



Screening

Socio-psychological factors in the Expanded Health Belief Model and subsequent colorectal cancer screening

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ABSTRACT

Objective: CRC screening interventions tailored to the Expanded Health Belief Model (EHBM) socio-psychological factors have been developed, but the contributions of individual factors to screening outcomes are unclear.

Methods: In observational analyses of data from a randomized intervention trial, we examined the independent associations of five EHBM factors – CRC screening knowledge, self-efficacy, stage of readiness, barriers, and discussion with a provider – with objectively measured CRC screening after one year.

Results: When all five factors were added simultaneously to a base model including other patient and visit characteristics, three of the factors were associated with CRC screening: self-efficacy (OR = 1.32, $p = 0.001$), readiness (OR = 2.72, $p < 0.001$), and discussion of screening with a provider (OR = 1.59, $p = 0.009$). Knowledge and barriers were not independently associated with screening. Adding the five socio-psychological factors to the base model improved prediction of CRC screening (area under the curve) by 7.7%.

Conclusion: Patient CRC screening self-efficacy, readiness, and discussion with a provider each independently predicted subsequent screening.

Practice implications: Self-efficacy and readiness measures might be helpful in parsimoniously predicting which patients are most likely to engage in CRC screening. The importance of screening discussion with a provider suggests the potential value of augmenting patient-focused EHBM-tailored interventions with provider-focused elements.

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1. Introduction

Screening for colorectal cancer (CRC) can reduce CRC mortality [1], but use of CRC screening remains low relative to other evidence-based preventive services [2]. Theory-driven interventions to encourage CRC screening have been developed to favorably influence the socio-psychological factors described in the Expanded Health Belief Model (EHBM) (e.g. screening barriers and self-efficacy) and related factors (e.g. stage of readiness), with the distal aim of increasing patient adoption of targeted screening behaviors [3,4]. However, in randomized controlled trials (RCTs),

theory-driven interventions have not consistently led to the desired changes in behaviors, including in CRC screening behaviors [5–18]. Further, even in the trials that found significant behavioral effects, the standardized behavioral effect sizes generally were small [8,9]. To improve intervention approaches for the future, it is important to understand why these approaches have not been more consistently successful.

Despite the fact that many interventions apply the EHBM, few studies have rigorously explored the relative contributions of the EHBM and related constructs to the behavior changes targeted in these interventions [19]. In intervention studies specifically related to CRC screening behaviors, few report on the status of such constructs post-intervention or their contribution to behavior change [20–23]. Furthermore, CRC screening outcomes were typically self-reported by patients and measured simultaneously with socio-psychological factors [11,14,15], so the temporal nature of the relationships between the socio-psychological factors and the health behaviors was unclear. For these reasons the relative

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associations of factors commonly measured and addressed in EHBMs-tailored interventions with subsequent objectively determined CRC screening behaviors remain unknown.

We examined this issue in the current study, conducting secondary observational analyses of data from an RCT of an experimental CRC screening intervention for patients that was individually tailored to EHBMs socio-psychological factors. We evaluated the prospective associations of EHBMs and related factors with objectively measured CRC screening. Measures of three EHBMs factors (self-efficacy, barriers, and cues to action) and of two related factors (knowledge and stage of readiness) were collected after the participants had received their assigned study intervention and had seen their primary care provider for a scheduled visit. While knowledge and stage of readiness are not included in the description of the EHBMs, both are important in evaluating how EHBMs constructs contribute to CRC screening. Knowledge is often viewed as necessary to promote behavior change, and commonly cited as a modifying factor in the EHBMs [24]. Similarly, behavioral experts call attention to the interrelationship of the EHBMs with stage of readiness to change behavior [25]. CRC screening was ascertained objectively by medical record review at one year follow-up. Based on the existing literature regarding the association of socio-psychological factors with CRC screening [12,26], we hypothesized that, after adjusting for baseline patient and visit characteristics that may influence screening (e.g., patient age, education, health status, insurance, and prior screening), CRC screening knowledge, barriers, self-efficacy, and stage of readiness and discussion of screening with the visit provider each would be significantly associated with receipt of CRC screening both when examined individually, and when examined simultaneously in a single adjusted model.

2. Methods

2.1. Participants

The study was conducted from February 1, 2010 through November 30, 2012. Patients aged 50–75 years who were either English- or Spanish-speaking and were not up-to-date for CRC screening were recruited at the time of previously scheduled appointments in primary care clinics in five sites: Sacramento, California (ten clinics); Bronx, New York (one clinic); Rochester, New York (three clinics); San Antonio, Texas (four clinics); and Denver, Colorado (eight clinics in and around Denver). Patients were considered to be not up-to-date for CRC screening if none of the following was documented or reported: fecal occult blood test (FOBT) within one year; flexible sigmoidoscopy within five years; or colonoscopy within ten years. This study includes the 1101 participants randomized in the parent study that had complete baseline and follow-up data (94.6% of the randomized sample).

2.2. Study procedures

The aim of the parent RCT was to compare the effectiveness of an interactive multimedia computer program that was tailored to EHBMs and related socio-psychological factors with a non-tailored informational control program. Both interventions were offered to patients in primary care clinics immediately before their scheduled provider visits. Details of the study design and procedures are available elsewhere [27]. Briefly, the tailored program messages addressed the status of several factors previously shown to be associated with CRC screening: knowledge, self-efficacy, and stage of readiness. The tailored program messages also were crafted to reduce common perceived barriers to screening (e.g., to address the fear that screening will be painful, intervention messages state

that severe pain with colonoscopy is uncommon and non-existent with FOBT), and to help overcome “actual” barriers (e.g., to address concerns that screening is not affordable, intervention messages state that, while some copayment may be required, most insurance plans cover the bulk of CRC screening costs, and that FOBT is generally a lower cost alternative). Beyond favorably influencing the status of these EHBMs socio-psychological factors, a proximal aim of the tailoring was to motivate patients to discuss CRC screening with their primary care provider during an office visit immediately following the patient’s use of the intervention, which would be a trigger for engaging in screening behavior. The ultimate aim of the tailored intervention was to encourage patients to actually complete CRC screening by either FOBT or colonoscopy during a one year study follow-up period.

The interventions and interviews were self-administered using touchscreen notebook computers. Research assistants administered written informed consent and then showed participants how to use the computer program. The computer program randomly assigned participants to either the tailored or non-tailored intervention. Since one of the aims of the parent study was to compare efficacy of the tailored intervention for Spanish-speaking Hispanics with others, randomization was stratified by patient language and ethnicity. Randomization also was implemented in blocks of ten participants within each ethnicity/language stratum to ensure approximately equal numbers across groups over the course of the study. Participants completed a computer-based baseline questionnaire and their assigned intervention before the primary care provider visit. Immediately after the visit, participants completed a follow-up questionnaire on the computer and received an incentive worth \$20. Approximately one year, data collection personnel conducted medical chart reviews. Institutional review board approval was obtained at all study performance sites.

2.3. Measures

EHBMs and related socio-psychological factors were measured in both pre- and post-intervention questionnaires. The current analyses employed the post-intervention measures, including knowledge, barriers, self-efficacy, stage of readiness, and discussion of screening with provider.

Knowledge was measured using 12-item scale that included knowledge about CRC screening recommendations, risk of not obtaining CRC screening, risks associated with CRC screening tests, and common inconveniences associated with CRC screening tests. One point was given to each correct answer, resulting in an overall score that ranges from 0 to 12 (higher score = greater knowledge, Cronbach’s alpha = 0.81). *Barriers* to CRC screening were measured using a 9-item Likert-like scale for FOBT-related barriers (Cronbach’s alpha = 0.86) and a 10-item Likert-like scale for colonoscopy-related barriers (Cronbach’s alpha = 0.87). Respondents were asked the degree to which they endorsed each item using a range of 1 to 5 (higher scores = fewer barriers). The average item rating for each barriers scale is report [28]. CRC screening *self-efficacy* was measured using two items. Patients were asked to rate the degree to which they agreed with statements about their ability to obtain FOBT and colonoscopy screening (range 1–5, higher score = higher self-efficacy). Each item is reported separately. *Stage of readiness to change behavior* was measured as stage of readiness for either FOBT or colonoscopy (e.g., pre-contemplation, contemplation, or planning). We used a modified version of a previously single validated item [29]. An indicator variable for planning versus contemplation or pre-contemplation was used in the current analysis. Each knowledge, barrier, and efficacy measure was used as a continuous measure in the current analysis; stage of readiness was used as an indicator variable. Discussion of screening with provider, a measure for *cues to action*, was obtained by asking patients to

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