Explaining Physician Rates of Providing Flexible Sigmoidoscopy[1]

Daniel E. Montaño,[2] William R. Phillips, and Danuta Kasprzyk

Battelle, Centers for Public Health Research and Evaluation, Seattle, Washington 98105 [D. E. M., W. R. P., D. K.], and Department of Family Medicine, University of Washington, Seattle, Washington 98195 [W. R. P.]

Abstract

Colorectal cancer is the third most frequent cancer, yet screening rates for this cancer remain low. This study was designed to identify factors associated with family physicians' rates of recommending or providing flexible sigmoidoscopy. We applied a behavioral model consisting of three components: physician attitude toward providing the test, facilitating conditions, and reinforcing conditions. Qualitative interviews identified relevant measures of each model component and guided the design of the survey. The survey was administered to 60 randomly selected family physicians in Washington State. Chart reviews were conducted to measure physician rates of providing flexible sigmoidoscopy. All three model components were significantly correlated with sigmoidoscopy rate. Multiple regression found physician attitude, facilitating conditions, and their interaction to be significant determinants of sigmoidoscopy rate (multiple $R = 0.72$). Analyses of specific items used to measure physician attitude found that physician beliefs about cost, time, income, degree of distaste, risk of complications, and screening effectiveness were significantly correlated with sigmoidoscopy rate. Specific facilitating conditions found to be correlated with rate of providing the test included physician and staff training, availability of a reminder system, and clinic structural conditions. This study provides strong support for application of a theory-based model to understand physician provision of flexible sigmoidoscopy testing for colorectal cancer. The findings provide very specific information to guide development of educational and motivational efforts and modification of facilitating conditions to increase physician provision of sigmoidoscopy to control colorectal cancer.

Introduction

Colorectal cancer is the third most frequent form of cancer and the second leading cause of cancer-related deaths among both men and women in the United States. Survival of patients with localized disease is extremely good (1–3). However, most (60%) patients have regional or distant metastases at the time of colorectal cancer diagnosis (4). Early detection and removal of precancerous polyps allow patients to recover without moving on to a diagnosis of cancer, whereas early detection and removal of cancerous polyps positively impacts survival rates (1, 2). Regular colorectal cancer screening among individuals age 50 years and older has great potential for both primary and secondary cancer prevention.

Routine sigmoidoscopic screening every 3–5 years beginning at age 50 has been recommended since the 1980s by the American Cancer Society, the National Cancer Institute, and other organizations (5). In a 1993 review, Ransohoff and Lang (6) concluded that although sigmoidoscopic screening had been recommended for over a decade, it has been widely ignored by physicians and patients. A recent task force sponsored by the AHCPR[3] and a consortium of five gastrointestinal groups, led by the American Gastroenterological Association, reviewed the evidence to date and released new colorectal cancer screening guidelines that include flexible sigmoidoscopy every 3–5 years (1). Subsequently, the American Cancer Society issued an update of its 1993 guidelines, which were in agreement with the AHCPR recommendations (7). The USPSTF now also recommends periodic flexible sigmoidoscopy screening of patients ages 50 and older (8).

National surveys indicate that colorectal cancer screening rates in the United States are disappointingly low, with between 26 and 40% of respondents reporting ever having had a proctoscopy or sigmoidoscopy (1, 2). Primary care physicians play a critical role in recommending and encouraging patient acceptance of this test. Patient compliance is associated with physician recommendation and how well the physician explains the importance of flexible sigmoidoscopy (9–11). However, current research indicates that this test continues to be viewed as controversial by primary care physicians (12). Thus, it is essential to understand the factors affecting physician recommendation and offering of flexible sigmoidoscopy to design effective intervention strategies to increase provision of the test (1).

Unfortunately, only a few studies to date have examined factors affecting clinician provision of flexible sigmoidoscopy. Some studies have assessed clinician screening policies and practices or assessed the association between physician characteristics and belief in effectiveness of the test (13, 14). Other studies have assumed that system barriers are most important in determining provision of flexible sigmoidoscopy and have investigated the prevalence of or strategies to overcome those barriers (11, 15–17). Although some studies have surveyed physicians to identify characteristics associated with their recommendation of the test, they have focused on practice and demographic characteristics rather than physician opinions (14, 18). Some studies have asked physicians to indicate whether

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[1] Supported by Grant CA47805 from the National Cancer Institute.
[2] To whom requests for reprints should be addressed, at Battelle, 4500 Sand Point Way N.E., Seattle, WA 98105.

[3] The abbreviations used are: AHCPR, Agency for Health Care Policy Research; USPSTF, United States Preventive Services Task Force; TPB, theory of planned behavior; ACS, American Cancer Society.

they think various factors affect their provision of the test (18, 19). These studies have not measured the strength of physician positive and negative opinions regarding provision of the test, nor have they assessed the association of these factors with actual rates of provision of the test. No studies have applied behavioral theory to understand the factors affecting provision of flexible sigmoidoscopy.

The findings presented here are from a larger study that applied behavioral theory to investigate family physicians' provision of multiple cancer screening procedures (20, 21). The subset of study data concerning flexible sigmoidoscopy were analyzed to: (*a*) understand factors including physician opinions (attitude, beliefs), experiences, and office conditions associated with physicians' rates of providing flexible sigmoidoscopy; and (*b*) identify factors that can be modified by interventions to increase clinicians' rates of offering this test.

Materials and Methods

Study Population. This study was conducted among 60 randomly selected family physicians in Washington State and approximately 55 established patients in each physician's practice.

Development of Physician Survey Instrument. Research conducted to understand clinician behavior and the provision of clinical services should be guided by behavioral theory to identify clinician characteristics to be measured, design survey items to measure those characteristics, and determine the analytic strategy to identify the factors that explain clinician behavior. In this research, we designed a survey instrument to measure Attitude and Facilitating Conditions. The Attitude component is central to the theory of reasoned action and TPB (22) and related to elements from other behavioral theories (23, 24). According to the theory of reasoned action and TPB, a person's intention or motivation to perform a behavior is most strongly determined by his or her attitude toward that behavior. Attitude toward the behavior is in turn determined by beliefs about outcomes or attributes of the behavior, with the strength of each outcome belief weighted by whether the outcome is considered to be positive or negative. In this study, a physician's attitude toward recommending or providing flexible sigmoidoscopy screening is determined by the physician's positive and negative beliefs about providing the test.

The "facilitating conditions" component is conceptually similar to the TPB perceived control, self efficacy from social cognitive theory, and facilitators from the theory of interpersonal behavior (25, 26). These are factors that make it easier or more difficult to carry out one's motivation to provide sigmoidoscopy testing. These could include physician training and experience or environmental conditions in the practice setting. Facilitating conditions are considered to have a direct effect on behavior but also to interact with physician attitude (*i.e.*, motivation) in affecting behavior. Thus, the effect of a positive attitude on provision of sigmoidoscopy would be enhanced by conditions that facilitate the ability to offer the test.

Other characteristics and experiences of the physician are considered to affect behavior via beliefs and attitude. Experiences may reinforce either positive or negative beliefs about the test, thereby indirectly impacting the likelihood of offering the test. For example, a physician who has more experience with colorectal cancer compared with other physicians may have more positive beliefs about sigmoidoscopy, a more positive attitude, and greater likelihood of ordering the test. Thus, we included "reinforcing conditions" as a component in the theoretic model.

We conducted open-ended elicitation interviews with 26 family physicians to identify the underlying issues to measure for each model component. Questions were designed to elicit information concerning: (*a*) physician attitude, consisting of beliefs about providing flexible sigmoidoscopy to patients over age 49; (*b*) facilitating factors that make it easier or more difficult to provide the test; and (*c*) reinforcing conditions consisting of experiences or events that may have affected the physician's opinions. Interviews were audio recorded, transcribed, and analyzed for content. A complete description of this process is reported elsewhere (20).

The content analysis identified 12 beliefs about sigmoidoscopy, 7 facilitating conditions, and 3 reinforcing conditions or experiences. We developed questionnaire items to measure each of these. The outcome beliefs included early detection, reduction in mortality, feelings about doing the procedure, perceptions about patient reactions, and impact on the practice. Questions measured each belief using 7-point bipolar scales with end points "strongly agree" and "strongly disagree." Facilitating conditions included items such as office reminder systems, training in flexible sigmoidoscopy, physician comfort with sigmoidoscopy proficiency, staff training, and availability of a room to conduct the test. We measured physician proficiency with a 7-point bipolar scale and recorded all other facilitators as dichotomous yes-no items. Reinforcing conditions included a history of having found colorectal cancer in a patient, having had a patient die from colorectal cancer, and having had a friend or family member die from colorectal cancer. We measured these with dichotomous items. The questionnaire also included other physician and practice characteristics including gender, age, length of time in practice, residency training, practice size, community size, number of patients seen per week, and hours per week spent on patient care.

Data Collection Design and Procedures. The data used for this study on sigmoidoscopy were collected as part of a larger study of cancer control services provided by family physicians in Washington State in 1990, and the data collection procedures have been described previously in detail (21). Briefly, 60 family physicians, randomly selected in Washington State, agreed to participate in this study (90% participation rate). These physicians completed a survey on cancer control services, which included the items about flexible sigmoidoscopy. Between 100 and 140 established patients from each physician's practice were randomly selected with stratification by sex to include 60% women and by age to include 60% over age 49. We sent these patients a letter requesting permission to audit their medical records for cancer screening tests, and 65% returned their consent. Next, we randomly selected 55 consenting patients per physician[4] (totaling 3281 patients) and audited their medical records for occurrence of six cancer control procedures within ACS recommended intervals. In addition to recording other cancer detection tests, medical record abstractors recorded each date of occurrence or physician recommendation of flexible sigmoidoscopy during the previous 5 years. For those patients who had not been in the practice for 5 years, medical records were reviewed to the date of their first visit. Because the goal of the study was to measure physician behavior, physician recommendation of the test was recorded even if the patient did not have the test.

[4] Fifty-five chart reviews/physician were determined to be necessary to have sufficient numbers within patient age/sex subgroups to compute stable rates of providing various cancer detection tests.

Data Analysis Procedures. The subset of the study data used in these analyses includes the flexible sigmoidoscopy and physician characteristic measures from the 60 physicians whose patients were surveyed and charts reviewed. Physician rates of providing flexible sigmoidoscopy were computed from the subset of chart review data of patients over age 49. The numbers of these patient charts ranged from 13 to 42 (mean, 31.3) per physician and totaled 1878. Each physician's rate of providing sigmoidoscopy was computed by counting the number of patients over age 49 for whom the physician had recommended or provided flexible sigmoidoscopy within the previous 5 years and dividing by the total number of patients over age 49.

Before conducting the analyses, we computed composite scores of each model construct for each physician. Physician attitude was computed by summing the 12 ratings of beliefs concerning sigmoidoscopy. Prior to computing this sum, negatively phrased items (*e.g.,* "sigmoidoscopy is time consuming and expensive") were recoded so that a higher score represents a positive motivation. This attitude score obtained an internal consistency of Cronbach's $\alpha = 0.73$. Similarly, the seven "facilitating condition" items were summed, after dichotomizing the physician proficiency measure at the midpoint to be consistent with the other dichotomous items. The facilitating condition score ranged from zero to seven, representing the presence or absence of seven facilitating conditions in each office, and obtained an internal consistency of Cronbach's $\alpha = 0.70$. The internal consistency of the three reinforcing condition measures was low; therefore, these items were treated as separate measures of reinforcing conditions.

Descriptive statistics were first run on physician characteristics, followed by analyses to explain physician sigmoidoscopy rates. We hypothesized that: (*a*) attitude and facilitating conditions would directly explain, and interact in explaining, sigmoidoscopy rates; and (*b*) reinforcing conditions affect sigmoidoscopy rates indirectly via physician attitude. We conducted correlation and hierarchical regression analyses to test these hypotheses, to assess how well these constructs explain physician rates of providing sigmoidoscopy, and to determine whether other characteristics improve the model constructs' explanation of sigmoidoscopy provision. Attitude and Facilitating Conditions were entered on the first step of the hierarchical regression, followed by Reinforcing Conditions and the Attitude-Facilitating Conditions interaction on the second step. Other physician and practice background characteristics were included in a stepwise third step to assess whether the model components are sufficient to explain sigmoidoscopy rate.

The model-testing analyses provide information about global constructs for the focus of possible interventions to increase screening rates. To identify more specific targets for interventions, we computed the correlations between physician sigmoidoscopy rate and the specific items making up the Attitude and Facilitating Condition scores.

Results

Descriptive Statistics. Most of the physicians who participated in the study were male (93%), residency trained (72%), and certified by the American Board of Family Practice (95%). Most were in solo (33%) or single specialty group (42%) practices. The mean age was 45.3, and mean time practicing medicine was 15.8 years. On average, they spent 34.8 h/week providing direct patient care to 104 patients per week. Physician sigmoidoscopy provision rates ranged from 13 to 69%, with a mean of 30% (SD, 15%).

Table 1 Correlations of Physician Attitude and Facilitating Condition Items with Sigmoidoscopy Provision Rates

Model construct items	Correlation
Physician attitude items	
Detect masses and polyps I cannot feel	0.21
Find cancer at early stage	0.21
Good income generator for my practice	0.24[a]
Time-consuming and expensive for me	−0.45[b]
Distasteful for me	−0.35[b]
Expose patients to significant risk of complications	−0.44[b]
Decline in mortality from cancer	0.38[b]
Expensive for my patients	−0.11
Physically uncomfortable for patients	0.00
Low patient compliance	−0.11
Require substantial nurse time	−0.15
Effort convincing patients to have it	−0.14
Facilitating condition items	
Medical school or residency training	−0.06
Postresidency training	0.35[b]
Office reminder for sigmoidoscopy	0.40[b]
Physician proficiency	0.43[b]
Clinic has flex sigmoidoscope	0.50[b]
Staff trained to assist	0.24[a]
Clinic room available	0.31[b]

[a] Significant, $P < 0.05$.
[b] Significant, $P < 0.01$.

Application of Model to Explain Sigmoidoscopy Rates. Both Physician Attitude and Facilitating Conditions obtained highly significant correlations with screening rate ($r = 0.48$ and 0.53, respectively). Only one of the reinforcing conditions, "having found colorectal cancer with the sigmoidoscopy test," was significantly correlated with screening rate ($r = 0.32$). This measure was also significantly correlated with physician attitude ($r = 0.31$), supporting the hypothesis that this experience may impact physicians' provision of the sigmoidoscopy test via their attitude.

In the hierarchical regression analysis, Physician Attitude and Facilitating Conditions, entered on the first step, each obtained significant regression weights and resulted in a significant multiple correlation of $R = 0.61$. On the second step the reinforcing condition of "having ever found cancer with sigmoidoscopy" was not significant, whereas the interaction between Physician Attitude and Facilitating Conditions obtained a significant β weight and increased the multiple correlation to $R = 0.72$. Finally, stepwise entry of physician and practice characteristics on the third step found only size of the community in which the physician practiced entered the equation with a significant regression weight, increasing the multiple correlation to $R = 0.74$.

Identification of Items that Explain Sigmoidoscopy Rates. Table 1 presents the correlations between the Attitude and Facilitating Condition items and physician sigmoidoscopy provision rate. Five beliefs were significantly correlated with sigmoidoscopy rate. Physician beliefs that sigmoidoscopy is time consuming and expensive, is distasteful to the physician, and would expose patients to risk of complications were significantly negatively correlated with rates of providing the test. Beliefs that sigmoidoscopy would be a good income generator and would lead to a decline in colorectal cancer mortality were significantly positively correlated with provision rates. Beliefs that sigmoidoscopy will detect polyps that the physician cannot feel and will find cancer at an early stage obtained nearly significant positive correlations with rates of providing sig-

moidoscopy. Five beliefs had low and nonsignificant correlations with screening rates. These are concerned with expense for the patient, patient discomfort, low patient compliance, effort needed to convince the patient to have the test done, and need for a nurse's time to help with the test.

Six of the seven facilitating condition measures were significantly correlated with physician rates of providing flexible sigmoidoscopy. Physicians had higher sigmoidoscopy rates if they had postresidency sigmoidoscopy training, had office reminder systems, felt comfortable with their sigmoidoscopy proficiency, worked in a clinic with a sigmoidoscope, had staff who were trained to assist with sigmoidoscopy, and had a clinic room available for performing the test. Medical school or residency training in sigmoidoscopy was not correlated with sigmoidoscopy rates.

Discussion

The application of behavioral theory to this research provided a framework for identifying constructs that potentially explain physician screening rates, measurement of those constructs, and specification of hypotheses to test. Additionally, it guided the analyses we conducted to identify specific factors that best explain provision of flexible sigmoidoscopy testing for colorectal cancer.

The hypotheses generated from application of the behavioral model were supported by our findings. All three constructs in the model, Physician Attitude, Facilitating Conditions, and Reinforcing Conditions, were found to be important in explaining sigmoidoscopy provision rates. Physician Attitude, based on beliefs about sigmoidoscopy, and Facilitating Conditions were found to be directly associated with physician screening behavior. The hierarchical regression findings indicate that Reinforcing Conditions, such as having detected cancer with sigmoidoscopy, affect the physician's attitude and thereby indirectly explain physician behavior.

The hierarchical regression analysis also found that Physician Attitude and Facilitating Conditions interact to explain physician rates of providing sigmoidoscopy. That is, the effect of physician attitude is greater in the presence of conditions that facilitate the physician's ability to provide the sigmoidoscopy test. Conversely, the impact of physician attitude on sigmoidoscopy provision is smaller when there are fewer conditions present that facilitate carrying through with provision of the test. This finding has important implications for intervention development. It demonstrates the need to pay attention to physician beliefs that make up attitude, simultaneously with facilitating conditions, when designing interventions, because the effect of changing one factor will be dependent on the level of the other factor.

With the exception of community size, other physician and practice background characteristics were found to provide no improvement in explaining sigmoidoscopy rate, beyond what is explained by Physician Attitude and Facilitating Conditions. This provides further support for the sufficiency of the model to explain sigmoidoscopy provision, the idea that attitude and facilitating conditions directly influence provision of this service, and that other characteristics influence sigmoidoscopy provision indirectly, through these factors. Community size had a small but significant effect in increasing the multiple correlation. Possibly it is not simply community size but the greater availability of sigmoidoscopy resources and equipment in larger communities that was associated with sigmoidoscopy rates. Thus, community size may simply reflect another facilitating condition that makes it easier to provide the test in larger communities. This is something that could be assessed in further research.

Our analyses identified very specific beliefs and facilitating conditions that might be targeted by interventions designed to increase sigmoidoscopy rates. These findings suggest that we can increase physicians' positive attitudes (*i.e.,* motivation) toward providing the test by developing intervention messages that will: (*a*) increase their beliefs that sigmoidoscopy will reduce cancer mortality, increase income for their practice, detect masses that cannot be felt, and find cancer at an early stage; and (*b*) decrease their beliefs that sigmoidoscopy is time consuming and expensive for them, will be distasteful for them, and exposes patients to risks of complication. Facilitating conditions can be improved by developing programs to provide sigmoidoscopy training and increase physician proficiency, develop strategies to implement office reminder systems, train staff, and make a room and sigmoidoscope available to primary care physicians. Our findings suggest that development of an intervention to target these beliefs and facilitating factors should increase sigmoidoscopy provision rates among family physicians. This study also identified beliefs and facilitating conditions that are not worth targeting in interventions because they had low correlations with behavior.

There are three important limitations to this study: (*a*) it was conducted in Washington State with family physicians. Thus, the findings may not reflect the opinions and practices of other types of physicians or of physicians practicing in other regions of the United States; (*b*) the data were collected 10 years ago, prior to recent changes in colorectal cancer screening guidelines by the USPSTF. However, most major organizations that primary care physicians pay attention to, including the ACS and National Cancer Institute, had recommended screening flexible sigmoidoscopy since the early 1980s. AHCPR and the USPSTF more recently modified their guidelines to support the ACS and National Cancer Institute sigmoidoscopy recommendations. Thus, although it would be useful to obtain more current opinions from a broader population of primary care physicians in the United States, there is no reason to expect that the factors found in this study to be correlated with sigmoidoscopy provision would have changed as a result of any recent shifts in physician opinions or practice; and (*c*) the study design was retrospective and cross-sectional, so it might be argued that physician performance rates determine physician attitude, rather than the reverse. If this were the case, it would be necessary for the clinician to be aware of his/her performance rate and to report beliefs/attitude to be congruent with this rate. However, other analyses found these physicians were very poor at estimating their rates of providing cancer screening tests (21). Thus, it is reasonable to conclude that the model constructs are predictive of physician behavior and should be targeted by interventions.

In conclusion, these findings provide strong support for application of a theory-driven approach to understanding physician provision of a cancer screening test. Physician Attitude based on beliefs about sigmoidoscopy and Facilitating Conditions were strongly associated with physicians' rates of providing the test. The significant interaction between attitude and facilitating conditions provides support for the hypothesis that these two factors have a multiplicative effect on provider behavior; therefore, interventions targeting these constructs need to be carefully designed. Finally, our study findings provide important information about the specific beliefs and facilitators to target in designing effective interventions to increase the provision of flexible sigmoidoscopy testing in primary care.

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