The Effects of Test Preference, Test Access, and Navigation on Colorectal Cancer Screening

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Abstract

Background: Little is known about how colorectal cancer screening test preferences operate together with test access and navigation to influence screening adherence in primary care.

Methods: We analyzed data from a randomized trial of 945 primary care patients to assess the independent effects of screening test preference for fecal immunochemical test (FIT) or colonoscopy, mailed access to FIT and colonoscopy, and telephone navigation for FIT and colonoscopy, on screening.

Results: Preference was not associated with overall screening, but individuals who preferred FIT were more likely to complete FIT screening ($P = 0.005$), whereas those who preferred colonoscopy were more likely to perform colonoscopy screening ($P = 0.032$). Mailed access to FIT and colonoscopy was associated with increased overall screening ($OR = 2.6, P = 0.001$), due to a 29-fold increase in FIT use. Telephone navigation was also associated with increased overall screening ($OR = 2.1, P = 0.005$), mainly due to a 3-fold increase in colonoscopy performance. We estimated that providing access and navigation for both screening tests may substantially increase screening compared with a preference-tailored approach, mainly due to increased performance of nonpreferred tests.

Conclusions: Preference influences the type of screening tests completed. Test access increases FIT and navigation mainly increases colonoscopy. Screening strategies providing access and navigation to both tests may be more effective than preference-tailored approaches.

Impact: Preference tailoring in colorectal cancer screening strategies should be avoided if the objective is to maximize screening rates, although other factors (e.g., costs, necessary follow-up) should also be considered.

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Introduction

In the United States, colorectal cancer screening among adults ages 50 years and older is a little more than 50%, with colonoscopies constituting more than three quarters of those screening tests (1). Patient-oriented strategies that have been reported to increase colorectal cancer screening include mailings and reminders (2), as well as navigation (3, 4). The role of patient preferences about colorectal cancer screening modalities is less clear, although such preferences differ across racial and ethnic groups, and may help to account for disparities in colorectal cancer screening rates (5–9). A 2010 NIH State-of-the-Science Conference called for studies on patient preferences and other factors influencing the choice of a colorectal cancer screening modality, and for research to develop strategies that can reduce barriers and increase access to screening (10). However, to our knowledge, no studies have examined the interplay of test preference, test access, and navigation in colorectal cancer screening.

We used data from a randomized controlled trial of colorectal cancer screening interventions in primary care (11), to investigate the independent effects of test preference, test access, and navigation on colorectal cancer screening. We addressed four questions: (i) Does the likelihood of undergoing colorectal cancer screening vary with individual test preference? (ii) How does increasing access to stool blood testing and colonoscopy affect colorectal cancer screening? (iii) How does providing telephone navigation for stool blood testing and colonoscopy affect colorectal cancer screening? and (iv) Does tailoring access and navigation to each individual’s preference have a different impact compared with providing access and navigation for both stool blood test and colonoscopy to all individuals?
Materials and Methods

Study design

Between 2007 and 2011, we conducted a randomized controlled trial of screening interventions among patients at 10 primary care practices affiliated with the Christiana Care Health System (CCHS) in Delaware. Participants ages 50 to 79 years who were not up to date with colorectal cancer screening were randomized into one of three groups: (i) a usual care control group; (ii) a standard intervention (SI) group that received nontailored mailed access to both stool blood test and colonoscopy; and (iii) a tailored navigation intervention (TNI) group that was provided mailed access and navigation based on self-reported screening test preference (11). The study was approved by Institutional Review Boards at Thomas Jefferson University (Philadelphia, PA) and CCHS.

The control group had limited access to stool blood tests, as colonoscopy was the overwhelming colorectal cancer screening modality of choice at the participating practices. In the standard intervention group, all participants were mailed a fecal immunochemical test (FIT) kit with instructions, along with a letter that included a telephone number to call for information on how to schedule a colonoscopy appointment. Callers were given the telephone number of an approved colonoscopy provider. In the TNI group, interventions were tailored to each participant’s colorectal cancer screening test preference reported on the baseline survey. Only the FIT kit was mailed to participants who preferred FIT, while only the colonoscopy information letter was mailed to participants who preferred colonoscopy. Participants who reported an equal FIT/colonoscopy preference received both the FIT kit and the colonoscopy information letter. A patient navigator then attempted to contact all TNI participants to encourage and assist them in completing colorectal cancer screening.

Study measures

Data were collected through baseline and endpoint surveys, and a medical records review. Information was obtained on participant sociodemographic characteristics, perceptions of colorectal cancer screening, and screening decision stage related to FIT and colonoscopy screening (11, 12). Screening decision stage was assessed for FIT and colonoscopy separately (decided against, never heard of, not considering, undecided, or decided to do), and the highest of the two test-specific decision stages was defined as the participant’s overall screening decision stage (11, 13, 14). The screening test with the highest decision stage was considered the preferred test (prefer FIT, equal FIT/colonoscopy preference, or prefer colonoscopy). In addition, study participants were categorized in terms of access to screening tests and navigation. Test access was classified as usual care (i.e., screening tests as offered by the practice), mailed FIT kit, mailed colonoscopy information number, or mailed FIT kit plus colonoscopy information number. Navigation status was also classified as no navigation, navigation for FIT only, navigation for colonoscopy only, and navigation for both FIT and colonoscopy.

Colorectal cancer screening was defined as the performance of any test recommended by American Cancer Society guidelines that applied at the start of the study in 2007. Evidence of screening was obtained from laboratory reports and medical records reviews, as well as from participant endpoint surveys. Screening recorded in any of those sources was counted, as long as it was performed within a 12-months following study randomization.

Data analyses

The main trial results about the intervention effects have been reported elsewhere (11). In this paper, our main objective was to estimate the independent impact of test preference, test access, and navigation, as well as preference-tailoring, on overall and test-specific (FIT and colonoscopy) colorectal cancer screening:

2. Access: comparison of different types of test access: usual care, FIT only, colonoscopy only, or FIT plus colonoscopy (primarily, the contrast of access to both FIT and colonoscopy vs. usual care).
3. Navigation: comparison of different levels of navigation: no navigation, FIT, colonoscopy, or FIT and colonoscopy (primarily, the contrast of navigation to both FIT and colonoscopy vs. no navigation).
4. Tailoring: comparison of access and navigation to both FIT and colonoscopy versus tailored access and navigation (FIT only, colonoscopy only, or FIT plus colonoscopy, depending on preference).

These effects were not directly estimable through simple comparisons of the trial arms. First, preference was not a randomization factor. Second, to completely evaluate access (usual care, FIT only, colonoscopy only, or FIT plus colonoscopy) and navigation (none, FIT only, colonoscopy only, FIT plus colonoscopy), we would need a 4 × 4 factorial trial design, and to evaluate tailoring, we would need two additional arms (tailored access without navigation or tailored access with navigation). Obviously, this was not feasible, and the trial randomized only a few combinations of elements, that is, nontailored access to both FIT and colonoscopy without navigation (SI) versus tailored access to FIT or colonoscopy with navigation (TNI). Consequently, only certain intervention elements can be evaluated directly through the randomized trial results (most notably, the main effect of access to FIT plus colonoscopy vs. usual care can be obtained by contrasting the standard intervention and usual care control groups). Other effects of individual intervention elements can only be evaluated indirectly through observational data analyses, and those are the ones we present in this paper. Finally, certain effects of...
Results

Table 1 summarizes the baseline characteristics of the 945 study participants (11). Colorectal cancer screening was completed by 305 (32%) participants, with screening tests being either an FIT or a colonoscopy (n = 164 and 141, respectively). Table 2 summarizes overall and test-specific screening rates (FIT and colonoscopy) according to preference, access, and navigation status.

Test preference

Within subgroups that were provided the same access and navigation (i.e., usual care control and SI groups), overall screening rates did not differ significantly across test preference categories (Table 2; standard intervention: 10%, 18%, and 22%, P = 0.166; standard intervention: 43%, 34%, 35%, P = 0.433). However, the type of test performed was significantly associated with test preference. More specifically, FIT screening rates tended to be higher among participants who preferred FIT than among those who had an equal preference for FIT and colonoscopy or those who preferred colonoscopy. Similarly, colonoscopy screening rates tended to be higher among participants who preferred colonoscopy than among those who had an equal preference for FIT and colonoscopy or who preferred FIT. The multivariable analyses confirmed that test preference was significantly associated with both FIT and colonoscopy screening (Table 3, P = 0.005 and 0.032, respectively).

Mailed access to both FIT and colonoscopy

Compared with usual care access, mailed access to both FIT and colonoscopy was associated with a strong increase in overall screening (Fig. 1A; "access" vs. "usual...
This was due to a substantial increase in FIT screening, although there was also a small decrease in colonoscopy screening (Fig. 1B and C, respectively). Multivariable analyses (Table 3) confirmed that providing mailed access to both tests led to a strong and statistically significant increase in overall screening (OR = 2.64). This effect was due to significantly increased FIT screening (OR = 29.1), while colonoscopy screening was somewhat decreased, although not significantly so (OR = 0.71).

Navigation for both FIT and colonoscopy

Navigation for both tests was associated with an increase in overall screening, as well as both FIT and colonoscopy (Fig. 1A–C, respectively; “access + navigation” vs. “access” bars among individuals with an equal preference for FIT and colonoscopy). Multivariable analyses (Table 3) confirmed that navigation was associated with a significant increase in overall screening (OR = 2.09), and that this effect was due to increases mainly in colonoscopy (OR = 3.22) and less so in FIT (OR = 1.53). Although the navigation impact on colonoscopy screening was significant and that on FIT screening was not, the magnitude of these two effects was not statistically different from each other (P = 0.080).

Nontailored access and navigation for both tests versus tailored access and navigation

To estimate the independent effect of tailoring access and navigation, we would need to contrast the TNI group, which provided access and navigation for the preferred test(s), with a nontailored intervention that would have...
provided access and navigation to both tests, irrespective of test preference. Because the latter intervention was not implemented in our study, we estimated the impact of tailored access and navigation indirectly.

This indirect estimation of the tailoring effect was based on an assumption. We found that navigation among participants with an equal FIT/colonoscopy preference led to increases in both FIT and colonoscopy screening (Table 3; OR = 1.53 and 3.22, respectively), but could not estimate the effect among participants with either FIT or colonoscopy preference. Therefore, our assumption entailed an extrapolation that the same screening benefit would also apply to these latter individuals, that is, that there is no interaction between preference and navigation. This assumption is partly supported by the fact that we found no significant interaction between preference and access. The substantial increase in FIT screening and modest decrease in colonoscopy screening was evident among each of the three test preference categories (Fig. 1; “access” vs. “usual care” bars within each of the three test preference categories; adjusted $P_{interaction} = 0.751$ for FIT screening and 0.318 for colonoscopy screening). The assumption is also consistent with the possibility that navigation for both tests may increase not only the performance of the preferred test, but also that of the nonpreferred test, as some individuals change their preference during navigation. In our study, test preference did indeed change during the navigation telephone call for 8% of those initially preferring FIT and 17% of those initially preferring colonoscopy.

For the estimation of the tailoring effect, the nontailored and the preference-tailored interventions are by definition identical among individuals with equal FIT/colonoscopy preference. However, among individuals who prefer FIT, we estimated that the nontailored intervention will lead to slightly higher overall screening than the tailored intervention (Table 4, OR = 1.12, $P = 0.799$), largely due to somewhat increased performance of the nonpreferred test (colonoscopy). Similarly, among individuals who prefer colonoscopy screening, we estimated that the nontailored intervention will lead to substantially higher overall screening than the tailored intervention (Table 4, OR = 2.70, $P = 0.005$), again due to substantially higher performance of the nonpreferred test (FIT).

Discussion

In our study, more participants preferred colonoscopy or had similar preference for the two tests than preferred stool blood testing. By itself, participant preference for a given colorectal cancer screening test was not associated with the likelihood of screening. However, having a preference for a particular screening test increased the likelihood of completing that test.

Our study was conducted in a diverse set of practices with patterns about modalities of colorectal cancer screening that mirror patterns that exist in many health systems.
in the United States (10). Yet, our results about access, navigation, and tailoring may not generalize to settings where screening modalities other than colonoscopy are predominant.

In terms of access, we found that the mailing of both an FIT kit and a colonoscopy information number led to doubling of overall screening, which was due mainly to a 30-fold increase in FIT screening. This result is consistent with prior conclusions that mailed stool blood test contacts are an effective way to increase colorectal cancer screening (15, 16). However, providing mailed access to both tests also led to a small and nonsignificant decrease in colonoscopy screening. These findings are in very good agreement with the results of a recent randomized trial (17).

In our study, the addition of patient navigation to a mailed FIT kit and colonoscopy information number led to a doubling of overall screening, which reflected a 50% increase in FIT screening and a 3-fold increase in colonoscopy screening. Our findings are again similar to those reported by a recent randomized trial (17). In our study, the effect of navigation on colonoscopy screening is particularly notable, given that participants were only provided a telephone number to use in scheduling colonoscopy screening. The impact of navigation might be enhanced if the navigators were authorized to schedule the screening procedure for interested patients, as has been the case in some prior studies (18, 19). However, in a recent randomized trial, after a provider recommendation during an office visit for either stool blood test or colonoscopy, the latter strategy performed worse, even with direct scheduling and other support offered (20).

Preference tailoring of screening options has been partly motivated by the concern that too many options may lead to patient confusion and inaction (21). However, results of a recent randomized trial suggest that restricting the choice about screening tests might actually have a negative impact on screening, particularly if the test offered is colonoscopy (20, 22). In our analyses, we estimated that providing access and navigation to both FIT and colonoscopy would generally have higher overall screening than providing limited access and navigation tailored to self-reported preference. The key in this difference is the performance of a test other than the one reported to be preferred. Our results rely on the assumption of no interaction between preference and navigation. However, if the effect of navigation is stronger among individuals with equal FIT/colonoscopy preference than among individuals who have a preference for either test, then our results overestimate the difference between the tailored and nontailored strategies. On the other hand, if the navigation impact is stronger among individuals with a clear preference for either FIT or colonoscopy than among individuals with an equal preference for those tests, then our results underestimate that difference.

Our findings about tailoring agree with a previous report that patients do not necessarily complete the screening plan that they deem most preferable (23). Therefore, to maximize overall colorectal cancer screening, it may be advisable to provide access to both FIT and colonoscopy screening initially, irrespective of reported preference, and deliver broad navigation that may support the completion of either test (particularly if the patient is having trouble completing his/her preferred test). Given that the logistics of performing an FIT will probably always be somewhat easier than those for undergoing a colonoscopy, a nontailored approach would likely lead to somewhat fewer colonoscopies (and more stool blood tests) than a tailored approach, and therefore require more efforts to achieve annual follow-up of individuals (24). So, in order for the nontailored strategy to preserve those screening benefits in the long run, it should incorporate an element of periodic reminders and possibly support and navigation activities for the individuals that opt for stool blood testing. This can be accomplished via automated reminders linked to electronic medical records systems which have been reported to influence patients’ colorectal cancer screening (2, 10, 25, 26). Finally, provider preferences and differential support for one or

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**Table 4. Comparison of hypothetical strategy of nontailored access and navigation for both FIT and CX versus TNI strategy of tailored access and navigation for preferred test(s) only (N = 933)**

<table>
<thead>
<tr>
<th>Overall screening</th>
<th>FIT screening vs. none</th>
<th>CX screening vs. none</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OR (95% CI) P</strong></td>
<td><strong>OR (95% CI) P</strong></td>
<td><strong>OR (95% CI) P</strong></td>
</tr>
<tr>
<td>Among those with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIT preference</td>
<td>1.12 (0.47–2.66) 0.799</td>
<td>0.95 (0.36–2.51) 0.918</td>
</tr>
<tr>
<td>Equal FIT/CX preference</td>
<td>1.00 (N/A)</td>
<td>1.00 (N/A)</td>
</tr>
<tr>
<td>CX preference</td>
<td>2.70 (1.36–5.37) 0.005</td>
<td>5.62 (1.81–17.4) 0.001</td>
</tr>
</tbody>
</table>

**Abbreviations:** CX, colonoscopy; N/A, not applicable (interventions are identical by design for this preference group).

*Final multivariable results based on 933 participants with full covariate data. The model included terms for preference, access, and navigation (from which the above tailoring effects were estimated), and controlled for primary care practice, age, sex, race, education, marital status, perceptions of colorectal cancer and screening, and baseline screening decision stage.
the other test, the influence of practice and provider performance metrics, and insurance and reimbursement issues may also affect the relative impact of each screening strategy.

Although one-fifth of our study participants were members of minority populations, our findings may not apply to settings that serve more diverse patients. Finally, study enrollment did not take place at the time of a primary care office visit, nor did study contacts involve direct contact between patients and their primary care providers. Although this study design allowed us to reach patients who may not see a provider very often, it did not have the benefit of a face-to-face provider recommendation and referral (10, 27).

Disclosure of Potential Conflicts of Interest
No potential conflicts of interest were disclosed.

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Conception and design: C. Daskalakis, S.W. Vernon, R. Sifri, R.E. Myers
Development of methodology: C. Daskalakis, R. Sifri, R.E. Myers
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