

BRIEF ARTICLES

Barrier-focused intervention to increase colonoscopy attendance among nonadherent high-risk populations

Wen Meng, Xi-Wen Bi, Xiao-Yin Bai, Hua-Feng Pan, Shan-Rong Cai, Qi Zhao, Su-Zhan Zhang

Wen Meng, Xi-Wen Bi, Xiao-Yin Bai, Hua-Feng Pan, Shan-Rong Cai, Su-Zhan Zhang, Cancer Institute (Key Laboratory of Cancer Prevention and Intervention, China National Ministry of Education, Key Laboratory of Molecular Biology in Medical Sciences, Zhejiang Province, China), The Second Affiliated Hospital, Zhejiang University School of Medicine, Hangzhou 310009, Zhejiang Province, China

Wen Meng, Department of Cardiothoracic Surgery, Hangzhou No. 1 People Hospital, Hangzhou 310006, Zhejiang Province, China

Qi Zhao, Xiacheng District Center for Disease Control and Prevention, Hangzhou 310003, Zhejiang Province, China

Author contributions: Meng W and Bi XW contributed equally to this work; Meng W, Bi XW, and Zhang SZ designed the research; Meng W, Bi XW, Bai XY, Pan HF, Cai SR and Zhao Q performed the intervention; Meng W and Bi XW analyzed the data and wrote the paper.

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Correspondence to: Su-Zhan Zhang, Professor, Cancer Institute, The Second Affiliated Hospital, Zhejiang University School of Medicine, 88 Jiefang Road, Hangzhou 310009, Zhejiang Province, China. zhangsuzhan@yahoo.com

Telephone: +86-571-87214404 Fax: +86-571-87214404

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Abstract

AIM: To increase attendance for colonoscopy among nonadherent high-risk individuals for colorectal cancer (CRC) screening in China.

METHODS: During the first 12 mo without intervention, only 428 of the 2398 high-risk subjects attended a scheduled colonoscopy examination. The 1970 subjects who did not attend for CRC screening were enrolled in the present study. Prior barrier investigation was performed to ascertain the reasons for nonadherence. A barrier-focused intervention program was then established and implemented among eligible nonadherent subjects by telephone interviews and on-site consultations. The completion rates of colonoscopy during the first 12 mo without intervention and the second 12 mo with intervention were compared. Variations in the effect of the intervention on some high-risk factors and barrier characteristics were analyzed using logistic regression.

RESULTS: 540 subjects who were not eligible were

excluded from the study. The colonoscopy attendance rate was 23.04% (428/1858) during the first 12 mo without intervention, and 37.69% (539/1430) during the second 12 mo with intervention ($P < 0.001$). Logistic regression analysis showed that the intervention was more effective among subjects with only objective barriers (OR: 34.590, 95% CI: 23.204-51.563) or subjects with some specific high-risk characteristics: first-degree relatives diagnosed with CRC (OR: 1.778, 95% CI: 1.010-3.131), personal history of intestinal polyps (OR: 3.815, 95% CI: 1.994-7.300) and positive result for immunochemical fecal occult blood testing (OR: 2.718, 95% CI: 1.479-4.996).

CONCLUSION: The barrier-focused telephone or on-site consultation intervention appears to be a feasible means to improve colonoscopy attendance among nonadherent high-risk subjects for CRC screening in China.

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Key words: Colorectal cancer; Screening; Intervention; Colonoscopy; Attendance

Peer reviewer: Dr. Shinji Tanaka, Director, Department of Endoscopy, Hiroshima University Hospital, 1-2-3 Kasumi, Minami-ku, Hiroshima 734-8551, Japan

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INTRODUCTION

In 2002, colorectal cancer (CRC) was the fourth most common cancer diagnosed worldwide in men and the third in women, over 1 000 000 new cases were diagnosed, and more than 500 000 deaths resulted^[1]. CRC screening can reduce mortality and incidence^[2-5]. Data from 1991 to 2004 for the United States show that advances in prevention, early detection, and treatment of cancer have resulted in an approximately 14% decrease

in overall cancer mortality, with remarkable declines for lung, colorectal, breast and prostate cancer^[6]. This evidence demonstrates that changes in lifestyle and/or cancer screening have been responsible for the decline in cancer mortality and incidence. The data from Chinese CRC screening practice have also shown decreased mortality and incidence rate in Jiashan and Haining^[7,8]. A two-step screening method has been recommended for community-based CRC screening in China: immunochemical fecal occult blood testing (iFOBT) and investigation by questionnaire of high-risk factors, followed by colonoscopy examination.

Although attendance rate for colonoscopy examination is crucial to the screening effect, it has remained disappointing in our urban CRC screening. Low attendance for CRC screening has also been found in other urban areas in China^[9]. Therefore, it is necessary to establish effective CRC screening intervention methods to increase attendance. The reasons for low attendance^[10-16] can be categorized into subjective or objective barriers. In this study, we evaluated the effects of a barrier-focused intervention program on colonoscopy attendance among nonadherent high-risk subjects undergoing community-based CRC screening in an urban area.

MATERIALS AND METHODS

CRC screening protocol in China

The protocol for CRC mass screening in China is as follows^[17]. Primary screening: subjects aged 40-74 years, who are positive for one or more of the following items are considered to be at high-risk for CRC: (1) immunochemical fecal occult blood testing (iFOBT); (2) first-degree relatives (FDRs) with CRC; (3) personal history of cancer or colorectal polyps; (4) two or more of the following items: (I) chronic diarrhea; (II) chronic constipation; (III) mucous and bloody stools; (IV) personal history of appendicitis or appendectomy; (V) personal history of chronic cholecystitis or cholecystectomy^[18]; (VI) history of psychiatric trauma (e.g. divorce or death of relatives). Secondary screening: subjects who are considered to be at high risk for CRC should undergo colonoscopy examination.

Enrollment

From the end of July 2006, we conducted population-based CRC screening according to Chinese screening guidelines in Xiacheng District, Hangzhou, China. All participants provided written informed consent. The 2398 subjects who were positive for the questionnaire and/or iFOBT were regarded as the high-risk population and were invited to follow-up colonoscopy. Only 428 (17.85%) high-risk subjects had attended a scheduled colonoscopy examination by the end of July 2007. The remained 1970 nonadherent high-risk subjects who did not attend colonoscopy examination were enrolled as the target population for our intervention. The cost of screening and intervention were supported by our research funding.

Table 1 Main barriers to colonoscopy among high-risk subjects (*n* = 407)

| Barriers | <i>n</i> (%) |
|---|--------------|
| Subjective barriers | |
| "I am not at risk for CRC": no symptoms | 185 (45.45) |
| Fear of finding cancer and subsequent surgery | 10 (2.46) |
| Fear of some complications related to colonoscopy | 9 (2.21) |
| Other personal health concerns ¹ | 9 (2.21) |
| Embarrassment | 2 (0.49) |
| Total | 215 (52.83) |
| Objective barriers | |
| Intolerance of pain or discomfort | 112 (27.52) |
| Busy on working days | 50 (12.29) |
| Intolerance of bowel preparation or diet control | 14 (3.44) |
| Inconvenience and complexity of colonoscopy procedure | 14 (3.44) |
| Transportation problems | 2 (0.49) |
| Total | 192 (47.17) |

¹Subjects preferred to focus on current health problems, such as diabetes, and fractures. CRC: Colorectal cancer.

Barrier investigation

To obtain in-depth information about the reasons for nonadherence, we selected 500 subjects from the target population and conducted questionnaire surveys by telephone or on-site interviews about the barriers to adherence. The questionnaires contained some acknowledged barrier options. Barriers were classified as subjective or objective. Only the most influential barrier was recorded. Four hundred and seven valid questionnaires were obtained. Table 1 lists the main barriers among high-risk nonadherent subjects.

Population classification

We planned to classify the target population into three groups for later evaluation of intervention effects. (1) Subjects with one or more subjective barriers (such as "I am not at risk for CRC"), with or without objective barriers. At least, the subjective barriers prevented them from attending colonoscopy examination. (2) Subjects with one or more objective barriers (such as intolerance of pain), without subjective barriers. They recognized the screening benefits but the objective barriers prevented them attending. (3) Subjects who simply forgot about or missed their colonoscopy examination. They were prepared to undergo colonoscopy.

Establishment and implementation of intervention

Based on the results of barrier investigation, a barrier-focused intervention program was established. The program included general and special measures. The general measures were performed among all eligible subjects and the special measures were performed selectively on each subject according to his/her specific barriers (Table 2). For subjects with subjective barriers, an explanation and education were used. For subjects with only objective barriers, the aim was mainly to adopt definite goals to improve objective conditions. For subjects without barriers, only general measures were used.

The intervention program was started at the end

Table 2 Barrier-focused intervention program

| Barriers | Special measures | General measures |
|---|--|---|
| Subjective barriers | Explanation and education | |
| “Not at risk for CRC”: no symptoms | Explain benefits and importance of screening, and give results of previous screening | Answering questions about the screening |
| Fear of finding cancer | Explain that early detection of CRC leads to good prognosis | Reminding of upcoming appointments |
| Fear of complications or perforation | Explain that complications in colonoscopy examination are rare | Arranging on-site consultations from the physician and epidemiologists if necessary |
| Embarrassment | Ensure that the patient’s confidence will be well protected | Providing guidance |
| Objective barriers | Improving objective condition | |
| Intolerance of pain | Arranging painless colonoscopy ¹ | |
| Lack of time on working days | Arranging examination at weekends | |
| Intolerance of bowel preparation | Simplifying bowel preparation | |
| Inconvenience and complexity of colonoscopy procedure | Providing guidance | |

¹Painless colonoscopy: Intravenous general anesthesia was performed during colonoscopy.

Table 3 Baseline characteristics of eligible subjects (n = 1430)

| Characteristics | n (%) |
|---|-------------|
| Age (yr) | |
| 40-59 | 687 (48.04) |
| 60-74 | 743 (51.96) |
| Sex | |
| Male | 511 (35.73) |
| Female | 919 (64.27) |
| High-risk factors | |
| FDRs diagnosed with CRC | 240 (16.78) |
| Personal history of intestinal polyps | 105 (7.34) |
| Personal history of other cancers | 136 (9.51) |
| Positive for questionnaire ¹ | 839 (58.67) |
| Positive for iFOBT | 241 (16.85) |
| Characteristics of barriers | |
| With subjective barriers | 646 (45.17) |
| With objective barriers | 714 (49.93) |
| Without barriers | 70 (4.90) |

¹Positive for questionnaire refers to having ≥ 2 of the following six items: (1) chronic diarrhea; (2) chronic constipation; (3) mucous or bloody stools; (4) personal history of appendicitis or appendectomy; (5) personal history of chronic cholecystitis or cholecystectomy; (6) history of psychiatric trauma. iFOBT: Immunochemical fecal occult blood testing.

of August 2007. The 1970 subjects received a series of telephone interviews or on-site interviews. The prevention care managers carried out the following: (1) explained the study purpose and obtained consent; (2) assessed eligibility by inquiring about patient disease history, and it was suggested that those with a disease history should be evaluated by specialists to make sure that they would tolerate the colonoscopy examination; (3) identification of the specific individual barriers to colonoscopy; (4) implementation of intervention measures predesigned to reduce these barriers; (5) arranged on-site consultations, during which the oncology physician and epidemiologists answered questions and tried to persuade subjects to participate in the colonoscopy examination; and (6) scheduled the colonoscopy appointments if the subjects consented.

The prevention care managers reminded the subjects by telephone 2 d ahead of the examination and provided guidance on the day of examination. Colonoscopy was

performed by gastroenterologists in the endoscopy units of local hospitals, and the results were retrieved via manual review of the medical records.

The intervention process was terminated in the following situations: (1) the subject attended a scheduled colonoscopy; (2) the subject definitely refused our invitation; and (3) the subjects were lost to follow-up after at least three calls. The intervention program was terminated at the end of August 2008.

Statistical analysis

The χ^2 test was used to evaluate statistical differences between the colonoscopy completion rates. Logistic regression analysis was used to evaluate the variation in the effects of the intervention on different characteristics of barriers and among subgroups with different high-risk factors. All data were analyzed using SPSS version 16.0.

RESULTS

Baseline characteristics

Five hundred and forty subjects were excluded from the study because of death ($n = 16$), medical unfitness to undergo colonoscopy ($n = 154$), movement from the community ($n = 260$), or other reasons ($n = 110$). Table 3 provides the baseline characteristics.

Intervention effect

Twenty-five subjects were lost to follow-up during the intervention, and we assumed that these subjects refused the colonoscopy invitation. The above 540 subjects were excluded from the study. The colonoscopy attendance rate was 23.04% (428/1858) during the first 12 mo without intervention, and 37.69% (539/1430) during the second 12 mo with intervention ($P < 0.001$). Among the eligible 1430 subjects, attendance rate post-intervention was 5.11% (33/646) for subjects with subjective barriers, 62.32% (445/714) for those with objective barriers, and 87.14% (61/70) for those with no barriers.

As shown in Table 4, the intervention was more effective for subjects with only objective barriers (OR:

Table 4 Variation in intervention effects (*n* = 1430)

| Characteristics | Adjusted OR | 95% CI | P value |
|---|-------------|----------------|---------|
| Age (yr) | | | |
| 40-59 | 1.000 | 0.643-1.133 | 0.273 |
| 60-74 | 0.853 | | |
| Sex | | | |
| Male | 1.000 | | |
| Female | 0.955 | 0.706-1.292 | 0.767 |
| High-risk factors | | | |
| FDRs diagnosed with CRC | 1.778 | 1.010-3.131 | 0.046 |
| Personal history of intestinal polyps | 3.815 | 1.994-7.300 | 0.000 |
| Personal history of other cancers | 1.444 | 0.745-2.799 | 0.277 |
| Positive for questionnaire ¹ | 1.589 | 0.925-2.727 | 0.093 |
| Positive for iFOBT | 2.718 | 1.479-4.996 | 0.001 |
| Characteristics of barriers | | | |
| With subjective barriers | 1.000 | | |
| With objective barriers | 34.590 | 23.204-51.563 | 0.000 |
| Without barriers | 132.421 | 59.709-293.681 | 0.000 |

¹Positive for questionnaire refers to having ≥ 2 of the following six items: (1) chronic diarrhea; (2) chronic constipation; (3) mucous or bloody stools; (4) personal history of appendicitis or appendectomy; (5) personal history of chronic cholecystitis or cholecystectomy; (6) history of psychiatric trauma. FDRs: First-degree relatives.

34.590, 95% CI: 23.204-51.563) and those without barriers (OR: 132.421, 95% CI: 59.709-293.681), compared to those with subjective barriers. The intervention was also more effective for subjects with FDRs diagnosed with CRC (OR: 1.778, 95% CI: 1.010-3.131), personal history of intestinal polyps (OR: 3.815, 95% CI: 1.994-7.300) or positive results for iFOBT (OR: 2.718, 95% CI: 1.479-4.996).

DISCUSSION

In previous studies on CRC screening intervention, higher attendance was achieved by some intervention practices such as health-care-provider-directed intervention^[19], telephone support^[20,21], psychoeducational intervention^[22,23], tailored guidance^[24,25], patient-physician communication^[26], motivational interviewing^[27], physician reminder^[28,29], community volunteers^[30], and mailed brochure^[31]. However, one-sided intervention methods may not achieve a satisfactory effect among nonadherent high-risk subjects.

In this study, we first identified the main barriers to colonoscopy examination, and then established a multifaceted barriers-focused intervention program that targeted objective and subjective barriers. The results indicated that the intervention program effectively increased the completion rate of colonoscopy among nonadherent high-risk subjects. The attendance rate of colonoscopy screening significantly increased during the intervention compared with the first 12 mo without intervention (23.04% *vs* 37.69%, $P < 0.001$), which reduced more effectively the mortality and incidence in the screening area, because more positive lesions were detected^[2,32]. Moreover, the targeted subjects during the intervention were nonadherent and did not respond to the examination invitations during the first 12 mo, which

made the intervention more difficult.

There were several barriers for any one subject, which made evaluation of each specific intervention measure complicated and inaccurate. We simplified the evaluation by classifying the target population into three behavioral groups according to their respective barriers. Colonoscopy completion rate in the population with objective barriers was higher than that in those with subjective barriers (62.32% *vs* 5.11%), which indicates that measures that target objective barriers are more effective. The colonoscopy completion rate in the population without barriers was as high as 87.14%, which indicates that only general intervention measures achieve satisfactory results among these individuals. Logistic regression also showed that the intervention was more effective for subjects with objective barriers and with no barriers compared to those with subjective barriers. Intervention measures that target subjective barriers should be improved to further increase the uptake rate.

Previous studies on barriers to CRC screening have noted that younger age is a predictor of receiving a physician recommendation for screening^[33,34]. However, in our study, logistic regression showed that there was no significant difference in intervention effects between middle-aged (40-59 years) and aged (60-74 years) populations. This may have resulted from the differences between our study population and those of previous studies in terms of ethnicity, socioeconomic status and other sociodemographic characteristics.

Our findings suggested that several high-risk factors were associated positively with intervention effect. The intervention was more effective among subjects with a history of intestinal polyps. Most of these subjects had been advised by their physicians to take regular examinations, which may have contributed to their higher compliance with our intervention. Subjects with positive results for iFOBT showed better compliance. The perceived value of different high-risk factors may explain partially the variation in intervention effect. According to the medical knowledge of high-risk subjects, some items in the questionnaire (e.g. personal history of appendicitis or appendectomy, history of psychiatric trauma) seem to be less specific to CRC than iFOBT is. This may reduce the perceived importance of questionnaire investigation and cause the subjects to consider iFOBT more valuable in CRC screening. However, further investigation is needed to confirm this explanation. The poor compliance of subjects with positive questionnaire results highlighted the importance of tailoring education programs to address questionnaire investigation of CRC. Poor participation in CRC screening in FDRs of patients with CRC has been reported previously^[35]. In our study, the subjects with FDRs diagnosed with CRC showed slightly better compliance. The possible reason was that the physicians who diagnosed and treated the index patients also explained the increased risk for the FDRs and advised CRC screening to increase their awareness and attendance.

Our study had several strengths: (1) we recruited

nonadherent high-risk subjects among whom intervention for colonoscopy examination has not been widely studied before; (2) the sample number was large, the consent rate was high, and few were lost to follow-up; and (3) the community setting of the study provided ready access to the subjects.

There were also some limitations to the study: (1) there was no comparison group, and one group pre- and post-test was studied; (2) it did not have saturation coverage of the communities, and it may not have included completion of all colonoscopy examinations, because the duration of the intervention was short; and (3) the population classification was based on self-reported barriers, which may have potential bias.

In summary, this barrier-focused intervention in nonadherent high-risk subjects may increase colonoscopy attendance in urban CRC screening. We found that our intervention in individuals with subjective barriers was not as effective or practical as in those with objective barriers. The next steps are to modify the intervention methods to better overcome subjective barriers. The ultimate goal is to apply the multifaceted barriers-focused intervention to other urban CRC screening regions in China.

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COMMENTS

Background

Colonoscopy examination is regarded as the gold standard for mass screening of colorectal cancer (CRC). Although attendance rate for colonoscopy examination among high-risk populations is crucial for screening success, it has remained disappointing for CRC screening. Therefore, it is necessary to establish effective screening intervention methods to increase colonoscopy compliance.

Research frontiers

In previous studies on CRC screening intervention, higher attendance was achieved by some intervention practices such as health-care-provider-directed intervention, or telephone support. However, one-sided intervention methods may not achieve a satisfactory effect among nonadherent high-risk subjects. Many studies have reported that subjective or objective barriers prevent high-risk subjects from undergoing colonoscopy examination, which indicates that barrier-focused intervention might be effective. However, such barrier-focused intervention has not been reported previously.

Innovations and breakthroughs

This is believed to be the first study to establish a barrier-focused intervention program and evaluate its effects on colonoscopy attendance in CRC screening. Moreover, in this study, nonadherent high-risk subjects were recruited, among whom, intervention for colonoscopy examination has not been widely studied before.

Applications

The study suggests that barrier-focused intervention is an effective method and may be used to increase colonoscopy attendance in other CRC screening regions.

Terminology

Barrier-focused intervention in CRC screening is an intervention method that

aims to increase colonoscopy attendance by removing the barriers that prevent the subjects from undergoing colonoscopy examination. Barrier-focused intervention must be tailored or individualized because every subject may have different barriers.

Peer review

The authors performed barrier-focused intervention to increase colonoscopy attendance among nonadherent high-risk populations in China. The colonoscopy attendance rate was 23% during the first 12 mo without intervention and 38% during the second 12 mo with intervention. The authors concluded that the barrier focused telephone or on-site consultation intervention appears to be a feasible means to improve colonoscopy attendance among nonadherent high-risk populations for CRC screening. Improving colonoscopy attendance in CRC screening is an important issue, and the results of this study are interesting.

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