 3.415-8.223), have health insurance (OR: 1.996, 95% CI: 1.426-2.794) and older in age. Higher income, however, was found to be a barrier to the screening (OR: 0.633, 95% CI: 0.467-0.858). An analysis of screening willingness showed that 37.5% of the patients would voluntarily participated in a screen at the recommended age, but 41.3% would do so under doctor's advice. Screening willingness was positively correlated with the patient's knowledge status. Patients with higher knowledge levels would like to participate in the screening (OR: 4.352, 95% CI: 3.008-6.298), and they would select colonoscopy as a screening approach (OR: 3.513, 95% CI: 2.290-5.389). However, higher income level was, again, a barrier to colonoscopic screening (OR: 0.667, 95% CI: 0.505-0.908).

**CONCLUSION:** Patient's level of knowledge and income should be taken into consideration when conducting a feasible CRC screening.

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**Key words:** Colorectal cancer; Screening; Behavior; Willingness; Survey

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## INTRODUCTION

Colorectal cancer (CRC) is one of the most common malignancies worldwide. The Asian Pacific Working Group on CRC has suggested that some Asian ethnic groups (e.g. Japanese, Korean and Chinese) are more susceptible to CRC than others, with an incidence similar to that of the West<sup>[1]</sup>. The incidence of CRC in China has increased rapidly since the 1980s<sup>[2,3]</sup>. CRC now ranks as the fifth leading cause of cancer-related deaths<sup>[4]</sup>. Screening is an effective tool for early diagnosis<sup>[5]</sup>, but the compliance rates have been low in many countries<sup>[6-10]</sup>. A study of community-based CRC screening in Hangzhou, China, which involved a population of 34726 individuals, revealed that the compliance rates for fecal occult blood test (FOBT) and colonoscopy were only 17.5% and 2.8%, respectively<sup>[11]</sup>. These figures are extremely low compared with those of the United States (overall screening rates were nearly 55% in 2008<sup>[12]</sup>).

Reasons for low compliance rates may vary among countries. A community-based screening among residents of Beijing revealed that busy work schedules and the complexity of screening procedures were the main barriers to CRC screening<sup>[13]</sup>. Lack of financial support, fear of pain and the necessity of bowel preparation were barriers to colonoscopic screening in a Hangzhou-based study<sup>[14]</sup>. Other researchers have doubted the feasibility of population screening in China, due to the requirements for a high awareness of the disease, sufficient medical resources and strong financial support<sup>[15]</sup>. Opportunistic screening (also called individual screening), which is performed on request from a physician or healthcare provider when a patient presents for consultation for other health reasons<sup>[16]</sup>, has been widely used in most cancer screening protocols throughout the world<sup>[17]</sup> and may be also suitable for Chinese outpatients. Individuals with more personal experience with illness are more likely compliant with the CRC screening<sup>[18]</sup>. China has a large population but with an uneven distribution of health resources. Additionally, the general population has a low awareness of CRC and inadequate knowledge regarding CRC and screening<sup>[19,20]</sup>.

Although CRC screening of outpatients might be effective, there have been few studies exploring its availability in China. The 2010 National Institutes of Health (NIH) State-of-the-Science Conference, which aimed to enhance the use and quality of CRC screening, recommended that studies should be carried out about patient screening preferences and other factors influencing informed, shared decision making regarding the choice of CRC screening modalities<sup>[12]</sup>. Therefore, our study was intended to explore outpatients' screening behavior and willingness as well as to identify influencing factors in Shanghai, China.

## MATERIALS AND METHODS

### Study population

From August 18 to September 7, 2010, 1200 consecutive outpatients were recruited for our survey from the Outpatient Department of Changhai Hospital, a tertiary care

hospital in Shanghai, China. Both sporadic and hereditary cases of CRC were the target of early detection. All these outpatients were over 18 years of age, able to communicate properly and free of mental disorders. Patients with a medical emergency or incurable tumor were excluded. Health care workers including doctors, nurses, medical educators and medical students were not included as subjects of this study.

### Study design

A self-designed questionnaire was developed after a literature review, and revised by epidemiologists and clinicians. The following contents were included: (1) Patient general information; (2) evaluation of CRC and screening knowledge; (3) previous screening behavior; (4) screening willingness; and (5) preferred approach. Available screening approaches in our hospital could be classified as fecal test (e.g. FOBT, stool DNA test), blood test (biomarkers in clinical research) and colonoscopy.

A pilot test was conducted in 50 outpatients by trained interviewers on August 18 to verify the feasibility of the survey. The questionnaire was distributed to the patients upon their arrival at the clinic, who were asked to answer the questions under the guidance of interviewers while waiting to see a doctor. To ensure the quality of the survey, additional information about screening was offered to guide the patient's choice of screening approach. This study was approved by the Ethics Committee of Changhai Hospital, and all patients gave written informed consent.

Comparing with other scoring system that evaluated the knowledge about CRC and screening<sup>[20,21]</sup>, several simple factors were taken into account in the evaluation: (1) is the patient familiar with CRC; (2) does the patient understand at least one of the clinical manifestations of CRC; (3) has the patient ever heard of cancer screening; and (4) is the patient familiar with colonoscopy as an early detection method for CRC? Patients were classified as having a high level of knowledge (answered all the questions above), a low level (answered no more than 2 questions) and a moderate level (between high and low).

### Statistical analysis

Data were managed using Microsoft Excel software, and duplicate questionnaires were excluded. The results were tabulated and analyzed with the PASW Statistics for Windows release 18.0 (SPSS, Inc., Chicago, Illinois). The primary outcomes were the patient's previous screening behavior, screening willingness and preferred screening approach. Pearson's  $\chi^2$  test was used to quantify the association between the outcomes and the predictor variables, which included gender, age, possession of health insurance and monthly household income. A bivariate logistic regression model was used to examine the association between the outcomes and levels of education and knowledge about CRC. Statistical significance was considered at  $P < 0.05$ , and odds ratios (OR) were given with 95% confidence intervals (CI).

Table 1 Characteristics of respondents

Patient characteristics	Number ( <i>n</i> = 1001)	Percent (%)
Gender		
Female	510	50.9
Male	491	49.1
Age (yr)		
< 40	397	39.7
≥ 40	604	60.3
Educational level		
Primary or no schooling	69	6.9
Secondary education	445	44.5
Higher education	487	48.7
Monthly household income		
< 4000 RMB (yuan) <sup>1</sup>	538	53.7
≥ 4000 RMB (yuan)	463	46.3
Health insurance		
No <sup>2</sup>	358	35.8
Yes	643	64.2
Previous CRC screening		
No	775	77.4
Yes <sup>3</sup>	226	22.6
Screening willingness		
Voluntary attendance	375	37.5
Under recommendation	413	41.3
No attendance	213	21.3
Preferred screening approach		
Blood test	249	24.9
Fecal test	186	18.6
Colonoscopy	322	32.2
Not specified	244	24.4
Knowledge about CRC and CRC screening		
Low	288	28.8
Moderate	247	24.7
High	466	46.6

<sup>1</sup>Renminbi is the official currency of the People's Republic of China; <sup>2</sup>Including the status of health insurance application; <sup>3</sup>Including colonoscopy, fecal occult blood test (FOBT) and double contrast barium enema (DCBE). CRC: Colorectal cancer.

## RESULTS

A total of 1200 consecutive patients were recruited for the survey. Of these, 1029 (85.75%) were successfully surveyed, and 171 (14.25%) did not respond to this survey. Among the 1029 respondents, 28 (2.72%) were found to have unfilled sections, but no duplicate data were detected. Ultimately, 1001 patients were included in our analysis. A total of 604 patients were not less than 40 years of age, which is the recommended minimal screening age in China for sporadic CRC<sup>[22]</sup>. The mean age of the patients was 45.25 years (range, 18–86 years). Patients were classified as having a high (*n* = 466, 46.6%), moderate (*n* = 247, 24.7%) or low (*n* = 288, 28.8%) levels of knowledge according to our definitions. Other predictor variables, such as educational level and monthly household income, are listed in Table 1.

### Previous CRC screening behavior

Among the 1001 included patients, 22.5% (*n* = 226) had previously undergone CRC screening. The most common examination method used was colonoscopy (91.6%); other methods (FOBT or double contrast barium enema, DCBE) accounted for a small proportion (8.4%). Fac-

tors influencing the participation in the screening were age, possession of health insurance, monthly household income and status of CRC knowledge (Table 2). Patients who had been screened tended to have a good knowledge of CRC and screening (OR: 5.299, *P* < 0.001), have health insurance (OR: 1.996, *P* < 0.001) and are older in age (OR: 3.834, *P* < 0.001). High income, however, was found to be a barrier to the screening (OR: 0.633, *P* < 0.003).

### Screening willingness

The analysis of screening willingness revealed that 37.5% of patients (*n* = 375) would voluntarily agree to be screened at the recommended age; 41.3% (*n* = 413) would need a physician's recommendation before attending the screening; and 21.3% (*n* = 213) refused to be screened (Table 1). We categorized the screening willingness into "attendance" (*n* = 788) and "rejection" (*n* = 213) and found that knowledge regarding CRC was the only factor influencing the screening willingness (Table 3). Patients with a high level of knowledge about CRC were more willing to attend the screening than those with a poor knowledge of CRC (OR: 4.352, *P* < 0.001).

### Screening approach

The analysis of patients' preference in screening approach revealed that colonoscopy was the most commonly preferred approach (32.2%, *n* = 322), while blood testing ranked second (24.9%, *n* = 249), and a fecal test was the least popular option (18.6%, *n* = 186). However, 24.4% of patients (*n* = 244) expressed an equivalent preference for all screening approaches (Table 1).

Colonoscopy is the most precise screening approach for CRC. Thus, the screening approaches were characterized into "precise modes (colonoscopy)" and "normal modes (blood and fecal tests)", and factors influencing the patient's selection of screening approach were investigated. Both CRC-associated level of knowledge and monthly household income influenced the choice of screening approach (Table 4). With an increase in knowledge, the proportion of patients selecting a precise screening approach was increased from 25.4% to 54.4% (*P* < 0.001). Patients with higher incomes, however, prefer not to adopt precise screening approaches on average (*P* = 0.010).

## DISCUSSION

In this outpatient-based study, we found that a high level of knowledge regarding CRC and screening techniques, possession of health insurance or advanced age were stimulus factors for prior CRC screening. Most of the patients were willing to participate in the screening, but 41.3% were willing to do so under doctor's recommendations before attendance. Level of knowledge was the only factor that influenced screening willingness. Outpatients with a higher level of knowledge were willing to participate in the screening and select colonoscopy as the screening approach. Higher income level, however, was a barrier to both the previous screening and the preference of colonoscopy as a screening methodology. These

**Table 2 Factors associated with outpatients' previous screening behavior *n* (%)**

Variable	Previously screened		OR (95% CI)	P value
	No ( <i>n</i> = 775)	Yes ( <i>n</i> = 226)		
Gender				
Female	401 (78.6)	109 (21.4)	1.000	0.365
Male	374 (76.2)	117 (23.8)	1.151 (0.856-1.548)	
Age (yr)				
< 40	356 (89.7)	41 (10.3)	1.000	< 0.001
≥ 40	419 (69.4)	185 (30.6)	3.834 (2.657-5.532)	
Health insurance				
No	303 (84.6)	55 (15.4)	1.000	< 0.001
Yes	472 (73.4)	171 (26.6)	1.996 (1.426-2.794)	
Educational level				
Primary or no schooling	52 (75.4)	17 (24.6)	1.000	-
Secondary education	319 (71.7)	126 (28.3)	1.208 (0.673-2.169)	0.526
High education	404 (83.0)	83 (17.0)	0.628 (0.346-1.141)	0.127
Monthly household income, RMB (yuan)				
< 4000	397 (73.8)	141 (26.2)	1.000	0.003
≥ 4000	378 (81.6)	85 (18.4)	0.633 (0.467-0.858)	
Level of knowledge				
Low	261 (90.6)	27 (9.4)	1.000	-
Moderate	213 (86.2)	34 (13.8)	1.543 (0.902-2.639)	0.113
High	301 (64.6)	165 (35.4)	5.299 (3.415-8.223)	< 0.001

OR: Odds ratio; CI: Confidence interval.

**Table 3 Factors associated with outpatients' screening willingness *n* (%)**

Variable	Screening willingness		OR (95% CI)	P value
	Rejection <sup>1</sup> ( <i>n</i> = 213)	Attendance <sup>2</sup> ( <i>n</i> = 788)		
Gender				
Female	120 (23.5)	390 (76.5)	1.000	0.089
Male	93 (18.9)	398 (81.1)	1.317 (0.971-1.786)	
Age (yr)				
< 40	76 (19.1)	321 (80.9)	1.000	0.207
≥ 40	137 (22.7)	467 (77.3)	0.807 (0.589-1.105)	
Health insurance				
No	73 (20.4)	285 (79.6)	1.000	0.630
Yes	140 (21.8)	503 (78.2)	0.920 (0.670-1.265)	
Educational level				
Primary or no schooling	16 (23.2)	53 (76.8)	1.000	-
Secondary education	109 (24.5)	336 (75.5)	0.931 (0.511-1.695)	0.814
High education	88 (18.1)	399 (81.9)	1.369 (0.748-2.506)	0.309
Monthly household income, RMB (yuan)				
< 4000	123 (22.9)	415 (77.1)	1.000	0.189
≥ 4000	90 (19.4)	373 (80.6)	1.228 (0.905-1.668)	
Level of knowledge				
Low	106 (36.8)	182 (63.2)	1.000	-
Moderate	52 (21.1)	195 (78.9)	2.184 (1.481-3.221)	< 0.001
High	55 (11.8)	411 (88.2)	4.352 (3.008-6.298)	< 0.001

<sup>1</sup>Patients rejected to attend screening; <sup>2</sup>Patients would attend screening voluntarily or under recommendation. OR: Odds ratio; CI: Confidence interval.

results indicated that patients' knowledge and income status should be considered when launching a screening program among outpatients in Shanghai.

To our knowledge, this is the first study to investigate outpatients' CRC screening behavior and to identify their screening preferences in China. The advantages of this study are the use of a prospective face-to-face survey of consecutive outpatients and a relatively large sample size. We attempted to establish a simple method to rapidly evaluate patients' levels of knowledge regarding CRC and

screening techniques. This method differs from other scoring systems. Our method allows the physician to evaluate the patient's level of knowledge through asking several simple questions, and an appropriate screening approach can be offered immediately following the evaluation.

Our results have several similarities to those of previous population-based studies that explored factors influencing CRC screening<sup>[20,23-26]</sup> and analyzed CRC screening willingness in Malaysia<sup>[21]</sup> and Taiwan<sup>[27]</sup>; however, there

Table 4 Factors associated with outpatients' choice of screening approach *n* (%)

Variable	Screening approach		OR (95% CI)	<i>P</i> value
	Normal <sup>1</sup> ( <i>n</i> = 435)	Precise <sup>2</sup> ( <i>n</i> = 322)		
Gender				
Female	233 (59.1)	161 (40.9)	1.000	0.340
Male	202 (55.6)	161 (44.4)	1.153 (0.864-1.539)	
Age (yr)				
< 40	163 (58.8)	114 (41.2)	1.000	0.593
≥ 40	272 (56.7)	208 (43.3)	1.093 (0.810-1.476)	
Health insurance				
No	149 (59.1)	103 (40.9)	1.000	0.533
Yes	286 (56.6)	219 (43.4)	1.108 (0.815-1.505)	
Educational level				
Primary or no schooling	27 (54.0)	23 (46.0)	1.000	-
Secondary education	197 (57.9)	143 (42.1)	0.852 (0.469-1.547)	0.599
High education	211 (57.5)	156 (42.5)	0.868 (0.479-1.571)	0.640
Monthly household income, RMB (yuan)				
< 4000	226 (53.3)	198 (46.7)	1.000	0.010
≥ 4000	209 (62.8)	124 (37.2)	0.677 (0.505-0.908)	
Level of knowledge				
Low	103 (74.6)	35 (25.4)	1.000	-
Moderate	136 (72.0)	53 (28.0)	1.147 (0.697-1.887)	0.590
High	196 (45.6)	234 (54.4)	3.513 (2.290-5.389)	< 0.001

<sup>1</sup>Blood and feces test; <sup>2</sup>Colonoscopy. OR: Odds ratio; CI: Confidence interval.

have also been some inconsistent results.

As shown in the previous studies, a better knowledge of CRC and screening is related to a higher participation rate in population-based screening<sup>[20,23-26]</sup>. Among our patients, better knowledge was associated with the previous screening. This association is consistent with qualitative evidence in which lack of knowledge about CRC and screening has been cited as a barrier to screening participation in the United States, Canada and China<sup>[28]</sup>.

Lack of health insurance is an important barrier to the screening participation among ethnic groups with all levels of education<sup>[29,30]</sup>. The US-based 2005 National Health Interview Survey (NHIS) showed that 19% of respondents with no insurance reported having CRC screening (FOBT or endoscopy), compared with over 39% of those who had insurance<sup>[29]</sup>. In our study, health insurance status was positively associated with the screening behavior. This is an important finding for outpatient screening because more than half of the patients (64.2%) were covered by health insurance. Their compliance with CRC screening may be relatively easy to promote if appropriate screening advice is offered.

Factors that could enhance the screening willingness in previous studies included the followings: being a close relative of a CRC patient<sup>[31]</sup>, perceived susceptibility, perceived less barriers to screening, doctor's recommendation and personal contact with friends or relatives having CRC<sup>[21]</sup>. In Taiwan, factors related to intentions to have FOBT were influenced by the inconvenience and the unpleasantness of the screening procedure. Participants' gastrointestinal symptoms or family histories and physicians' recommendation or patients' health conditions were relevant to the intentions for a flexible sigmoidoscopic or colonoscopic screening<sup>[27]</sup>. Additionally, a knowledge of

CRC symptoms was associated with willingness to be screened in Malaysia on univariate analysis but not on multivariate analysis<sup>[21]</sup>. Among the patients in our survey, the knowledge regarding CRC and screening was an important factor that influenced screening willingness, meanwhile 41.3% patients expressed that they would need doctor's recommendation before attending the screening. So interventional studies which intend to increase the patients' knowledge regarding CRC and screening would help enhance the screening willingness.

Income level is another important factor affecting an individual's decision to be screened. Patients with more affluent socioeconomic status have been shown to have a higher average rate of screening than the less affluent<sup>[8,32,33]</sup>. However, in our study, the high-income patients were found to have a lower rate of screening and the reluctance of colonoscopic screening. This opposite phenomenon might be related to some cultural reasons. High-income patients live in better conditions and tend to get good treatment, so they are less concerned about using the preventive screening because they are more "healthy". Similar trend was detected in a Hong Kong population who perceived their health status to be good and had a less concern about contracting CRC than those who perceived a fair or poor health status<sup>[19]</sup>. The reluctance of high-income patients to take colonoscopic screening may also be influenced by the complexity of bowel preparation and the uncomfortable feeling caused by colonoscopy.

There are several limitations in this study. First, it was based in a single center. Our preliminary results on outpatient behavior and willingness cannot represent all the outpatients in Shanghai. Second, some patients (14.25%) did not respond to our survey, although great efforts were made to publicize the significance of the survey.

This may cause some patient selection bias, and a multi-center survey may be needed to confirm our results. However, our hospital, which is the largest endoscopy center in Shanghai, attracts many patients for this procedure. Therefore, our results are fairly representative of urban outpatient clinics.

In conclusion, most of the outpatients are willing to participate in CRC screening. A better knowledge about CRC and screening techniques is positively correlated with previous screenings, higher willingness to participate in the screening and a preference for colonoscopy as a screening methodology. However, a higher income level is a barrier to the screening behavior and the selection of colonoscopy. These results may have some implications for outpatient CRC screening and may help guide the further interventional studies.

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## COMMENTS

### Background

The incidence of colorectal cancer (CRC) in China has increased since the 1980s. Screening is an effective method for early detection of CRC.

### Research frontiers

Opportunistic screening which screened CRC among outpatients might be more effective in China, but has not been well illustrated. Studies exploring patient's screening preferences and factors influencing the choice of colorectal cancer screening modalities are needed before the screening is started. In this study, the authors demonstrated the factors influencing outpatients' screening behavior and willingness in Shanghai, China.

### Innovations and breakthroughs

This is the first study to report outpatients' screening behavior and willingness as well as to identify influencing factors in Shanghai, China. The results indicate that patients' levels of knowledge and income should be considered when launching a screening program among outpatients.

### Applications

By understanding what factors will influence colorectal cancer screening behavior and willingness among Chinese outpatients, this study has provided some implications for screening practice and may help guide further interventional studies.

### Peer review

It is a very interesting research for the readers, the conclusions are very valuable and it should be accepted for publication in the journal.

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