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Healthy Colon, Healthy Life:

A Novel Colorectal Cancer Screening Intervention

Judith M.E. Walsh, MD, MPH, Rene Salazar, MD, Tung T. Nguyen, MD, Celia Kaplan, DrPH, MA, Lamkieu Nguyen, MD, Jimmy Hwang, PhD, Stephen J. McPhee, MD, and Rena J. Pasick, DrPH

Division of General Internal Medicine (Walsh, Salazar, Nguyen T, Kaplan, McPhee), Department of Medicine; Comprehensive Cancer Center (Walsh, Salazar, Nguyen T, Kaplan, Hwang, McPhee, Pasick); Medical Effectiveness Research Center (Salazar, Nguyen T, Kaplan), University of California San Francisco, San Francisco; and Santa Clara Valley Health and Hospital System (Nguyen L), Santa Clara, California

Abstract

Background—Colorectal cancer (CRC) screening rates are increasing, but they are still low, particularly in ethnic minority groups. In many resource-poor settings, fecal occult blood test (FOBT) is the main screening option.

Intervention—Culturally tailored telephone counseling by community health advisors employed by a community-based organization, culturally tailored brochures, and customized FOBT kits.

Design—RCT. Participants were randomized to (1) basic intervention: culturally tailored brochure plus FOBT kit ($n=765$); (2) enhanced intervention: brochure, FOBT plus telephone counseling ($n=768$); or (3) usual care ($n=256$).

Setting/participants—Latino and Vietnamese primary care patients at a large public hospital.

Main outcome measures—Self-reported receipt of FOBT or any CRC screening at 1-year follow-up.

Results—1358 individuals (718 Latinos and 640 Vietnamese) completed the follow-up survey. Self-reported FOBT screening rates increased by 7.8 % in the control group, by 15.1 % in the brochure group, and by 25.1 % in the brochure/telephone counseling group ($p<0.01$ for differences between each intervention and usual care and for the difference between brochure/telephone counseling and brochure alone). For any CRC screening, rates increased by 4.1 % in the usual care group, by 11.9 % in the FOBT/brochure group, and by 21.4 % in the brochure/telephone counseling group ($p<0.01$ for differences between each intervention and usual care and for the difference between the basic and the enhanced intervention).

Conclusions—An intervention that included culturally tailored brochures and tailored telephone counseling increased CRC screening in Latinos and the Vietnamese. Brochure and telephone

counseling together had the greatest impact. Future research should address replication and dissemination of this model for Latinos and Vietnamese in other communities, and adaptation of the model for other groups.

Background

Colorectal cancer (CRC) is the second-leading cause of cancer mortality in the U.S. Among Latinos, CRC is the second-leading cause of cancer death in men and the third-leading cause of cancer death in women.¹ CRC is the third most common cancer in Vietnamese Americans in the U.S.² CRC screening is recommended for all individuals aged ≥ 50 years. There are many and increasing screening options.^{3–5} Although leading organizations differ in their recommendations, there is general agreement that CRC screening should include fecal occult blood testing, sigmoidoscopy, or colonoscopy. However, colonoscopy (and even sigmoidoscopy) may not be readily available, especially in resource-poor settings.

Although rates of CRC screening are increasing, they are still low and tend to be lowest among ethnic minority groups, including Latinos and Vietnamese, compared with non-Latino whites.^{6,7} Data from the 2007 California Health Interview Survey show that 33 % of Vietnamese adults and 39 % of Latino adults aged ≥ 50 years had *never* had any CRC screening test. This compares with 28 % and 25 % for African-American and Anglo adults, respectively.⁸ Latinos and Vietnamese are two rapidly growing ethnic groups in the U.S., with Latinos currently comprising 12.5 % of the U.S. population, and projected to become the nation's largest ethnic/racial population by 2010.⁴ Vietnamese Americans are one of the fastest-growing Asian/Pacific ethnic groups.⁹ Thus, development of interventions that efficiently reach these subgroups with effective screening promotion strategies represents an important public health challenge.

Made possible by the diversity of the San Francisco Bay Area and an ethnically diverse research team, our study was designed to ascertain whether two culturally distinct ethnic subgroups could be reached through a common intervention delivered through a single partnering community-based organization for the purpose of raising rates of colorectal screening. The benefits of this approach are multiple. First, U.S. communities are increasingly diverse in the sense that multiple ethnic and language groups reside in the same or nearby neighborhoods, go to the same schools, and use the same clinics. For interventions targeting disparities, the greatest external validity might be achieved from strategies that are broad enough to target multiple culturally varied groups and at the same time retain an ability to tailor by culture.¹⁰ Second, the demonstration of effectiveness in two such diverse groups would signal considerable potential for applicability even more broadly. Third, limited English speakers have consistently shown the highest rates of late stage for detection of cancers amenable to routine screening.^{11,12} To demonstrate that a single intervention can be effective in more than one of these high-risk groups would have clear public health significance.

Interventions to increase rates of CRC screening have targeted both physicians and patients with strategies such as reminders,^{13–15} provision of fecal occult blood test (FOBT) cards,^{13,16} provision of patient education material,^{16,17} and academic detailing to

physicians.¹⁸ To date, the most effective interventions have generated modest (6 %–12 %) increases in uptake of CRC screening,^{17,19,20} and others^{16,21} have shown no effect.

Our CRC promotion intervention had four features designed to achieve maximum effect. The first is *cultural tailoring*, that is, the development of interventions, strategies, messages, and materials to conform to specific cultural characteristics.^{22,23} In our intervention, this included language adaptation of all messages and materials, the development of unique brochures with images and messages found to be appealing and acceptable to each ethnic group, and perhaps most importantly, the use of ethnically concordant telephone counselors who possessed an innate understanding of the social context (the sociocultural forces that shape people's day-to-day experiences and that directly and indirectly affect health and behavior) of our target audiences.²⁴ Culturally tailored messages have been used in successful cancer screening programs targeting diverse ethnic groups,^{25–31} demonstrating a positive impact on cancer screening rates.

Second, the CRC screening messages were tailored by *adoption stage* according to the transtheoretical model of behavior change (TTM) which assesses an individual's readiness to engage in a behavior.^{32,33} Rakowski adapted the TTM to successfully increase use of mammography.³⁴ Third, in order to deliver tailored messages in a personal but still efficient manner, the choice was made to use *telephone counseling* by a team of Latino and Vietnamese lay health advisors. Telephone counseling can reach those who rarely access medical care, and it has been used to address several cancer disparities in clinic and community settings.^{35–38} Fourth, the telephone counseling intervention was located in and operated by a partnering community-based organization (CBO), Catholic Charities, located in San Jose CA, which helped enhance the credibility of the program as well as build the capacity of this trusted entity to promote the health of community members.

In this context, this study addressed the following question: Can an intervention that includes culturally tailored brochures with or without tailored telephone counseling increase rates of CRC screening among Latinos and Vietnamese seen in primary care clinics? To our knowledge, no prior studies have assessed the effect of a culturally and individually tailored intervention to increase CRC screening in diverse underserved populations.

Methods

Intervention

The intervention consisted of three components: telephone counseling, culturally tailored brochures, and a customized FOBT kit. Telephone counseling was delivered according to a protocol and scripts modeled on the *Pathfinders* study to increase breast and cervical cancer screening rates in five ethnic groups.³⁹ Three Latino and five Vietnamese community health advisors (CHAs) were recruited by our CBO partner and trained for >20 hours using didactic course work, role-plays, and practice counseling sessions with study investigators as well as on-site visits to participating clinics and a gastroenterology suite. CHAs delivered messages specific to each individual's adoption stage and perceived barriers to screening. Scripts for barriers were based on our study⁷ of barriers to CRC screening in Latinos and Vietnamese. There were separate scripts for each adoption phase as well as for each barrier.

Thus individual participants were provided personalized information based on their defined stage of change as well as their defined barriers to cancer screening. To ensure quality control, study investigators met frequently with the CHAs, and they regularly reviewed the CHAs' records.

Bilingual culturally tailored brochures were developed separately in Spanish and Vietnamese languages. Initial messages were crafted using results from our prior survey⁷ of barriers to CRC screening in Latinos, Vietnamese, and whites. Focus groups were conducted at various developmental phases to refine message content and to ascertain appropriate brochure design formats. The brochures addressed the need for CRC screening, a description of the tests, and commonly asked questions about CRC screening. Examples of barriers addressed included embarrassment, concern about the stool collection being dirty or messy, the need for testing if one feels healthy or eats a healthy diet and concern about the cost of the test. The brochures included pictures of physicians and community members and all included an English translation. Some of the tailoring components included brochure size and color, types of pictures were included and where they were placed, and where the English translation was placed in the brochure.

The ColoScreen® FOBT kit contained three cards for collecting stool, three wooden applicator sticks, a stamped return envelope, a lab slip, and a letter from the individual's primary care physician emphasizing the importance of CRC screening. Also included were simplified written instructions in English and Spanish or Vietnamese for collecting the stool and information on dietary restrictions particular to the Latino and Vietnamese cultures.

Setting

Santa Clara Valley Medical Center (SCVMC) is a public hospital owned and operated by the county of Santa Clara. SCVMC operates a network of community-based clinics that provide primary care to residents of Santa Clara County, many of whom are Latino or Vietnamese. There is limited endoscopy capacity at SCVMC and so the primary CRC screening option is the FOBT. Screening colonoscopy is not routinely available and is reserved for those who have a family history of CRC; otherwise diagnostic colonoscopy is used in patients who have a positive FOBT or CRC symptoms.

Participants

Participants were Vietnamese and Latino male and female patients at one of the five SCVMC primary care satellite sites. Primary care physician panel lists were generated via an electronic medical record and included patient name, age, and ethnicity. At SCVMC, some parts of the medical record are on paper and some are electronic, so identifying in advance only those patients due for CRC screening was not possible.

All primary care physicians seeing patients at the medical center were invited to participate and asked for permission to contact their eligible Vietnamese or Latino patients aged 50–79 years with no history of cancer. Exclusion criteria included dementia or any condition (e.g., terminal illness) for which the primary care physician deemed the patient ineligible for CRC screening. After the physician gave permission, eligible patients received a mailed letter describing the study, enclosing a refusal postcard. Individuals who did not return the refusal

postcard received a telephone call asking them to participate in a telephone survey and the intervention trial. Those who participated in the telephone interview received \$15 cash after completion of both baseline and follow-up surveys.

Study Design

An RCT compared two variations of the intervention with usual care. Participants completed a baseline survey by phone and were then randomized to receive (1) usual care (controls), (2) mailed FOBT kit plus culturally tailored brochures, or (3) mailed FOBT kit plus culturally tailored brochures and tailored telephone counseling. Randomization was done using a computer-generated random number list, and a randomization scheme stratified by gender and ethnicity. A telephone follow-up survey was administered 9–12 months after baseline.

Baseline and Follow-Up Survey Instruments

The survey instrument was developed based on our prior survey⁷ of barriers to CRC screening in Vietnamese, Latinos, and whites. The survey was developed in English, translated into Spanish and Vietnamese, and then back-translated into English to ensure lexical equivalency; it was pilot tested and revised. This methodology ensured that the source language did not become the dominant language.²² The surveys were administered using computer-assisted telephone interviewing by trained bilingual telephone interviewers and conducted in Vietnamese, Spanish, or English, according to the participant's choice. The follow-up survey, similar to the baseline survey although shorter, was administered 9 – 12 months after the baseline survey. IRB approval was obtained from University of California, San Francisco, and SCVMC in May, 2005.

Survey items included demographics, acculturation, perceived health status, perceived risk of developing cancer, previous CRC screening behaviors, intention to be screened, beliefs, knowledge items, and perceived barriers and facilitators to CRC screening. Acculturation was measured using a five-item scale developed by Marin et al.⁴⁰ and previously used and validated in the Latino population. These items included questions about language read and spoken at home, spoken with friends, used as a child, and language in which an individual thinks. The scale is graded such that a high value denotes high acculturation.

Provider factors were derived from available SCVMC physician data and included gender, ethnicity, and gender and language concordance with the patient.

Outcomes

Because the primary screening option available at SCVMC is FOBT, the main study outcomes were self-reported receipt of FOBT or any CRC screening (FOBT, sigmoidoscopy and/or colonoscopy) during the 1-year follow-up. All questions measuring CRC screening tests had been recommended for use as standardized self-report measures for CRC.⁴¹ Questions included whether or not respondents had ever completed a home stool blood test (FOBT); (2) recency of latest FOBT; (3) if they ever had a sigmoidoscopy or colonoscopy; and (4) recency of that endoscopy.

Sample Size

Sample size was calculated based on a test of differences between experimental groups on follow-up FOBT rates separately for Vietnamese and Latino participants. An effect size of 10 % was assumed to be clinically significant. For each ethnic group, each intervention group required 344 participants and the usual care group required 111 participants. Using a 90 % power and assuming 20 % attrition, it was calculated that 900 participants would be needed per ethnic group for a total of 1800 participants.

Analyses

The baseline survey was conducted in 2005–2006, the follow-up survey was conducted in 2006–2007, and the data analyses were completed during 2007–2009. Data were analyzed using SAS, version 1.3. The primary analyses were designed to examine the impact of the intervention on receipt of FOBT and on any CRC screening. Descriptive statistics were computed for all demographic and dependent variables, including means and SDs for continuous data and frequency distributions for each of the categoric variables. Descriptive statistics were also calculated for the telephone counseling variables.

For the univariate comparisons, *t*-tests were used for continuous variables and chi-square of independence for the categoric variables. The percentage of individuals up-to-date for screening at baseline and follow-up were measured as the percentage of individuals who had had the recommended screening test within the recommended time interval, specifically, the percentage of individuals who had had FOBT within the past year, sigmoidoscopy within the past 5 years, and colonoscopy within the past 10 years. The percentage of individuals up-to-date with any CRC screening was calculated as the percentage of individuals who had FOBT within the past year, sigmoidoscopy within the past 5 years, or colonoscopy within the past 10 years.

The difference between baseline and follow-up rates was calculated for each condition. To compare the differences in the change in screening rates between study groups, *t*-tests were used. The primary analysis assessed whether the difference with either Group-2 or Group-3 interventions was significantly greater than that with Group 1, the usual care (control) group. The secondary analysis evaluated whether the difference with the Group-3 intervention (FOBT kit plus brochure plus tailored telephone counseling) was significantly greater than that with the Group-2 intervention (FOBT kit plus brochure).

Multivariate analyses were performed to determine the independent impact of the interventions on rates of CRC screening and included both patient and provider factors. Patient factors included in the multivariate model were age, gender, marital status, education, employment, acculturation, self-rated health, perceived cancer risk, and cancer knowledge. Because all Vietnamese participants described a low acculturation level, acculturation was not included in the model for Vietnamese. Provider factors included gender, patient–physician gender, ethnicity, and language concordance. The estimates of these parameters of multivariate logistic regression models were computed in a stepwise manner by entering or removing variables, one variable at a time, from the list of potential predictors. The entry criterion of $p=0.30$ and the removal criteria of $p=0.35$ was set for

entering and removing variables in the stepwise models. All predictors were presented in the final parsimonious model; variables showing a significant effect ($p < 0.05$) are marked with an asterisk.

Results

Provider Characteristics

Of 49 SCVMC physicians asked to participate, 44 agreed (90 %). Among participating physicians, 23 (56 %) were women; half (51 %) were Caucasian; 10 % were Latino; 17 % were Vietnamese; and the remainder, of other ethnicities. About half (51 %) of participating physicians spoke Spanish. All of the Vietnamese physicians spoke Vietnamese. On average, physicians were in clinical practice about 6.5 half-day sessions per week and 42 (95 %) were U.S. graduates.

Participant Characteristics

The participant flow diagram is shown in Figure 1. Letters were mailed to 5377 potential participants. After excluding those who were not eligible or for whom phone numbers were incorrect, 4156 were eligible for the survey. Call attempts were made to a total of 3670 eligible individuals who did not return refusal postcards. A total of 1789 individuals completed the baseline survey for a response rate of 51 %. Because 1279 individuals could not be reached by phone, the percentage of those reached who actually responded was 62 %. A total of 1358 individuals completed the follow-up survey for a retention rate of 76 %. Four percent of baseline survey participants refused the follow-up survey, 11 % were not available, and 10 % of total respondents were not found either because of a wrong number, phone number disconnected, or being deceased.

Participant characteristics (Table 1)—Participants' mean age was 61 years; the majority of both ethnicities were female and married or living with a partner. The majority of Latinos was born outside of the U.S. and completed the interview in Spanish; all of the Vietnamese were foreign-born and virtually all completed the interview in Vietnamese. The majority of both groups had less than a 12th-grade education and measured low on the acculturation scale. Most rated their health as fair to poor. Few perceived themselves to be at high risk for CRC. There were no significant differences among the three study arms.

Baseline cancer screening behavior (Table 2)—The majority of both ethnicities had heard of CRC, although fewer had heard of a polyp or the endoscopic screening tests. About two thirds had ever had CRC screening at baseline. There were no significant differences between intervention groups.

Impact of intervention on colorectal cancer screening (Table 3)—The changes in screening rates (follow-up rate versus baseline rate) are compared in Table 3. The Group-2 intervention (FOBT kit plus brochure) and Group-3 intervention (FOBT kit plus brochure plus telephone counseling) are each compared to the Group-1 intervention (usual care). In addition, Group 3 is then compared to Group 2. For the primary outcome (receipt of FOBT), screening rates increased 7.8 % in Group 1; 15.1 % in Group 2; and 25.1 % in Group 3.

Group-2 and Group-3 pre–post differences were both significantly greater than that in Group 1. The difference in Group 3 was significantly greater than that in Group 2. Similar trends were seen for the secondary outcome of being up-to-date with any CRC screening.

A preplanned subgroup analysis was performed comparing the effects of the intervention separately in Latinos and Vietnamese. In Latinos, the pre–post differences for the primary outcome for Group 2 and Group 3 were both significantly greater than that for Group 1; however, the Group-3 difference was not significantly greater than that in Group 2. For any CRC screening, both interventions were significantly better than usual care and the Group-3 difference was significantly greater than that seen in Group 2.

In contrast, among Vietnamese, the pre–post difference for Group 2 was not significantly greater than Group 1, although the difference for Group 3 was significantly greater than that for Group 1 and Group 2. For the secondary outcome, the only significant difference was between Groups 2 and 3.

Multivariate analyses (Tables 4 and 5)—Multivariate analyses were performed for the entire study cohort and also separately for Latinos and Vietnamese. For the primary outcome of FOBT in the past year, the effect of the Group-3 intervention was significant compared to the Group-1 intervention, but the effect of the Group-2 intervention was not significant when compared to that of Group 1. Similar results were seen when Latinos and Vietnamese were analyzed separately. For the outcome of any CRC screening, both Group-2 and Group-3 interventions had significant effects compared to Group 1; however, when Latinos and Vietnamese were analyzed separately, only the Group-3 intervention was significant.

Features of tele phone counseling—There were eight CHAs: three were Latino and five were Vietnamese. All of the Latino counselors were women and three of the Vietnamese counselors were women. A total of 758 participants were randomized to receive telephone counseling, and 593 participants (78 %) actually received telephone counseling. The average number of times a participant was contacted was 1.74 (SD=1.62), and the average duration of counseling was 17 (SD=11) minutes. Latino participants were counseled an average of 20 (SD=10) minutes and Vietnamese participants were counseled an average of 14 (SD=8) minutes.

Discussion

This study targeted promotion of colorectal screening to two low-income and ethnically diverse populations. This highly successful intervention resulted in a large increase in self-reported rates of FOBT screening among Latinos and Vietnamese. Overall, direct provision of an FOBT kit and a culturally tailored brochure plus individually and culturally tailored counseling—all provided in the patient’s language of choice: English, Spanish, or Vietnamese—resulted in a 25 % pre–post increase in self-reported screening. The basic intervention, which included the FOBT kit and brochure without the telephone counseling, was not sufficient to increase rates of self-reported CRC screening, but the addition of the tailored telephone counseling seemed to be the key feature that made a difference.

It is thus far rare for studies to feature both cultural and individual tailoring across two or more ethnic groups in the context of a single intervention. Pasick and colleagues' randomized trial³⁹ of 1463 African-American, white, Latina, Filipina, and Chinese women used culturally and individually tailored print as well as telephone counseling in four languages, resulting in significant pre–post increases of 16 % for Pap ($p=0.001$) and 10 % for mammography ($p=0.05$).

Surprisingly, individuals who were less acculturated were more likely to be up-to-date at follow-up. In another study,⁴² low acculturation was associated with less endoscopic screening but it was not associated with FOBT screening. It is possible that those who are less acculturated are less likely to question their physicians and to have testing if it is recommended.

Few CRC screening interventions have targeted a disadvantaged group or those of diverse ethnicity or levels of acculturation. In a recent randomized trial in a community health center serving a low-income and ethnically diverse (predominantly Latino, African-American, and white) population where colonoscopy was the primary available screening test, patients were randomized to receive a culturally tailored letter with educational material and contact (either in person or by phone) with a language-concordant “navigator” or to usual care. The navigators were community health workers trained to address barriers to CRC screening. Nine months later, participants in the intervention group were more likely to receive colonoscopy than those in the control group (21 % vs 10 %; $p<0.001$).²⁷ In Healthy Colon, Healthy Life, there was an increase in CRC screening, but as in many low-income settings, the main available CRC screening test was FOBT. In addition, in Healthy Colon, Healthy Life, all of the CHA contact with the participants occurred by telephone, demonstrating that telephone counseling only (which is inherently more efficient than in-person contact) is both feasible and highly effective.

This study has several limitations. It was conducted in a single geographic setting and it is possible that Latinos and Vietnamese living in Santa Clara CA are different from Latinos and Vietnamese living elsewhere in the country. However, these are all patients in a public health care system, and it is likely that this system has many similarities with other public health-care systems nationwide. Second, only two ethnic groups, Latinos and Vietnamese, were included, although these are two very large and important groups in the U.S. However, because efficacy was shown in these two diverse groups, this suggests the potential for broad applicability.

Third, the outcome of CRC screening was by self-report. Nevertheless, standardized questions about CRC screening that have been used and validated in many surveys where individuals are asked about CRC screening were used.^{41,43,44} In addition, self-report of FOBT screening has previously been shown to be very accurate, with no difference in accuracy related to ethnicity.⁴⁵ Fourth, CRC screening outcomes are available for only those participants who completed both the baseline and follow-up surveys. Finally, FOBT was the primary available screening test and this may not be the case in other settings. However, self-reported receipt of sigmoidoscopy and colonoscopy was also measured. Also, these

results are probably generalizable to many resource-poor settings where there is limited endoscopy capacity and stool tests are likely to be the primary screening option available.

The results of Healthy Colon, Healthy Life, expand on the recommendations of the Task Force on Community Preventive Services⁴⁶ about client-oriented screening interventions and CRC screening. The Task Force recommends the use of small media, such as brochures, to encourage FOBT screening based on strong evidence of efficacy. However, when the Task Force evaluated the use of one-on-one education either in person or by telephone to increase rates of FOBT screening, it concluded that the evidence was insufficient. The results of Healthy Colon, Healthy Life provide important new evidence to suggest that one-on-one education combined with small media is indeed effective in increasing rates of CRC screening.

Conclusion

This individually and culturally tailored intervention was highly successful in increasing rates of CRC screening in two ethnically diverse populations, Latino and Vietnamese. Key features of the intervention included a single overall approach in which messages were linguistically and culturally appropriate, and telephone counseling was tailored to individual stage of change and delivered by community members through a trusted community-based organization. Future directions include assessment of the cost effectiveness of this intervention and its dissemination for other Vietnamese and Latino communities in addition to research to adapt and test our approach among other ethnic groups in both urban and rural locations.

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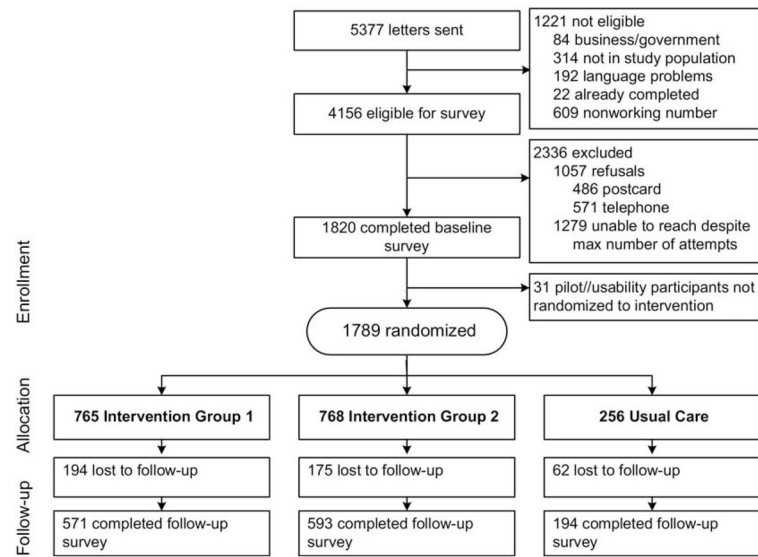


Figure 1.
Participant flow diagram

Table 1

Characteristics of study participants who were primary care patients and completed the baseline survey

Characteristics	Study arm			p-value ^a
	Group 1: usual care	Group 2: FOBT plus brochure	Group 3: FOBT plus brochure plus counseling	
ALL PARTICIPANTS (N=1789)				
Sociodemographics				0.59
Age (years; M [SD])	60.37 (6.5)	60.63 (6.7)	60.73 (6.8)	
Gender				0.96
Male	79 (30.9)	237 (31.0)	233 (30.3)	
Female	177 (69.1)	528 (69.0)	535 (69.7)	
Marital status				0.35
Married or living with partner	144 (56.3)	452 (59.01)	470 (61.2)	
Other	112 (43.8)	313 (40.9)	298 (38.8)	
Country of birth				0.80
Mexico	89 (34.9)	284 (37.4)	284 (37.2)	
U.S.	32 (12.6)	82 (10.8)	89 (11.7)	
Vietnam	113 (44.3)	337 (44.3)	337 (44.1)	
Other	21 (8.2)	57 (7.5)	54 (7.1)	
Years in U.S. (M [SD])	19.17 (10.9)	19.2 (10.9)	19.0 (11.1)	0.87
Employment status				0.13
Employed	62 (24.2)	168 (22.0)	157 (20.4)	
Unemployed	77 (30.1)	238 (21.1)	245 (31.9)	
Homemaker	79 (30.89)	216 (28.2)	229 (29.8)	
Retired	38 (14.8)	143 (18.7)	137 (17.8)	
Annual household income (\$)				0.14
<20,000	140 (54.7)	443 (57.9)	451 (58.7)	
>20,000	40 (15.6)	81 (10.6)	75 (9.8)	
Did not respond	76 (29.7)	241 (31.5)	242 (31.5)	
Education (years)				0.50
6	136 (53.1)	433 (56.6)	430 (56.0)	
7–12	59 (23.1)	186 (24.3)	191 (24.9)	
13	61 (23.8)	146 (19.1)	147 (19.1)	
Language of interview				0.83
English	29 (11.3)	68 (8.9)	76 (9.9)	
Spanish	114 (44.5)	358 (46.8)	351 (45.7)	
Vietnamese	113 (44.1)	339 (44.3)	341 (44.4)	
Acculturation score^b				0.32
High (>3.0)	34 (13.3)	76 (9.9)	81 (10.56)	
Low (<3.0)	222 (86.7)	689 (90.1)	687 (89.5)	

Characteristics	Study arm			p-value ^{df}
	Group 1: usual care	Group 2: FOBT plus brochure	Group 3: FOBT plus brochure plus counseling	
Self-rated health				0.87
Excellent/very good	11 (4.4)	31 (4.2)	42 (5.6)	
Good	45 (18.1)	148 (19.9)	137 (18.4)	
Fair	137 (55.0)	399 (53.7)	402 (53.9)	
Poor	56 (22.5)	165 (22.2)	165 (22.1)	
Perceived risk of developing colon cancer				0.39
More likely than others	27 (10.6)	95 (12.4)	108 (14.1)	
About the same as others	179 (69.9)	530 (69.3)	502 (65.4)	
Less likely than others	50 (19.5)	140 (18.3)	158 (20.6)	
LATINOS (n=993)				
Sociodemographics				0.38
Age (years; M [SD])	59 (6.8)	60 (7.4)	60 (7.6)	
Gender				0.99
Male	39 (27.3)	114 (26.8)	115 (26.9)	
Female	104 (72.7)	312 (73.2)	312 (73.1)	
Marital status				0.23
Married or living with partner	66 (46.2)	192 (45.1)	217 (50.8)	
Other	77 (53.9)	234 (54.9)	210 (49.2)	
Country of birth				0.81
Mexico	32 (22.5)	82 (19.4)	89 (21.0)	
U.S.	89 (62.7)	284 (67.3)	284 (67.0)	
Vietnam	—	—	—	
Other	21 (14.8)	56 (13.3)	51 (12.0)	
Years in U.S. (M [SD])	23.33 (12.8)	23.01 (12.7)	22.92 (13.2)	0.17
Employment status				0.53
Employed	32 (22.4)	101 (23.7)	92 (21.6)	
Unemployed	40 (28.0)	118 (27.7)	114 (26.7)	
Homemaker	49 (34.3)	121 (28.4)	138 (32.3)	
Retired	22 (15.4)	86 (20.2)	83 (19.4)	
Annual household income (\$)				0.22
<20,000	72 (50.4)	239 (56.1)	231 (54.1)	
>20,000	27 (18.9)	55 (12.9)	50 (11.7)	
Did not respond	44 (30.8)	132 (31.0)	146 (34.2)	
Education (years)				0.57
6	93 (65.0)	307 (72.1)	295 (69.1)	
7–12	34 (23.8)	85 (20.0)	94 (22.0)	
13	16 (11.2)	34 (8.0)	38 (8.9)	
Language of interview				0.48

Characteristics	Study arm			p-value ^{df}
	Group 1: usual care	Group 2: FOBT plus brochure	Group 3: FOBT plus brochure plus counseling	
English	29 (20.3)	68 (16.0)	76 (17.8)	
Spanish	114 (79.7)	358 (84.0)	351 (82.2)	
Acculturation score^b				0.39
High (>3.0)	33 (23.1)	76 (17.8)	81 (19.0)	
Low (<3.0)	110 (76.9)	350 (82.2)	346 (81.0)	
Self-rated health				0.39
Excellent/very good	9 (6.3)	23 (5.4)	38 (8.9)	
Good	25 (17.6)	93 (22.0)	80 (18.8)	
Fair	80 (56.3)	232 (54.9)	232 (54.6)	
Poor	28 (19.7)	75 (17.7)	75 (17.7)	
Perceived risk of developing colon cancer				0.73
More likely than others	20 (14.0)	70 (16.4)	80 (18.7)	
About the same as others	95 (66.4)	277 (65.0)	266 (62.3)	
Less likely than others	28 (19.6)	79 (18.5)	81 (19.0)	
VIETNAMESE (n=793)				
Sociodemographics				0.48
Age (years; M [SD])	61 (6.1)	61 (5.7)	61 (5.7)	
Gender				0.90
Male	40 (35.4)	123 (36.3)	118 (34.6)	
Female	73 (64.6)	216 (63.7)	223 (65.4)	
Marital status				0.26
Married or living with partner	78 (69.0)	260 (76.7)	253 (74.2)	
Other	35 (31.0)	79 (23.3)	88 (25.8)	
Country of birth				0.40
Vietnam	113 (100.0)	337 (99.7)	337 (99.1)	
Other	0 (0.0)	1 (0.3)	3 (0.7)	
Years in U.S. (M [SD])	15.05 (6.5)	15.15 (6.4)	15.25 (6.7)	0.68
Employment status				0.27
Employed	30 (26.6)	67 (19.8)	65 (19.1)	
Unemployed	37 (32.7)	120 (35.4)	131 (38.4)	
Homemaker	30 (26.6)	95 (28.0)	91 (26.7)	
Retired	16 (14.2)	57 (16.8)	54 (15.8)	
Annual household income (\$)				0.36
<20,000	68 (60.2)	204 (60.2)	220 (64.5)	
>20,000	13 (11.5)	26 (7.7)	25 (7.3)	
Did not respond	32 (28.3)	109 (32.2)	96 (28.2)	
Education (years)				0.45
6	43 (38.1)	126 (37.2)	135 (39.6)	

Characteristics	Study arm			p-value ^a
	Group 1: usual care	Group 2: FOBT plus brochure	Group 3: FOBT plus brochure plus counseling	
7-12	25 (22.1)	101 (29.8)	97 (28.5)	
13	45 (39.8)	112 (33.0)	109 (32.0)	
Language of interview				N/A
English				
Vietnamese	113 (100.0)	339 (100.0)	341 (100.0)	
Acculturation score^b				0.64
High (>3.0)	1 (0.9)	0 (0.0)	0 (0.0)	
Low (<3.0)	112 (99.12)	339 (100.00)	341 (100)	
Self-rated health				0.85
Excellent/very good	2 (1.9)	8 (2.5)	4 (1.3)	
Good	20 (18.7)	55 (17.2)	57 (17.8)	
Fair	57 (53.3)	167 (52.2)	170 (53.0)	
Poor	28 (26.2)	90 (28.1)	90 (28.0)	
Perceived risk of developing colon cancer				0.55
More likely than others	7 (6.2)	25 (7.4)	28 (8.2)	
About the same as others	84 (74.3)	253 (74.6)	236 (69.2)	
Less likely than others	22 (19.5)	61 (18.0)	77 (22.6)	

Note: All participants: Group 1, n=256; Group 2, n=765; Group 3, n=768. Latinos: Group 1, n=143; Group 2, n=426; Group 3, n=427. Vietnamese: Group 1, n=113; Group 2, n=339; Group 3, n=341.

^aDifferences between the groups calculated by χ^2 or *t*-tests

^bAcculturation score was measured by a previously validated five-item scale.³⁸ Low acculturation was defined as < 2.99 and high acculturation was defined as ≥ 3.0. Scale items include language(s) read and speak, spoken at home, spoken with friends, language(s) used as a child (up to age 12 years), and language(s) in which a person thinks.

FOBT, fecal occult blood test

Table 2

Baseline CRC screening behavior of 1789 Latino and Vietnamese primary care patients

Screening status	Study arm			p-value ^a
	Group 1: usual care	Group 2: FOBT plus brochure	Group 3: FOBT plus brochure plus counseling	
ALL PARTICIPANTS (N=1789)				
Ever heard of screening				
Heard of colon cancer	213 (83.2)	644 (84.2)	632 (82.3)	0.43
Heard of polyp	79 (30.7)	281 (36.7)	296 (38.5)	0.09
Heard of FOBT	170 (66.4)	498 (65.1)	465 (60.6)	0.09
Heard of SIG	129 (50.4)	343 (44.8)	343 (44.7)	0.10
Heard of COL	106 (41.4)	323 (42.2)	327 (42.6)	0.82
Heard of SIG/COL	147 (57.4)	421 (55.0)	408 (53.1)	0.23
Ever had CRC screening				
Ever FOBT	178 (69.5)	544 (71.1)	529 (68.9)	0.63
Ever SIG	56 (21.9)	174 (22.8)	148 (19.3)	0.37
Ever COL	53 (20.7)	185 (24.2)	178 (23.2)	0.25
Ever SIG or COL	93 (36.3)	303 (39.6)	281 (36.6)	0.36
Up-to-date with CRC screening				
FOBT in past year	110 (43.0)	348 (45.5)	338 (44.0)	0.58
SIG in past 5 years/COL in past 10 years	77 (30.1)	253 (33.1)	246 (32.0)	0.37
Any CRC screening	152 (59.4)	483 (63.1)	458 (59.6)	0.25
LATINOS (n=996)				
Ever heard of screening				
Heard of colon cancer	113 (79.0)	341 (80.1)	330 (77.3)	0.62
Heard of polyp	41 (28.7)	130 (30.5)	131 (30.7)	0.37
Heard of FOBT	78 (54.5)	218 (51.2)	189 (44.3)	0.04
Heard of SIG	59 (41.3)	156 (36.7)	146 (34.2)	0.13
Heard of COL	50 (35.0)	157 (36.9)	146 (34.2)	0.52
Heard of SIG/COL	71 (49.7)	208 (48.8)	183 (42.9)	0.14
Ever had CRC screening				
Ever FOBT	84 (58.7)	257 (60.3)	239 (56.0)	0.68
Ever SIG	28 (19.6)	82 (19.3)	63 (14.8)	0.26
Ever COL	28 (19.6)	87 (20.4)	67 (15.7)	0.10
Ever SIG or COL	47 (32.9)	139 (32.6)	109 (25.5)	0.15
Up-to-date with CRC screening				
FOBT in past year	57 (39.9)	163 (38.3)	156 (36.5)	0.52
SIG in past 5 years/COL in past 10 years	36 (25.2)	115 (27.0)	94 (22.0)	0.22
Any CRC screening	77(53.9)	225 (52.8)	205 (48.0)	0.30
VIETNAMESE (n=793)				

Screening status	Study arm			<i>p</i> -value ^a
	Group 1: usual care	Group 2: FOBT plus brochure	Group 3: FOBT plus brochure plus counseling	
Ever heard of screening				
Heard of colon cancer	100 (88.5)	303 (89.4)	302 (88.6)	0.77
Heard of polyp	38 (33.6)	151 (44.6)	165 (48.4)	0.03
Heard of FOBT	92 (81.4)	280 (82.6)	276 (80.9)	0.92
Heard of SIG	70 (62.0)	187 (55.2)	197 (57.8)	0.19
Heard of COL	56 (49.6)	166 (49.0)	181 (53.1)	0.46
Heard of SIG/COL	76 (67.0)	213 (62.8)	225 (66.0)	0.34
Ever had CRC screening				
Ever FOBT	94 (83.2)	287 (84.7)	290 (85.0)	0.80
Ever SIG	28 (24.8)	92 (27.1)	85 (84.9)	0.53
Ever COL	25 (22.1)	98 (28.9)	111 (32.6)	0.15
Ever SIG or COL	46 (40.7)	164 (48.4)	172 (50.4)	0.14
Up-to-date with CRC screening				
FOBT in past year	53 (47.0)	185 (54.6)	182 (53.4)	0.20
SIG in past 5 years/COL in past 10 years	41 (36.3)	138 (40.7)	152 (44.6)	0.35
Any CRC screening	75 (66.4)	258 (76.1)	253 (74.2)	0.42

Note: All participants: Group 1, *n*=256; Group 2, *n*=765; Group 3, *n*=768. Latinos: Group 1, *n*=143; Group 2, *n*=426; Group 3, *n*=427. Vietnamese: Group 1, *n*=113; Group 2, *n*=339; Group 3, *n*=341.

^aDifferences between the groups calculated by χ^2 or *t*-tests

COL, colonoscopy; CRC, colorectal cancer; FOBT, fecal occult blood test; SIG, sigmoidoscopy

Table 3

Colorectal cancer screening rates before and after the intervention in 1358 primary care clinic patients

Screening status	Baseline (n [%])	Follow-up (n [%])	Change (%)	p-value ^a	p-value ^b
ALL PARTICIPANTS					
Up-to-date on FOBT					
1: Usual care	92 (47.4)	107 (55.2)	7.8	—	<0.001
2: FOBT + brochure	257 (45.0)	343 (60.1)	15.1	0.010	
3: FOBT + brochure + counseling	265 (44.7)	414 (69.8)	25.1	<0.001	
Up-to-date on any CRC screening					
1: Usual care	124 (63.9)	132 (68.0)	4.1	—	<0.001
2: FOBT + brochure	369 (64.6)	437 (76.5)	11.9	0.002	
3: FOBT + brochure + counseling	358 (60.4)	485 (81.8)	21.4	<0.001	
LATINOS					
Up-to-date on FOBT					
1: Usual care	49 (48.5)	53 (52.5)	4.0	—	0.137
2: FOBT + brochure	108 (35.6)	168 (55.4)	19.8	<0.001	
3: FOBT + brochure + counseling	117 (37.3)	195 (62.1)	24.8	<0.001	
Up-to-date on any CRC screening					
1: Usual care	62 (61.4)	61 (60.4)	-1.0	—	0.003
2: FOBT + brochure	161 (53.1)	206 (68.0)	14.9	<0.001	
3: FOBT + brochure + counseling	153 (48.7)	230 (73.2)	24.5	<0.001	
VIETNAMESE					
Up-to-date on FOBT					
1: Usual care	43 (46.2)	54 (58.1)	11.9	—	<0.001
2: FOBT + brochure	149 (55.6)	175 (65.3)	9.7	0.547	
3: FOBT + brochure + counseling	148 (53.0)	219 (78.5)	25.5	0.006	
Up-to-date on any CRC screening					
1: Usual care	62 (61.4)	71 (76.3)	14.9	—	0.001
2: FOBT + brochure	208 (77.6)	231 (86.2)	8.6	0.770	

Screening status	Baseline (n [%])	Follow-up (n [%])	Change (%)	p-value ^a	p-value ^b
3: FOBT + brochure + counseling	205 (73.5)	255 (91.4)	17.9	0.058	

^a Difference between usual care and interventions

^b Difference between two interventions

CRC, colorectal cancer; FOBT, fecal occult blood test

Table 4

Multivariate predictors of being up-to-date with FOBT (OR [95 % CI])

Predictors	All participants	Latino participants	Vietnamese participants
Married: yes vs no	0.86 (0.67, 1.11)	0.72 (0.52, 0.99)	0.90 (0.59, 1.38)
Acculturation: high vs low	0.44 (0.29, 0.66)	0.53 (0.34, 0.84)	—
Provider factors			
Ethnicity concordance: yes vs no	0.90 (0.70, 1.13)	0.79 (0.53, 1.16)	0.85 (0.56, 1.24)
Language concordance: yes vs no	0.71 (0.55, 0.91)	0.71 (0.49, 1.03)	1.16 (0.71, 1.87)
Intervention group			
FOBT + brochure vs usual care	1.18 (0.84, 1.66)	1.08 (0.68, 1.73)	1.33 (0.80, 2.20)
FOBT + brochure + counseling vs usual care	1.89 (1.34, 2.66)	1.44 (0.90, 2.30)	3.02 (1.77, 5.14)

Note: Boldface indicates significance.

FOBT, fecal occult blood test

Table 5Multivariate predictors of being up-to-date with any CRC screening^a (OR [95 % CI])

Predictors	All participants	Latino participants	Vietnamese participants
Acculturation: high vs low	0.37 (0.23, 0.57)	0.57 (0.35, 0.92)	Not in model
CRC knowledge: high (>3.0) vs low (<3.0)	1.51 (1.13, 2.01)	1.34 (0.93, 1.92)	1.58 (0.95, 2.65)
Provider factors			
Ethnicity concordance: yes vs no	0.85 (0.64, 1.14)	0.66 (0.44, 0.99)	0.55 (0.30, 1.02)
Language concordance: yes vs no	0.74 (0.55, 0.99)	0.88 (0.58, 1.32)	1.68 (0.82, 3.43)
Intervention group			
FOBT + brochure vs usual care	1.51 (1.03, 2.19)	1.36 (0.84, 2.21)	1.99 (1.05, 3.76)
FOBT + brochure + counseling vs usual care	2.01 (1.37, 2.95)	1.76 (1.08, 2.87)	3.20 (1.62, 6.33)

Note: Boldface indicates significance. Factors included in the models but that were not significant included age, gender, marital status, level of education, employment, self-rated health, perceived risk of developing cancer, ever having heard of a polyp, provider gender, provider-patient gender concordance, and provider language concordance.

^a Any CRC screening included FOBT in the past year or sigmoidoscopy in the past 5 years or colonoscopy in the past 10 years.

CRC, colorectal cancer; FOBT, fecal occult blood test