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Author manuscript

Med Decis Making. Author manuscript; available in PMC 2020 January 26.

Published in final edited form as:

Med Decis Making. 2020 January ; 40(1): 29–41. doi:10.1177/0272989X19890603.

Impact of Tailored Interventions on Receipt of a Preference-Concordant Colorectal Cancer Screening Test

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Abstract

Background.—Individuals at average risk for colorectal cancer (CRC) have multiple test options. Preference for a specific test modality may impact CRC screening decision-making. The current study examined the: 1) sociodemographic and health belief characteristics of average-risk

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Data from the current study were presented as a poster presentation at the 2019 American Society of Preventive Oncology annual meeting in Tampa, Florida.

Declaration of Conflicting Interests: The authors declare that there is no conflict of interest.

Disclosures: The authors declare no potential conflicts of interest.

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participants with a test preference of stool blood test (SBT) vs. those with a preference of colonoscopy, and following receipt of a tailored CRC screening intervention: 2) percentage of participants who completed a preference-concordant CRC screening test; and 3) sociodemographic, healthcare experience, health belief characteristics and intervention group(s) associated with completion of a preference-concordant screening test.

Methods.—Participants (n=603) were female, aged 50–75, at average CRC risk, not currently up-to-date with CRC screening recommendations, had internet access, and were randomized to receive one of three tailored CRC screening promotion interventions. Multivariable logistic regression analyses were conducted.

Results.—The majority of women (64%) preferred SBT, whereas 36% preferred colonoscopy. There were significant differences in test preference by age, stage of change for the specific tests, perceived benefits of CRC screening, perceived barriers to both tests, and self-efficacy for colonoscopy. Two hundred thirty participants completed CRC screening at 6 months post-intervention. Of those, the majority (84%) completed a test concordant with their preference. Multivariable analyses revealed that compared to participants completing a preference-discordant test, those completing a preference-concordant test were older (P=.01), had health insurance (P<.05), and were in the phone counseling only group (P<.01).

Conclusions.—High levels of completion of preference-concordant CRC screening can be achieved by educating average-risk patients about the multiple screening test options, soliciting their preferences, and offering testing that is concordant with their preference.

Colorectal cancer (CRC) is the third most commonly diagnosed cancer in the United States (U.S.) and the second leading cause of cancer death when men and women are combined (1). In 2019, there will be an estimated 145,600 new CRC diagnoses and 51,020 CRC deaths (1). Of these, 67,100 CRC diagnoses and 23,380 CRC deaths will be among U.S. women (1). CRC incidence and mortality can be reduced through regular CRC screening, which can identify pre-cancerous polyps and cancer at an earlier stage, when it is most treatable (1). The U.S. Preventive Services Task Force recommends that for average risk individuals—those without a significant family history or a personal history of bowel syndromes (e.g., ulcerative colitis, Crohn's disease, Lynch syndrome)—CRC screening should start at age 50 (2). Individuals at average risk for CRC have multiple options regarding which CRC test they can complete, whereas colonoscopy is recommended for those at increased risk (2). Thus, average risk individuals have two decisions to make: first, whether to complete a CRC screening test, and then, which CRC test to complete.

In 2015, only 63% of U.S. adults were up-to-date with CRC screening recommendations (3). Of those up-to-date, 60.3% completed an endoscopic screening (i.e., colonoscopy in the past 10 years or sigmoidoscopy in the past 5 years) and 7.2% completed a stool blood test (SBT) (i.e., fecal immunochemical test or fecal occult blood test) (3). However, there are notable disparities in CRC screening completion. For example, white and black adults are more likely than individuals of Hispanic, Asian, or American Indian/Alaska Native descent to complete CRC screening (3). In addition, younger adults (aged 50–64) are less likely to complete CRC screening than those age 65 or older (3). Differences in CRC screening rates

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also are found by education, socioeconomic status, insurance status, state/region of residence, and immigration status (3, 4).

Prior research has demonstrated that patients have clear preferences for certain CRC test modalities (5). Patients who are provided with a choice to complete either SBT or colonoscopy are more likely to complete a screening test compared to those only provided a recommendation for colonoscopy (6). Furthermore, when individuals' test preferences are not taken into account (i.e., their healthcare provider orders a different screening test), patients' satisfaction with the CRC screening decision-making process, their CRC screening intentions, and their screening rates are reduced (7). In order to provide patient-centered care, CRC screening test preference should be considered. However, relatively few studies have assessed CRC test preference. In addition, it is possible that patients with specific characteristics may prefer one test over another. Further, it may be that patients with specific sociodemographic and/or healthcare experience characteristics are less likely than others to receive a CRC test concordant with their preferred screening test.

The current study utilizes data from a large randomized intervention trial in which 1,196 age-appropriate women who were not up-to-date with CRC screening guidelines were randomized to receive one of three tailored CRC screening educational interventions (i.e., Web intervention, phone intervention, or Web and phone intervention) or usual care (8). Women randomized to one of the three tailored intervention groups (n=891) were asked to report their CRC screening test preference during intervention receipt (approximately two months after baseline) (8). At baseline, 1,139 women (95.2%) were determined to be average-risk and 56 (4.7%) were at increased risk for CRC (due to family history), with 1 missing (0.1%) (8).

Most individuals in the U.S. who are up-to-date with CRC screening have completed endoscopy (colonoscopy or sigmoidoscopy) (3), and prior studies have suggested that most individuals prefer endoscopy (9). Thus, we were interested in further examining preferences and completion as it relates to the intervention and participants' baseline sociodemographic, healthcare experience, and health belief characteristics. The current study uses only data from average-risk participants because the focus is on concordance between preference and test receipt, and average-risk individuals can choose which test they prefer, whereas colonoscopy is recommended for individuals at increased risk (2). Specific research questions addressed in the current study include:

1. What are the sociodemographic, healthcare experience, and health belief characteristics of average-risk individuals who prefer SBT versus those who prefer colonoscopy?
2. Of those who completed a CRC screening test, what percentage of participants complete a CRC screening test concordant with their preferred screening test modality versus those who complete CRC screening test discordant with their preference following receipt of a tailored CRC screening intervention?
3. Of those who completed a CRC screening test, what sociodemographic, healthcare experience, health belief characteristics and intervention group(s) are

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associated with completing a screening test concordant with their preferred test, while controlling for covariates?

Methods

Study procedures and participant flow have been described previously (8). Study procedures were approved by the Indiana University-Purdue University Indianapolis Institutional Review Board and were compliant with the Health Insurance Portability and Accountability Act. Participants were patients within two health care systems and were eligible if they were female, ages 50 to 75, not currently up-to-date with CRC screening recommendations, and had internet access. Women were ineligible if they had a personal history of CRC, colorectal polyps, or inflammatory bowel disease, and any medical conditions that would prohibit CRC screening. Of those assessed for eligibility (n=8,355), 7,159 were excluded because they: 1) opted out prior to being contacted by the study team (n=801), 2) were contacted, but opted out prior to determining eligibility (n=2,274), 3) were ineligible (n=3,564), 4) declined to participate (n=431), or 5) were consented, but unable to be contacted for baseline interview (n=89) (8).

Following informed consent and completion of a baseline interview, participants (n=1,196) were randomized to one of four groups, including three intervention groups and usual care (8). Some women were also not up-to-date with mammography; these women also received mammography education via the same intervention method through which they received CRC screening education (Champion et al, under review; Champion et al., in preparation). The current study focuses upon data captured as part of the CRC screening intervention. However, due to the multi-behavioral focus of the parent study (on both CRC and breast cancer screening), only women were enrolled. Here we present preference concordance data on CRC screening, as women at average risk for the disease have a choice between screening modalities (as opposed to breast cancer screening where mammography is the only recommended screening modality). Data were collected at baseline, during and directly following intervention receipt (approximately 2 months after baseline), and at 6 months post-intervention (CRC screening receipt). Participants received a $20 gift certificate at each data collection time point.

Interventions

The three tailored interventions were informed by the Health Belief Model, Transtheoretical Model, and Likelihood Persuasion Behavioral Theory (8). Participants randomized to the tailored Web-only intervention group completed an interactive Web-based computer program which included video vignettes, graphs, animations of screening tests, and tailored messages based upon the participants' characteristics and health beliefs. The concept behind the storyline of the Web program was a talk show about health (called "Health Matters with Barbara Daniels") which included actors portraying a talk show host (called "Barbara Daniels") and two guests (one woman portraying an elementary school teacher/community advocate and another woman portraying a physician). At times the host addressed the guests on the show and at other times addressed the study participant by directly looking at the camera and providing tailored information and/or asking questions to which the participant

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could respond by making a selection on their computer. Tailored messages populated based upon participants' responses to demographic and health beliefs questions throughout the program. The average time that it took to complete the Web program was 14.69 minutes for the Web-only arm and 13.71 minutes for the Web + phone arm.

The phone counseling session was guided by a computer program which populated tailored messages based upon participant characteristics and responses to health belief items. Those in the tailored phone counseling-only group interacted with one of six trained interventionists via phone (average time = 19 minutes). Women in the Web + phone intervention group received both the interactive Web-based computer program and tailored phone counseling. Women in the Web + phone intervention group were asked to complete the Web intervention prior to receiving the phone intervention (average time of phone counseling portion = 19 minutes). Seven interventionists completed the phone counseling portion of the intervention for the Web + phone group (six of whom also provided phone counseling to participants in the phone counseling–only group).

Women randomized to the Web-only, phone-only, or Web + phone intervention group were asked to report their preference for a CRC screening test during receipt of the intervention. Women in the usual care group were not asked to report their preference. Thus, they were excluded from the current analyses.

Measures

Health Belief Model variables.—At baseline, participants completed measures utilized in prior research assessing perceived CRC risk (e.g., "I am likely to get colon cancer sometime during my life"), perceived benefits of CRC screening (e.g., "Having regular colon tests will help me find colon cancer when it is small and can be cured"), perceived barriers to SBT (e.g., "Collecting a stool sample is unpleasant"), perceived barriers to colonoscopy (e.g., "Having to take the special medicine to clean out my bowel before the test would be hard"), self-efficacy for completing SBT (e.g., "How sure are you that you could complete each of the following steps to get a stool blood test?... Get a stool blood test kit from my doctor"), and self-efficacy for completing colonoscopy (e.g., "How sure are you that you could complete each of the following steps to get a colonoscopy?... Find transportation to have a colonoscopy") (8, 10–12). The Health Belief Model scales were originally developed for breast cancer screening but were adapted for CRC screening and demonstrated adequate content and construct validity in prior research (12, 13). Cronbach's alpha for the Health Belief Model scales in the current study were as follows: 0.96 (perceived CRC risk), 0.71 (perceived benefits of CRC screening), 0.75 (perceived barriers to SBT), 0.85 (perceived barriers to colonoscopy), 0.93 (self-efficacy for completing SBT), and 0.90 (self-efficacy for completing colonoscopy).

Transtheoretical Model Stage of change.—At baseline, participants reported whether they were thinking about completing a colonoscopy in the next 6 months and whether they were thinking about completing a SBT in the next 6 months. Participants were categorized as being in the Pre-Contemplation stage for the specific CRC tests if they were not considering completing that CRC screening test in the next 6 months and in the

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Contemplation stage if they were considering having that CRC screening test in the next 6 months, using measures from prior research (8, 10–12).

Knowledge.—At baseline, 11 items from prior research assessed participants' knowledge of CRC and CRC screening tests (e.g., "What is a small growth inside the colon that might turn into cancer called?") and are based upon the multiple dimensions of information shared in the intervention materials and in prior intervention studies conducted by the team (8, 10–12). The Cronbach's alpha for the knowledge scale in the current study was 0.50.

Fear.—At baseline, 8 items assessed participants' level of fear regarding the development of cancer ("When I think about cancer, I get scared") (8, 10, 14). The fear scale was originally designed to assess breast cancer fear and demonstrated adequate construct and content validity (14), and was adapted for general cancer fear. The Cronbach's alpha for the fear measure in the current study was 0.93.

Fatalism.—At baseline, 11 items assessed the extent to which one holds the belief that death is inevitable following a cancer diagnosis (e.g., "If a woman gets cancer, that's the way she was meant to die") (15–17). Cronbach's alpha in the current study for fatalism was 0.87. Psychometric testing of the fatalism scale has been reported previously (15–17).

Sociodemographics and healthcare experiences.—At baseline, participants responded to variables assessing sociodemographic characteristics including age, race, education, income, marital status, insurance status, and height and weight (to determine body mass index [BMI]) (8). In addition, participants responded to an item assessing the number of times they had seen a healthcare provider in the past year, an item assessing whether a healthcare provider had ever previously recommended the participant complete a colonoscopy, an item assessing whether a healthcare provider had ever previously recommended the participant complete a SBT, an item about prior completion of a SBT, and an item about prior completion of a colonoscopy (8).

CRC test preference.—Test preference was solicited toward the end of each tailored intervention, but before the full intervention was completed. Participants responded to a single item about their preferred CRC test modality with options that included SBT and colonoscopy. Individuals selecting both SBT and colonoscopy were coded as having no preference (8). Individuals who did not respond with a preference in the phone or Web + phone intervention groups were coded as missing, unless they were in the Web + phone intervention group and had a stated CRC test preference during completion of one of the intervention components. As the item assessing test preference occurred *during* the intervention following receipt of information about the various test modalities, this item was asked once during the course of the study (post-baseline, but prior to the follow-up interview) for the majority of participants. Individuals in the Web + phone group had the opportunity to answer the preference item during both the Web and phone counseling portions of the intervention. Therefore, their Web-intervention response was utilized for preference coding as they were asked to complete the Web portion of the intervention prior to the phone counseling portion of the intervention. Furthermore, as this item was asked only

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during receipt of each of the tailored interventions, those in usual care did not have the opportunity to indicate their test preference.

Statistical analyses

Among women randomized to one of the three intervention groups (n=891), 38 were at increased risk for CRC and risk status was missing for one person. These participants were excluded from the current analyses. In addition, average-risk individuals in the intervention groups with available data who were lost to follow-up prior to intervention receipt or who failed to complete their tailored intervention (and therefore, did not report a test preference) (n=240) and those who reported no test preference (n=9) were excluded for the current analysis, resulting in 603 participants. Figure 1 portrays the participant flow for the current analyses. Ad hoc analyses revealed that individuals randomized to the Web-only group were significantly more likely to be excluded from analyses due to either not completing the tailored intervention or reporting no preference (P<001).

Receipt of screening by 6 months post-baseline was defined by a "best estimate" screening receipt variable. Participants were considered screened if they reported "yes" to the screening question in the self-report interview or a completed test was documented in medical records. They were coded as not screened otherwise or missing if both self-report and medical records were missing (8). Medical record data on individuals who completed both SBT and colonoscopy was used to determine the date of receipt of each of the tests (if recorded), in order to examine which test the participant completed first. This method was used for the small number of individuals (n=27) who completed both SBT and colonoscopy in order to define concordance (the first completed test compared with their preference) for those individuals. Dates of screening test were available for 19 of the 27 (70%) participants completing both tests. In cases where one or more of these dates were missing (n=8), it was decided to code those individuals as having had SBT first (given typical clinical practice of SBT first, followed by diagnostic colonoscopy if the SBT is positive). A concordance variable was created to indicate individuals who received a CRC screening test concordant with their stated preference (concordance was coded as 1, discordance was coded as 0).

Pearson chi-square tests (or two-sided Fisher's exact test for variables having sparse expected cell counts) and two-sided independent-groups t-tests (or Wilcoxon rank sum test for variables with a non-normal distribution) were used to compare preference groups and concordance/discordance groups on categorical and continuous variables, respectively. Because individuals randomized to the Web + phone intervention group were asked about preference twice, their first reported preference was used in statistical analyses. Finally, all variables associated with receipt of a concordant screening test at p<.25 in univariate analyses were further assessed in multivariable logistic regression analyses. Statistical analyses were performed using R software (18) with Arsenal (19) and Tidyverse (20) packages. A P value of <0.05 was considered statistically significant for all analyses. The funding source had no role in the study.

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Results

Overall intervention results have been reported previously (8). Specifically, the percentage of women adherent to any CRC screening test six months post-intervention were as follows: phone only = 52.5%, Web only = 22.7%, Web + phone = 44.4%, usual care = 24.6% (8). Of the 603 women who were at average CRC risk and reported a test preference, 386 (64%) preferred SBT and 217 (36%) preferred colonoscopy. Of the 603 women, 28% were assigned to the Web-only group, 36% were assigned to the phone-only group, and 37% were assigned to the Web + phone group. Demographics for the total sample and by study arm are presented in Table 1. The majority were White (88%), married (62%), had an annual household income above $30,000 (71%), and had completed some college, a 4 year college degree, or a graduate degree (74%). In addition, most (89%) had health insurance and had seen a healthcare provider in the past year (93%). Approximately 40% had ever completed a CRC screening test previously (i.e., either SBT or colonoscopy). The average age was 58.6 years (range: 50–75).

Of the sociodemographic characteristics and healthcare experiences, only age was associated with CRC test preference (Table 2). Specifically, participants who preferred colonoscopy were significantly younger compared to those preferring SBT (P=.03). BMI was specified as a categorical variable with three levels because it provides well-established meaningful categories and it was more strongly associated with concordance than continuous BMI (P=0.28 vs. P=0.93). A number of health belief variables were associated with CRC test preference (Table 2) in the directions that would be expected theoretically. Stages of change at baseline for SBT and colonoscopy were significantly associated with test preference. As expected, individuals who were in the contemplation stage for SBT were more likely to prefer SBT (78.8%, P=.002) and those who were in the contemplation stage for colonoscopy were more likely to prefer colonoscopy (66.2%, P<.001). Participants preferring colonoscopy had higher levels of perceived benefits of CRC screening (P=.008), lower barriers to both colonoscopy (P<.001) and SBT (P=.022), and higher self-efficacy for colonoscopy (P<.001). None of the other associations were significant.

Overall CRC intervention effect and predictors of CRC screening test completion have been previously reported (8). Among those in the three tailored intervention groups, 230 participants completed a CRC screening test at 6 months post-intervention; of these, 193 women (84%) completed a test concordant with their preference while the remaining 37 (16%) completed a test discordant with their preferred test. Among 230 CRC screening completers, 164 (71.3%) women reported a preference for SBT, and of those, 129 (78.7%) completed a SBT, 14 (8.5%) completed a colonoscopy, and 20 (12.8%) completed both a SBT and a colonoscopy. Of those who completed both tests, 11 completed a SBT first (concordant with preference), 1 completed a colonoscopy first (discordant with preference), and for 8 participants, the dates for test completion were unknown. Among 230 CRC screening completers, 66 (28.7%) women reported a preference for colonoscopy, and of those, 37 (56.1%) completed a colonoscopy, 23 (34.8%) completed SBT, and 6 (9.1%) individuals completed both a SBT and a colonoscopy. Of those who completed both tests, 1 completed a colonoscopy first (concordant with preference), 2 completed a SBT first (discordant with preference), and for 3 participants, the dates of test completion were

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unknown. As previously noted, individuals for whom test dates were not known were coded as having completed SBT prior to colonoscopy and concordance was coded accordingly. Among those who did not complete a CRC screening test 6 months post-intervention (n=290), 170 (59%) preferred SBT and 120 (41%) preferred colonoscopy.

In multivariable logistic regression analyses, age, intervention group, and insurance status were significantly associated with receipt of a preference-concordant test (see Table 3). Specifically, older women were more likely than younger women to complete a preference concordant test (OR = 1.9 per 5-year increase, P=01). In addition, women with health insurance were more likely to complete a preference concordant test (OR = 0.2, P<.05) than those without health insurance. Finally, women in the phone-only group were significantly more likely to receive a concordant test compared to those in Web only (OR = 7.9, P= 0.002) and Web + phone (OR = 6.4, P= 0.001) groups. This suggests that the phone-only intervention was superior in promoting the receipt of a preference-concordant test.

Discussion

The current study sought to understand the characteristics of individuals who preferred one CRC screening modality over another, the percentage of women receiving a preference-concordant CRC screening test following receipt of one of three tailored interventions, and the characteristics of participants receiving a preference-concordant test receipt while controlling for covariates. Findings revealed significant differences in test preference by age, baseline stage of change for SBT, baseline stage of change for colonoscopy, perceived benefits of CRC screening, perceived barriers to SBT, perceived barriers to colonoscopy, and self-efficacy for colonoscopy. The finding that younger age was significantly associated with a preference for colonoscopy is contrary to a prior RCT where Schroy and colleagues found no significant independent associations between demographic factors and preference for SBT vs. colonoscopy (21). In our study, younger individuals (compared to older individuals) preferred the more invasive screening test (colonoscopy). Similar to the findings regarding preference for colonoscopy in our study, Hawley and colleagues found that preference for endoscopy (either colonoscopy or sigmoidoscopy) was associated with self-efficacy, stage of change, and perceived benefits (9). However, contrary to the findings of the current study, Hawley and colleagues also found that preference for endoscopy was associated with physician recommendation and greater CRC worry. In the current study, physician recommendation was not associated with preference for either test, nor was cancer fear or cancer fatalism. Hawley and colleagues also found that preference for SBT was associated with SBT self-efficacy, which was not found in the current study (9).

Differences in test preference between our study findings and those in prior literature may be due to differences in sociodemographic characteristics between studies as well as potential change in awareness of SBT and/or changes in preferences over time. In the current study, participants were not asked to report reasons for preferring one test to another. However, Schroy and colleagues reported that among those who preferred colonoscopy, test accuracy was an important factor in their choice (21). In addition, those who preferred SBT cited worry about discomfort, inconvenience, and bowel preparation as factors influencing their

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test preference (21). Ultimately, however, those preferring colonoscopy were more likely to have a screening test ordered in that prior study (21).

Of those women in the current study who completed a screening test at six months postintervention, 84% completed a preference-concordant test. Each of the tailored interventions presented both SBT and colonoscopy as potential screening modalities for women at average risk. After participants specified a preferred CRC test during the intervention, the remaining intervention content was then focused on reducing barriers and providing access to their preferred test. Rates of preference-concordance testing in the current study were markedly higher than those found in a prior RCT featuring a CRC screening decision aid (21). Schroy and colleagues found that while 95% of participants had a test preference, only 59% of tests ordered were concordant with patient preference (21). Similarly, Hawley and colleagues found that only 50% of participants received a preference-concordant test (9). The high rates of completion of preference-concordant tests in the current study may be due to both the high rates of preference for SBT and the ability to have a SBT mailed directly to one's home at the conclusion of the tailored phone intervention portion (i.e., the phone-only or Web + phone intervention arms). At the conclusion of the interventions that included the phone counseling (i.e., the phone-only or Web + phone intervention arms), individuals who preferred colonoscopy were able to receive assistance with scheduling a colonoscopy. In the Web intervention, individuals indicating that they were interested in completing either a SBT or colonoscopy were provided with their provider's office phone number and asked to call to have either a SBT mailed to their home or to have a colonoscopy scheduled (depending upon their stated preference).

In the current study, older age, receipt of the tailored phone counseling intervention, and insurance status were significantly associated with receipt of a preference-concordant test in multivariable logistic regression analyses. Participants who preferred SBT were offered the opportunity to have a kit mailed to their home at the end of the intervention (when receiving the phone intervention components) or were asked to call their providers' office about having a kit mailed to them (when receiving the Web intervention). As age was associated both with preference of SBT and receipt of a preference-concordant test, older participants may have completed a preference-concordant test due to being given the opportunity to complete this less-invasive test (compared to colonoscopy). Older individuals also may be more likely than younger individuals to have had multiple conversations with providers about CRC screening over the years, and due to these discussions, may have been more resolved in their decision about what screening test was right for them. Most of the participants in the current study had health insurance. However, having insurance was significantly associated with receipt of a preference-concordant test, suggesting that individuals with insurance might be able to ultimately access their preferred option more readily than uninsured individuals.

The finding that individuals who receive the phone counseling intervention only are more likely to receive a preference-concordant screening test was unexpected. In the current study, individuals in the phone counseling intervention group and the Web + phone intervention group had the opportunity to discuss the test options with a live person. In addition, although the phone counseling script and the Web intervention script generally presented the same

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information, phone interventionists had the opportunity to answer participant questions in both groups receiving the phone counseling component. Thus, one would expect that the completion rates of a preference-concordant test would have been similar between these two intervention groups. Pairwise comparisons and multivariable analyses confirmed that individuals in the phone counseling-only group were more likely to receive preference-concordant test. However, in ad hoc analyses, we found that the phone counseling–only group reported higher baseline stage of change for SBT as well as higher preference for SBT. This may have contributed to our findings that women in the phone counseling-only group received preference-concordant tests at a higher rate (8).

Implications for practice.

Although satisfaction data (satisfaction with either the intervention or healthcare) were not collected in the current study, prior research suggests that having one's provider order a CRC screening test that is preference-concordant is associated with satisfaction, screening intentions, and test completion (7). In order to provide patient-centered care and promote informed decision-making, healthcare providers should educate all average-risk patients about there being multiple CRC screening test modalities available, discuss pros and cons of the tests, discuss individuals' test preferences, and facilitate patients receiving their preferred test. In addition, providers should consider that many individuals, especially older adults, may prefer the less-invasive CRC screening modality of SBT, and support this preference and their decision to complete SBT.

Strengths.

Strengths of the study include a large sample size and randomized controlled design. In addition, all participants were due for CRC screening, most had health insurance, and the majority had seen a healthcare provider in the past year, making this a group of women who were not up-to-date at baseline, despite having access to healthcare.

Limitations and future directions.

Several limitations should be noted. First, study participants were predominately white women. Prior literature has found racial/ethnic differences in patient preferences (5, 6). For example, White patients have been found to be more likely to adhere to colonoscopy recommendations, whereas non-White patients have been found to be more likely to adhere to SBT recommendations (6). Although the current study found no racial differences between CRC screening test preference, this may have been due to the small numbers of non-White participants. Second, all participants were from a single Midwestern state, enrolled in a randomized controlled trial aimed at promoting CRC screening, and most had health insurance. Therefore, generalizability may be limited. Additional research is needed among individuals from more diverse racial and ethnic backgrounds, among those from different states and regions of the U.S., and among individuals who may be under-or uninsured. Third, women randomized to the Web-only intervention group were significantly more likely to be excluded from the analyses due to not completing the tailored intervention or reporting no preference ($P<.001$). It may be that individuals who were randomized to the Web intervention felt less compelled to complete the intervention as they were not directly interacting with another human, whereas those in the intervention arms that received the

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phone counseling component knew they would be receiving phone counseling with a live person. Finally, we asked about test preference during intervention receipt (not at baseline or at follow-up), and thus, are not able to capture potential changes in preference over time or in the control group. Future intervention trials might capture test preference at multiple time points and for all intervention groups.

Conclusions

In order to provide patient-centered care and to facilitate informed decision-making, it is important that patients' preferences be considered and supported. Women who were not currently up-to-date with CRC screening received one of three tailored CRC educational interventions. Most women preferred SBT, which may indicate a shift in preference trends from prior research studies where colonoscopy was preferred. Furthermore, among those completing a CRC screening test post-intervention, the majority of women completed a preference-concordant test, suggesting that high rates of preference-concordance test receipt can be achieved.

Individuals who received the tailored phone counseling–only intervention, those with health insurance, and older participants were significantly more likely to receive a screening test concordant with their stated preference. Findings have important implications for future research and practice.

Acknowledgments:

We acknowledge Nenette M. Jessup for her role in study coordination and coordinating manuscript meetings. The authors would like to acknowledge Carla D. Kettler for her role in data management. In addition, the authors would like to acknowledge Kathy Zoppi, Kate Bol, Allison Woody, and Susan Wathen, from the Community Health Network in Indianapolis, IN, and Marc Rosenman and Evgenia Teal, from Regenstrief Institute in Indianapolis, IN, for their assistance with obtaining lists of potential study participants and with their help with the medical records review process.

Funding acknowledgements: Financial support for this study was provided by the National Cancer Institute at the National Institutes of Health (R01CA136940; PI: V. L. Champion). The efforts of Dr. Shannon M. Christy were supported by the National Cancer Institute while she was a predoctoral fellow at Indiana University-Purdue University Indianapolis (R25CA117865; PI: V. L. Champion) and while she was postdoctoral fellow at Moffitt Cancer Center (R25CA090314; PI: T. H. Brandon). The funding agreement ensured the authors' independence in designing the study, interpreting the data, writing, and publishing the report. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. This study is registered with the clinical trials identifier NCT03279198 https://clinicaltrials.gov/show/NCT03279198.

Financial support for this study was provided entirely by grants from the National Cancer Institute at the National Institutes of Health (R01CA136940; PI: V. L. Champion; R25CA117865; PI: V. L. Champion; R25CA090314; PI: T. H. Brandon). The funding agreement ensured the authors' independence in designing the study, interpreting the data, writing, and publishing the report.

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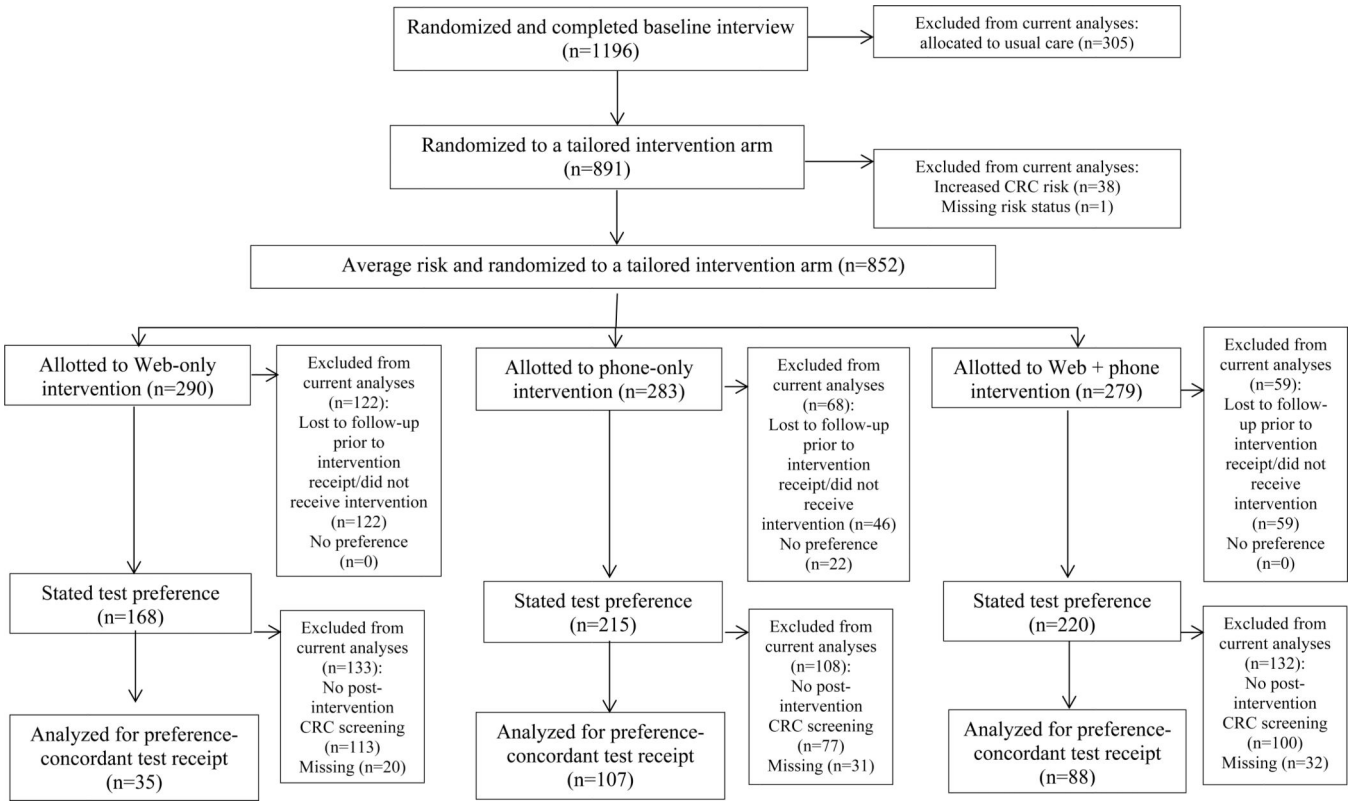

Figure 1. Study Participant Flow Diagram.
CRC, colorectal cancer.

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Table 1

Baseline Variables by Study Group (N=603)

Percentage=column percent	Web (n=168)	Phone (n=215)	Web + Phone (n=220)	Total (n=603)	*P* value
Age					0.649
Mean (SD)	58.9 (6.0)	58.4 (6.0)	58.7 (5.9)	58.6 (6.0)	
Range	50.7 – 72.9	50.6 – 75.0	50.5 – 75.6	50.5 – 75.6	
Race					0.217
White	147 (87.5%)	198 (92.1%)	187 (85.0%)	532 (88.2%)	
Black	17 (10.1%)	14 (6.5%)	25 (11.4%)	56 (9.3%)	
Other	4 (2.4%)	3 (1.4%)	8 (3.6%)	15(2.5%)	
Income N-Miss					0.763
N-Miss	3	9	4	16	
<= $30,000	44 (26.7%)	57 (27.7%)	69 (31.9%)	170(29.0%)	
$30–75,000	70(42.4%)	88 (42.7%)	90 (41.7%)	248(42.2%)	
>= $75,000	51 (30.9%)	61 (29.6%)	57 (26.4%)	169(28.8%)	
Education					0.122
High school or less	32 (19.0%)	62 (28.8%)	62 (28.2%)	156(25.9%)	
Some college	81 (48.2%)	80 (37.2%)	89 (40.5%)	250(41.5%)	
Bachelor’s or higher	55 (32.7%)	73 (34.0%)	69 (31.4%)	197(32.7%)	
Marital status					0.076
N-Miss	0	1	1	2	
Not married	60 (35.7%)	71 (33.2%)	95 (43.4%)	226(37.6%)	
Married	108 (64.3%)	143 (66.8%)	124 (56.6%)	375 (62.4%)	
Insurance status					0.271
Has insurance Coverage	153 (91.1%)	185 (86.0%)	197 (89.5%)	535 (88.7%)	
Has no insurance coverage	15 (8.9%)	30 (14.0%)	23 (10.5%)	68 (11.3%)	
Doctor visits					0.610
N-Miss	2	0	1	3	
Has not seen doctor	10 (6.0%)	18 (8.4%)	14 (6.4%)	42 (7.0%)	
Has seen doctor >=1 times	156 (94.0%)	197 (91.6%)	205 (93.6%)	558 (93.0%)	
BMI					0.825
N-Miss	3	7	10	20	
Underweight/normal	37 (22.4%)	50 (24.0%)	50 (23.8%)	137(23.5%)	
Overweight	50 (30.3%)	57 (27.4%)	52 (24.8%)	159(27.3%)	
Obese	78 (47.3%)	101(48.6%)	108(51.4%)	287(49.2%)	
Doctor recommend colonoscopy?					0.616
N-Miss	1	0	0	1	
No or not sure	55 (32.9%)	76 (35.3%)	68 (30.9%)	199(33.1%)	
Yes	112 (67.1%)	139 (64.7%)	152 (69.1%)	403 (66.9%)	
Doctor recommend SBT?					0.674
No or not sure	101 (60.1%)	126 (58.6%)	138 (62.7%)	365 (60.5%)	

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Percentage=column percent	Web (n=168)	Phone (n=215)	Web + Phone (n=220)	Total (n=603)	*P* value
Yes	67 (39.9%)	89 (41.4%)	82 (37.3%)	238(39.5%)	
Baseline stage colonoscopy					0.439
Pre-contemplation	126 (75.0%)	173 (80.5%)	171 (77.7%)	470 (77.9%)	
Contemplation	42 (25.0%)	42 (19.5%)	49 (22.3%)	133(22.1%)	
Baseline stage FOBT					0.732
Pre-contemplation	144 (85.7%)	182 (84.7%)	192 (87.3%)	518 (85.9%)	
Contemplation	24 (14.3%)	33 (15.3%)	28 (12.7%)	85 (14.1%)	

Analyses do not control for familywise error rates. BMI, body mass index; FOBT, fecal occult blood test; SBT, stool blood test.

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Table 2

Baseline Characteristics by CRC Test Preference (N=603)

Percentage=row percent	Preferred Stool Test (n=386)	Preferred Colonoscopy (n=217)	Total (n=603)	*P* value
Age				**0.029**
Mean (SD)	59.0 (6.1)	57.9 (5.6)	58.6 (6.0)	
Range	50.5 – 75.6	50.5 – 72.3	50.5 – 75.6	
Marital status				0.205
Not married	152 (67.3%)	74 (32.7%)	226 (100.0%)	
Married	233 (62.1%)	142 (37.9%)	375 (100.0%)	
Race				0.660
White	341 (64.1%)	191 (35.9%)	532 (100.0%)	
Black	34 (60.7%)	22 (39.3%)	56 (100.0%)	
Other	11 (73.3%)	4 (26.7%)	15 (100.0%)	
Income				0.238
<= $30,000	118 (69.4%)	52 (30.6%)	170 (100.0%)	
$30–75,000	157 (63.3%)	91 (36.7%)	248 (100.0%)	
>= $75,000	103 (60.9%)	66 (39.1%)	169 (100.0%)	
Education				0.652
High school or less	102 (65.4%)	54 (34.6%)	156 (100.0%)	
Some college	163 (65.2%)	87 (34.8%)	250 (100.0%)	
Bachelor’s or higher	121 (61.4%)	76 (38.6%)	197 (100.0%)	
Doctor visits				0.288
Has not seen doctor	30 (71.4%)	12 (28.6%)	42 (100.0%)	
Has seen doctor >=1	353 (63.3%)	205 (36.7%)	558 (100.0%)	
Times				
Insurance status				0.142
Has insurance coverage	337 (63.0%)	198 (37.0%)	535 (100.0%)	
Has no insurance coverage	49 (72.1%)	19 (27.9%)	68 (100.0%)	
BMI				0.747
Underweight/normal	90 (65.7%)	47 (34.3%)	137 (100.0%)	
Overweight	98 (61.6%)	61 (38.4%)	159 (100.0%)	
Obese	185 (64.5%)	102 (35.5%)	287 (100.0%)	
Doctor recommend colonoscopy?				0.539
No or not sure	131 (65.8%)	68 (34.2%)	199 (100.0%)	
Yes	255 (63.3%)	148 (36.7%)	403 (100.0%)	
Doctor recommend SBT?				0.420
No or not sure	229 (62.7%)	136 (37.3%)	365 (100.0%)	
Yes	157 (66.0%)	81 (34.0%)	238 (100.0%)	
Baseline stage colonoscopy				**< 0.001**
Pre-contemplation	341 (72.6%)	129 (27.4%)	470 (100.0%)	
Contemplation	45 (33.8%)	88 (66.2%)	133 (100.0%)	

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Percentage=row percent	Preferred Stool Test (n=386)	Preferred Colonoscopy (n=217)	Total (n=603)	*P* value
Baseline stage SBT				**0.002**
Pre-contemplation	319 (61.6%)	199 (38.4%)	518 (100.0%)	
Contemplation	67 (78.8%)	18 (21.2%)	85 (100.0%)	
Perceived risk of developing colon cancer (next 10 years)				0.092
Higher risk	23 (69.7%)	10 (30.3%)	33 (100.0%)	
About the same or not sur	276 (61.5%)	173 (38.5%)	449 (100.0%)	
Lower risk	86 (71.7%)	34 (28.3%)	120 (100.0%)	
Fatalism total score				0.269
N-Miss	1	0	1	
Mean (SD)	20.2 (6.8)	19.6 (6.2)	20.0 (6.6)	
Range	11.0 – 45.0	11.0 – 35.0	11.0 – 45.0	
Fear total score				0.205
N-Miss	0	1	1	
Mean (SD)	22.4 (7.5)	23.3 (7.9)	22.7 (7.6)	
Range	8.0 – 40	8.0 – 40.0	8.0 – 40.0	
Perceived susceptibility to colon cancer total score				0.343
N-Miss	1	0	1	
Mean (SD)	6.8 (2.3)	6.6 (2.2)	6.7 (2.2)	
Range	3.0 – 15.0	3.0 – 15.0	3.0 – 1	
Benefits of CRC screening total score				**0.008**
N-Miss	2	0	2	
Mean (SD)	17.8 (3.1)	18.5 (3.0)	18.1 (3.0)	
Range	5.0 – 25.0	10.0 – 25.0	5.0 – 25.0	
Barriers to SBT total score				**0.022**
N-Miss	1	2	3	
Mean (SD)	20.2 (4.9)	19.2 (5.4)	19.9 (5.1)	
Range	8.0 – 40.0	8.0 – 40.0	8.0 – 40.0	
Barriers to colonoscopy total score				**< 0.001**
N-Miss	0	1	1	
Mean (SD)	37.2 (8.4)	34.2 (9.1)	36.1 (8.8)	
Range	14.0 – 70.0	14.0 – 70.0	14.0 – 70.0	
Self-efficacy for SBT total score				0.711
N-Miss	0	1	1	
Mean (SD)	28.6 (4.6)	28.8 (4.7)	28.7 (4.6)	
Range	8.0 – 32.0	8.0 – 32.0	8.0 – 32.0	
Self-efficacy for colonoscopy total score				**< 0.001**
N-Miss	0	1	1	
Mean (SD)	36.0 (7.5)	38.7 (5.8)	36.9 (7.1)	
Range	11.0 – 44.0	11.0 – 44.0	11.0 – 44.0	
CRC/CRC screening knowledge score				0.251

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Percentage=row percent	Preferred Stool Test (n=386)	Preferred Colonoscopy (n=217)	Total (n=603)	*P* value
Mean (SD)	5.3 (1.9)	5.5 (1.9)	5.3 (1.9)	
Range	0.0 – 11.0	0.0 – 10.0	0.0 – 11.0	
Prior SBT completion				0.373
Ever had SBT	106 (66.2%)	54 (33.8%)	160 (100.0%)	
Never had SBT	264 (62.3%)	160 (37.7%)	424 (100.0%)	
Prior colonoscopy completion				0.535
Ever had colonoscopy	75 (61.5%)	47 (38.5%)	122 (100.0%)	
Never had colonoscopy	307 (64.5%)	169 (35.5%)	476 (100.0%)	
Prior SBT or colonoscopy completion				0.876
Ever had SBT or colonoscopy	151 (64.0%)	85 (36.0%)	236 (100.0%)	
Never had SBT or colonoscopy	223 (63.4%)	129 (36.6%)	352 (100.0%)	

Analyses do not control for familywise error rates. BMI, body mass index; CRC, colorectal cancer; SBT, stool blood test.

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Table 3

Multivariable Model Predicting Concordance (N=218)

	OR	*P* value	95% CI Lower OR	95% CI Upper OR
Age	1.9	**0.013**	1.1	3.1
Treatment group				
Phone only vs. Web only	7.9	**0.002**	2.2	32.3
Web only vs. Web + phone	0.8	0.675	0.3	2.3
Phone only vs. Web + phone	6.4	**0.001**	2.2	22.1
Race				
Black vs. white	0.6	0.462	0.1	2.7
Other vs. white	0.9	0.963	0.1	11.3
Education				
Some college vs. high school or less	0.6	0.429	0.2	2.1
Bachelor's or higher vs. high school or less	0.4	0.159	0.1	1.3
Marital status				
Married vs. not married	1.5	0.404	0.6	4.3
Insurance status				
Has no insurance vs. has insurance	0.2	**0.047**	0.1	1.0
Income level				
$30–75,000 vs. <= $30,000	0.7	0.558	0.2	2.3
>= $75,000 vs. <= $30,000	0.8	0.795	0.2	3.4
SBT Stage				
Contemplation vs. pre-contemplation	2.0	0.375	0.5	11.0
Benefits of CRC screening total score	0.8	0.152	0.7	1.1
Fatalism total score	1.1	0.365	0.9	1.4
Prior screening completion				
No prior screening with SBT or colonoscopy vs.	1.9	0.191	0.7	5.1

For treatment group, a contrast test was performed to test all three pairwise comparisons. Analyses do not control for familywise error rates. Customized odds ratios are presented for continuous variables in the model—age (5-year increment), benefits of colorectal cancer (CRC) screening total score (1/2 SD increment of 1.6) and fatalism total score (1/2 SD increment of 3.5). SBT, stool blood test.