

Dunn, Michael A., Understanding the Psychosocial Factors of Communication that Underlie Colorectal Cancer-Screening Adherence. Master of Science (Primary Care Clinical Research), August, 2009, 137 pp., 11 tables, 5 figures, references, 136 titles.

This pilot study was the first to utilize the Interpersonal Processes of Care (IPC) instrument to investigate physician/patient communication and the extent to which it impacts a patient's adherence to the recommendation to obtain a colorectal cancer screening test. A total of 45 individuals participated in this cross-sectional study. Potential participants (50 years of age or older in 2007) were recruited from the billing records of the University of North Texas Health Science Center/Department of Family Medicine. All potential participants had been seen by their primary care physician for a preventative visit in 2007. While no IPC factor was found to be significantly associated with adherence, one IPC factor, hurried communication, trended towards significance (*p-value* 0.055) when combined in a predictive model that also measured a subject's level of social support and number of persons that lived with them.

UNDERSTANDING THE PSYCHOSOCIAL FACTORS OF COMMUNICATION
THAT UNDERLIE COLORECTAL CANCER-SCREENING ADHERENCE

THESIS

Presented to the Graduate Council of the
Graduate School of Biomedical Sciences

University of North Texas
Health Science Center at Fort Worth

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

By

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Fort Worth, Texas

August 2009

ACKNOWLEDGEMENTS

Many individuals were involved in the successful completion of this study. Dr Cardarelli not only acted as Principal Investigator for this project, but showed great leadership in transforming the Primary Care Clinical Research Fellowship during my four years as a medical student and Pre-doctoral fellow. I was the accidental beneficiary of entering the fellowship at the same time that he assumed responsibility for it. As a result, I have the unique privilege of being the first to advance through the fellowship as he originally envisioned it and under its revised curriculum, tailored to the needs of the clinical researcher.

I would like to thank my Graduate Committee for their support and assistance in overseeing this study: Drs Cardarelli, Fulda, Lurie, and Berg. Their understanding, flexibility, and assistance as I tried to balance the demands of both medical student and graduate student are very much appreciated. The staff of the Primary Care Research Institute was also of great assistance in completing this study. Of particular note were the spirited and cheerful assistance of Dr. Anna Espinoza and Lee Ann Cunningham.

Most importantly, I would like to thank my wife, Avegiyel. Thank you for your love, understanding, and sacrifice as I completed this project. I could not have finished it without your love and support. It is for you that I dedicate this project and thesis.

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CHAPTER I

INTRODUCTION

Beneficial patient outcomes are the intent of medical practice. These positive outcomes depend upon the application of an appropriate care regimen as well as cooperation by the patient to follow prescribed recommendations [1]. The patient's contribution to his/her beneficial outcome is often overlooked, as more emphasis is placed on developing better modes of treatment [2]. However, if a patient is unresponsive in implementing the recommendations of his/her physician, then even the most beneficial advice will not accomplish its intended goal: a positive outcome [3].

Patients may be unresponsive for a number of reasons. They may be unable to obtain the prescribed medications, misunderstand what was relayed to them by the physician, forget instructions, or be unable or unwilling to respond for any number of other reasons [4].

New tools and methods must be developed to relieve this burden, increase patient responsiveness, and obtain beneficial outcomes [1,3-11]. However, before new tools and methods can be developed, an understanding of the underlying elements that affect adherence must first be acquired. This study attempts to advance this understanding by examining whether physician-patient interpersonal factors of communication [12] are associated with a patient's adherence to the recommendation for obtaining a colorectal cancer screen by their physician. It is anticipated that the results of this study will

advance the collective knowledgebase and, thereby, assist efforts to improve patient outcomes, contribute to the understanding of barriers to adherence, and aid in the development of future strategies to overcome these barriers. Towards this end, the **aim of the study** is as follows:

To determine if an association exists between interpersonal factors of patient/physician communication and adherence to colorectal cancer screening recommendations. Specific interpersonal factors of communication to be investigated include [12]:

Communication Domain

- 1) Hurried communication*
- 2) Elicited concerns, responded*
- 3) Explained results/medications*

Decision-Making Domain

- 4) Patient-centered decision making*

Interpersonal-Style Domain

- 5) Compassionate, respectful*
- 6) Discriminated*
- 7) Disrespectful office staff*

It is hypothesized that an association exists between interpersonal factors of physician/patient communication and adherence to colorectal cancer screening recommendations. Specifically, the seven interpersonal factors of communication [12] are hypothesized to have the following associations:

- 1. A negative association exists between hurried communication and adherence to colorectal cancer screening recommendations.**
- 2. A positive association exists between eliciting patient concerns/ responding to concerns and adherence to colorectal cancer screening recommendations.**
- 3. A positive association exists between explaining results/medications and adherence to colorectal cancer screening recommendations.**
- 4. A positive association exists between patient-centered decision making and adherence to colorectal cancer screening recommendations.**
- 5. A positive association exists between conveying a compassionate, respectful style and adherence to colorectal cancer screening recommendations.**
- 6. A negative association exists between conveying a discriminatory style and adherence to colorectal cancer screening recommendations.**
- 7. A negative association exists between having a disrespectful office staff and adherence to colorectal cancer screening recommendations.**

Significance

Cancer is the second leading cause of death in the United States and contributes one out of every four deaths in the overall population every year [13]. Colorectal cancer is the third leading cause of death by cancer and the third most commonly diagnosed cancer within the US population [14], but it has a high degree of preventability if precancerous lesions are identified and removed early [15]. In fact, it has a 5-year survival rate of 90% with early detection, and timely screening for colorectal cancer has been shown to be highly effective in reducing mortality [15]. Therefore, timely screening for colorectal cancer is essential to lowering morbidity and mortality rates [15,16]. For this reason, the American College of Gastroenterology (ACG), the American Cancer Society (ACS), and the United States Preventive Services Task Force (USPSTF) all strongly recommend screening men and women 50 years of age or older for colorectal cancer [16,17,18]. However, the effectiveness of CRC screening relies upon a partnership between the physician and patient to follow-through with the screening procedure once recommended.

Evidence demonstrating patient adherence to physician recommendations is not very promising, so new methods that rectify this situation are needed in order to improve patient outcomes. Research has shown that only 1/3 of the US population follows the medication recommendations of their physician [1] and that the cost of non-adherence is high [4]: 125,000 deaths a year [19], 23% of nursing-home admissions at a cost of \$31.3 billion [20], and 10% of hospital admissions at a cost of \$15.2 billion [21] have been attributed to non-adherence to physician recommendations. In 2008 only 50% of

individuals 50 years of age or older had ever been screened for colorectal cancer, even though an estimated 60% of deaths from colorectal cancer could be prevented if everyone were screened as recommended per guidelines [15].

It is widely acknowledged that new tools and methods must be developed to relieve the patient's burden, increase patient responsiveness, and ultimately obtain beneficial patient outcomes [1,3-11]. However, before new tools and methods can be developed, an understanding of the underlying factors that affect adherence must first be made.

Studies continue to investigate potential associations between demographic, socioeconomic, and patient-satisfaction factors and their potential impact on the health-behavior patterns of patients [22]. The number of such investigations has accelerated over the last several years as awareness of large disparities in health between groups within the United States has increased [23]. A number of studies have shown increased adherence to specific drug regimes for certain ailments when various communication channels and instruments are provided to patients [7,24,25], but few studies have investigated which, if any, factors of physician/patient communication impact patient adherence. Furthermore, no known study has investigated these interpersonal factors of communication and their impact on a patient's adherence to the recommendation for obtaining a colorectal cancer screen by their physician.

It is acknowledged that a subset of studies has investigated some of the factors that influence a patient's desire, decision, and ability to obtain screening for colorectal cancer once recommended by their physician. For example, one study explored the

impact of physician influence upon patient adherence to colorectal cancer screening recommendations and found an association [26]. Likewise, two studies have investigated the impact of physician-patient communication on adherence to colorectal cancer screening recommendations and have demonstrated evidence of an association [27,28]. However, these studies included surveys that broadly measured patient satisfaction of physician communication but did not delve into the specifics of what occurred during the doctor's appointment. Due to this limitation, these surveys cannot measure interpersonal factors of communication and how they may impact adherence to recommendations.

Due to the limited scope of prior studies and the importance of adherence on the effective treatment of patients, it is widely acknowledged that new tools and methods must be developed to increase patient responsiveness [1,3-11]. These new tools and methods can only be effectively developed when the underlying elements that affect patient adherence are understood. Interpersonal factors of communication may be elements that significantly impact patient adherence.

This study will measure adherence to screening recommendations as the outcome and evaluate whether physician-patient interpersonal factors of communication are associated with a patient's adherence to their physician's recommendation for obtaining a colorectal cancer screen. It is anticipated that the results of this study will advance the collective knowledgebase regarding adherence and colorectal screening efforts. This added knowledge will assist other efforts that aim to improve patient outcomes, contribute to the understanding of barriers to adherence, and aid in the development of future strategies to overcome these barriers.

CHAPTER II

BACKGROUND

In 2008, an estimated 148,810 persons in the United States were diagnosed with colorectal cancer (CRC) and approximately 49,960 died from this disease [14]. CRC accounts for fully 10% of all new cancer deaths in the US and is the third leading cause of cancer-related mortality [14]. Survivability from CRC depends upon its stage at detection and has a 5-year survival rate of 90% with early detection [15]. Therefore, obtaining periodic CRC screening exams can significantly reduced morbidity and mortality.

Due to the prevalence of CRC, its relative ease of detection, relatively low complication rate secondary to screening procedures, and high survivability rate with early detection, several medical organizations have published guidelines for CRC screening [16-18]. Although there are minor differences between the guidelines for higher-risk patients, they are all in agreement that screening should begin at age 50 for an average-risk patient (i.e., no symptoms, no inflammatory bowel disease, nor family history of CRC). The American College of Gastroenterology (ACG), the American Cancer Society (ACS), and the United States Preventive Services Task Force (USPSTF) all recommend an annual fecal occult blood test (FOBT) with flexible sigmoidoscopy (FS) every five years, or colonoscopy every 10 years, or double-contrast barium enema (DCBE) every 5-10 years (see Table 1). The FOBT is a non-invasive test that detects

blood in stool samples of the patient. Both the flexible sigmoidoscopy and colonoscopy are invasive tests where a tube with a camera on its tip is inserted into the rectum to visualize the sigmoid portion of the colon or entire colon, respectively. Either technique allows removal of polyps and acquisition of biopsies during visualization. During a double-contrast barium enema, X-ray images of the colon are taken while the colon is filled with barium and air.

Table 1. Colorectal Cancer Guidelines for Average-risk Patients

Annual fecal occult blood test with flexible sigmoidoscopy every 5 years
<i>or</i>
Colonoscopy every 10 years
<i>or</i>
Double-contrast barium enema every 5-10 years

- 1) Average risk: all persons ≥ 50 years of age and who are not in the moderate- or high-risk categories.
- 2) Moderate-/ high-risk patients have more frequent intervals of screening and/or age to begin screening.
- 3) Moderate risk: personal/family history of adenomatous polyps or colorectal cancer.
- 4) High risk: patients with inflammatory bowel disease, or family history of familial adenomatous polyposis or hereditary non-polypoid colon cancer.

An estimated 60% of deaths from CRC could be prevented if everyone over the age of 50 was screened per recommended guidelines [15]. However, the 2001 Behavioral Risk Factor Surveillance System (BRFSS) reported screening rates of only 23.5% for FOBT within 12 months and 43.4% for lower endoscopy (i.e., either colonoscopy or flexible sigmoidoscopy) within 10 years [29]. Additionally, the Centers for Disease

Control and Prevention reported in 2008 that no more than 50% of the US population had *ever* been screened for CRC regardless of whether they are current for their recommended screening interval [15]. Furthermore, in addition to CRC screening rates lagging behind those for breast and cervical cancer [15], CRC disparities also exist: African-Americans suffer a 15-percent higher incidence of CRC and a 40-percent higher mortality from CRC than Caucasians in the United States [30-35].

Given the low CRC screening rates, prevalence of CRC morbidity and mortality, its preventability if detected early, and existing health disparities, ways to increase adherence to recommended guidelines will make a significant impact on the lives of many people and the over-burdened US healthcare system. In fact, patient adherence has been found to be one of the factors that significantly affects the incremental cost-effectiveness of one CRC screening test over another [36-40]. Therefore, investigating methods that result in increased adherence to guidelines is a win-win situation benefiting both the individual and the health care system at-large.

Factors Impacting Adherence

There have been numerous studies over the last three decades which have investigated various factors that may be significantly associated with adherence to colorectal cancer screening (CRCS) recommendations [41]. Eight broad categories of factors have been studied for association with patient adherence, including investigations into the impact of the physician's decision to recommend a CRC screen (see Figure 1). Six other categories of factors have been studied for associations with the physician's

decision to recommend CRC screening for a patient, including investigations into the association of patient adherence upon the physician’s decision to recommend CRC screening. As illustrated in Figure 1, patient adherence is potentially affected by a wide spectrum of factors, and the physician and patient are intricately coupled together and influence each other’s decision process, which ultimately affects the patient’s CRC screening status. It has been, and remains, the objective of clinical research related to CRC screening adherence to uncouple the numerous factors to determine which significantly impacts adherence. With this knowledge, new and effective techniques can be developed to increase screening rates, decrease morbidity, and save lives.

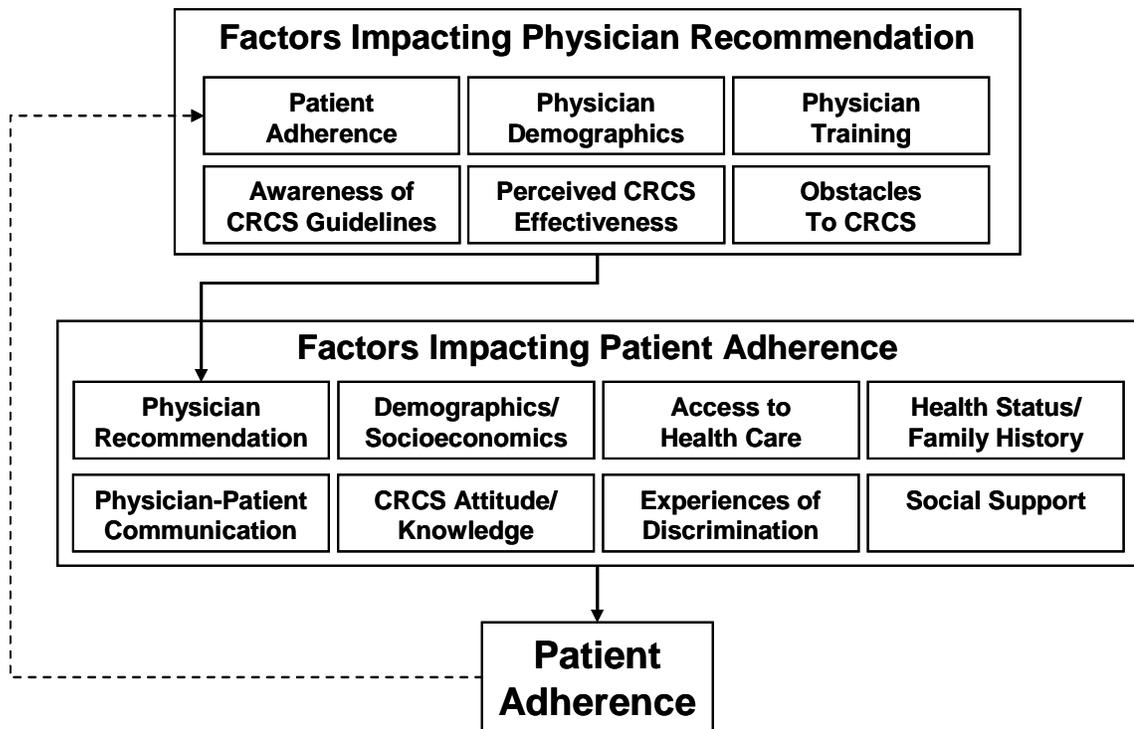


Figure 1. Factors Impacting CRC Screening Adherence

Subramanian, et al. published an evaluation of peer-reviewed articles pertaining to adherence to CRC screening guidelines [41]. Their article was published in the journal *Preventive Medicine* in 2004 and reviewed US studies involving individuals at average-risk for CRC. Their study provides the framework for the following discussion regarding factors associated with CRC screening adherence. Their synopsis is further strengthened by inclusion of US studies that have been published since the time of their extensive evaluation, particularly ones that have significant findings and extend their original review.

Factors Impacting Patient Adherence

Demographics/Socioeconomics

Age was found to be a significant factor associated with adherence in all but two studies [42,43], with older individuals more adherent than younger ones [44-50]. Two studies demonstrated a binomial distribution of adherence by age with a peak at 75 years of age [42,43]. Those less than 65 or more than 85 years of age demonstrated the lowest adherence. Therefore, Subramanian et al. [41] speculated that the two studies that did not find age to be a significant factor of adherence [42,43] may have been due to an improper modeling scheme. Age may have been modeled with a linear assumption when it may actually possess non-linear behavior.

Although not as consistent a factor as age across the studies, higher education was significantly associated with adherence in the majority of studies [28,36,42,44,45,49,51,

52]. Also, in one study which reported that education was insignificant, college-degreed males were more likely to have been screened than less educated ones [53].

Subramanian et al. found that income was not consistently associated with adherence to CRC screening recommendations [41]. Although several studies did report that higher income levels were significantly associated with higher rates of adherence [45,51,52,54]. They also found that in general gender, race, and marital status had insignificant associations with adherence once multiple regression analysis was performed [41].

Access to health care

Individuals who have a usual source of health care are significantly more likely to be adherent to CRC screening recommendations than those without one [42,45,55]. Breen et al. [42] found that individuals with a usual source of care were more than 3 times as likely to be adherent, utilizing data from the 1987, 1992, and 1998 National Health Interview Surveys. Cardarelli et al. found similar results utilizing the 2004 Behavioral Risk Factor Surveillance System data [55]. They reported that having at least one personal health care provider significantly predicted up-to-date CRC screening: Adjusted OR =2.91, 95% CI 2.58-3.28 [55]. Self-reported data of men and women aged 50 years and older (controlled for age, gender, race/ethnicity, education, income, and health insurance status) were used in their analysis.

Investigating adherence to FOBT screening from a different approach, Morrow et al. found that non-adherent individuals were significantly less likely to have a family

physician [43]. Several other studies have reported that individuals who have regular doctor visits have significantly better adherence to CRC screening recommendations than those who do not [56-58].

Studies that have investigated an association between medical insurance/HMO participation and adherence to CRC screening recommendations show it to be predictive of adherence [28,42,44,45,51,53,58,59]. No significant difference in CRC screening adherence between managed care and fee-for-service plans was found in the few number of studies that have investigated such a relationship [58,60].

Health Status/Family History

Studies consistently report that family history of colorectal cancer is significantly associated with adherence to CRC screening [45,46,50,51,53,54,61,62]. One study found that individuals with colorectal cancer in their family were twice as likely to be up-to-date with CRC screening guidelines compared to those without a history [53]. And a couple of studies have shown that individuals with a family history of screening for other types of cancer to be more adherent to CRC screening guidelines as well [51,63].

The presence or absence of chronic conditions in individuals has not been shown to be consistently associated with adherence to CRC screening guidelines [41]. Although a few studies have reported higher adherence in those individuals with poor health status [44,45].

Lastly, smoking (which is sometimes used as a negative indicator of an individual's willingness to engage in preventive health behavior) is not consistently

significant among studies [41]. However, some studies reported that smokers were less likely to be adherent to CRC screening guidelines [44,50,51].

Physician Recommendation

Studies that have investigated adherence to a physician's recommendation to obtain a CRC screen consistently demonstrate a strong association [28,46,54,58,63-73]. For example, Zapka et al. reported that individuals were 12 times more likely to adhere with screening guidelines when clinicians recommended that they undergo a flexible sigmoidoscopy procedure [58]. Likewise, the study by Mandelson et al. demonstrated that women were 18 times more adherent to CRC screening guidelines when their physician recommended that they undergo screening with a FOBT [70]. And Leard et al reported adherence to physician recommendations to be above 80% for all CRC screening tests [74]. Certainly, a physician's recommendation is a major factor in a patient's adherence to CRC screening guidelines.

Physician-Patient Communication

Katz et al. investigated the relationship between the general quality of self-rated patient-provider communication and adherence to CRC screening recommendations utilizing a convenience sample of African-American church members [27]. Their study assessed adherence to FOBT, flexible sigmoidoscopy, and colonoscopy among participants. Patient-provider communication was quantified utilizing a three-item

questionnaire (Cronbach α of 0.74) which asked (Responses included: Always, Almost always, Sometimes, Rarely, Never):

- 1) 'I receive enough understandable information from my doctor/healthcare provider to make good decisions about my health.'
- 2) 'My doctor/healthcare provider involves me in decisions about my health care treatment.'
- 3) 'My doctor/healthcare provider understands my health needs.'

They found individuals that rated their patient-provider communication as 'good' to be predictive of adherence to CRC screening recommendations when compared to those that rated their communication as 'poor': Adjusted OR=1.95, 95% CI 1.29 – 2.94. However, CRC screening rates remained low for both groups, with the 'good' communication group at 36% adherent and the poor communication group at 17% adherent to CRC screening recommendations.

As part of an investigation of the adherence of low-income woman to cancer screening recommendations involving breast, cervical, and colorectal cancer, O'Malley et al. included variables to measure the possible impact of the patient-provider relationship [28]. They limited their investigation to screening tests involving Pap smears, clinical breast exams, mammography, and FOBT. Additionally, they investigated three main components of the patient-provider relationship (communication, compassion, and trust) and found compassion to be predictive of adherence to FOBT for women < 65 years of age: Adjusted OR=2.91, 95% CI 1.10 - 7.78. They, however, did not find the same result for women \geq 65 years of age.

O'Malley et al. adapted the Primary Care Assessment Survey to develop their questionnaire [28,75]. To measure compassion they asked individuals the following three questions (Responses included: Poor, Fair, Good, Excellent):

- 1) 'How would you rate the doctor's patience with your questions or worries?'
- 2) 'How would you rate the doctors caring and concern for you?'
- 3) 'How would you rate your doctor's respect for you?'

For communication, their questionnaire asked 'How would you rate the doctor's explanations of health problems or treatment (Responses included: Poor, Fair, Good, Excellent)'. For trust they inquired 'All things considered, how much do you trust your doctor? (Scale of 0-10 where 0 is "Not at all" and 10 is "Completely.")'.

As part of an investigation of the adherence of low-income African-Americans to CRC screening guidelines for FOBT and flexible sigmoidoscopy, Lawsin et al. included variables to measure the possible impact of physician influence [26]. Physician influence was assessed utilizing 17 items (not specified in the article) [46,48]. Although greater physician influence demonstrated a significant association with adherence to CRC screening guidelines (p-value<0.05) in univariate analysis, it became non-significant in the multivariate regression analysis.

Subramanian et al. concluded their review of studies involving adherence to CRC cancer guidelines by stating that "[p]hysician-patient relationship and trust issues are key factors to successfully implement colorectal cancer screening and more studies on this relationship are required" [41]. They also reported that physician-patient education does not always have a positive impact on patient adherence, even though patients may have

misconceptions about the benefits of CRC screening and/or lack of knowledge regarding screening procedures that may act as barriers to adherence [41]. Studies have shown that education programs have small or no impact on CRC screening rates [76-82]. This result is not specific to CRC screening. Other interventions that attempt to change individual behaviors in order to reduce risk factors, such as smoking, have also not been very successful [83-85].

Stewart et al. developed and validated the Interpersonal Processes of Care (IPC) instrument to measure the social-psychological aspects of the physician-patient relationship [12]. The underlying premise for the creation and use of this instrument is that the relationship between physician and patient is dynamic. Each person affects the other's behavior and actions, such that a patient's ultimate actions are based in part by the dynamic interaction of physician and patient. When physicians empower patients by sharing information and empathizing with them, patients gain knowledge and become more motivated and capable of managing their own health. This empowerment leads to better outcomes for the patient. However, physicians who do not relinquish the burden of decision making, or stay unaware of/insensitive to a patient's cultural beliefs and preferences, may ultimately disincentivize or alienate a patient to an extent that they become less willing to follow the physician's guidance. This alienation leads to worse outcomes for the patient.

The IPC instrument was created with the intention to overcome the limitation of existing surveys that broadly measure satisfaction of physician-patient communication but do not delve into the specifics of what occurred during the doctor's appointment. For

example, instead of focusing on how satisfied an individual was with their doctor's communication, it inquires about "How often the doctor spoke too fast" or "How often the doctor explained your test results". The IPC instrument consists of 29 questions arranged into 3 domains, 7 2nd order factors, and 10 1st order factors. The 'Communication' domain consists of three 2nd order factors: 'hurried communication', 'elicited concerns, responded', and 'explained results/medications'. The 'Decision Making' domain consists of the 'patient-centered decision making' 2nd order factor. The 'Interpersonal Style' domain consists of the three 2nd order factors: 'compassionate, respectful', 'discriminated', and 'disrespectful office staff'. The IPC instrument was validated in a sample of racially/ethnically diverse individuals of low socioeconomic status. Reliability coefficients for all domains were > 0.70 [12].

CRC Knowledge/Attitude

Both inadequate knowledge of and negative attitudes toward colorectal cancer and screening are consistently shown in studies to be barriers to screening. Lack of CRC knowledge has been shown to be associated with both inadequate perceptions of cancer risk and low adherence [45,86-89]. Individuals demonstrating positive attitudes toward CRC screening and possessing an understanding that screening is beneficial were reported to be more adherent [45,46,48,51,53,90]. Similarly, those who understand CRC to be preventable and curable and who possess a positive perception of screening also demonstrated better adherence [44-46,48,62,90]. On the other hand, fear of cancer and pessimism are reported to be barriers to screening [44,45,91,92]. The percentage of

patients reporting fear of finding cancer as the reason for not adhering to CRC screening recommendations is as high as 70% [41]. Powe et al. investigated the impact of fatalism on adherence among elderly African Americans and discovered that it was the most important factor in non-adherence [62]. Powe defined fatalism as the belief that death is inevitable when cancer is present. This finding may partially explain the high rate of CRC screening non-adherence in African Americans and, subsequently, their increased morbidity and mortality from CRC.

Studies reveal that patients have preferences for specific CRC screening tests [41] and this preference may affect their adherence to guidelines when their physician recommends one type of test over another. If the physician's recommendation is in agreement with the patient's preference, it may reinforce a desire for screening. On the other hand, if the recommendation is at odds with the patient's preference, the patient may tend to ignore the advice, thereby reducing their adherence to the consternation of the recommending physician.

A study by Leard et al. of individuals aged 50-75 years found that 31% preferred FOBT, 14% preferred DCBE, 13% preferred flexible sigmoidoscopy, and 38% preferred colonoscopy [93]. Another study by Ling et al. reported that 43% would choose FOBT and 40% colonoscopy if given the option [94]. Additionally, 62% of patients for whom accuracy was most important stated colonoscopy as their test of choice, while 76% of patients for whom invasiveness was an important factor selected FOBT. Patient's preference for a particular CRC screening test is also influenced by economic

considerations, as well. A study by Pignone et al. reported that patient's preferences were strongly sensitive to out-of-pocket expenses [95].

Two studies have reported on brief instruments to measure beliefs and attitudes [96] and knowledge and attitudes [97] of CRC screening. The instrument developed and studied by Vernon et al. was conducted using predominately employed, white men [96] and has not been evaluated among other populations [97]; for example, persons of lower socioeconomic status or groups with higher percentages of minorities. These other populations have been found to have higher rates of non-adherence and, therefore, experience greater rates of morbidity and mortality [98-101].

Wolf et al. expanded upon the work of Vernon et al. through the development of a brief instrument to assess the attitude and knowledge of veterans of the VA health care system to CRC screening [97]. Veterans of the VA health care system are predominately low income and about half are African American [97]. Wolf et al. reported that 41.1% of their participants were African American, only 22% had completed college, average reading ability was at the eight grade level (with 36% possessing reading skills below that of eight grade), and 69% were unemployed or retired.

Wolf et al. followed individuals over a twelve-month period and compared their responses to the attitude and knowledge survey at the beginning of the study to their responses at the end of the study. The change in attitudes and knowledge were then compared to whether the individuals obtained either a FOBT or flexible sigmoidoscopy during the twelve-month follow-up period. Wolf et al. reported that their 4-question attitude and 3-question knowledge survey obtained a Cronbach α of 0.73 and 0.59,

respectively. They concluded that their survey may be a useful tool for measuring the effect of interventions designed to improve CRC screening through improved patient knowledge and attitudes. Their survey may eventually be considered for use as a screening assessment to identify those individuals who are at greatest risk for not being adherent to CRC screening guidelines [97].

Experiences of Discrimination

A review of studies addressing adherence to CRC screening found none that investigated the affect of discrimination or the perception of discrimination upon adherence. As previously stated, disparities in colorectal cancer exist in the United States: African Americans suffer a 15-percent higher incidence of CRC and a 40-percent higher mortality from CRC than Caucasians [30-35]. These disparities have been attributed [26] to various causes, including lower participation in CRC screening [102,103], detection of cancer at later stages [104], and post-diagnostic factors (e.g., access to care/treatment) [102].

African Americans participate in endoscopy screening less often than Caucasians. The SEER review reported that 34.8% of African Americans versus 38.1% of Caucasians were diagnosed with CRC in its early stages, and 23.3% of African Americans versus 19% of Caucasians were diagnosed at the later, more severe, stages [104]. Even after controlling for age and stage of diagnosis, African Americans have lower survival rates than Caucasians (56% versus 64%) [105], suggesting that post-diagnostic factors increase

their health disparity [26]. Taken together, these findings support the need for additional understanding of the barriers to CRC screening in African Americans [26].

African Americans have reason to be suspicious of the health care system due to past abuses. Memories of the past may affect their trust of health professionals and how they access health services [106], thus increasing their inherent health disparities. The Tuskegee syphilis study serves as an example of such an abuse at the hands of physicians. Coupled with the recent memory of blatant racism in the United States, African Americans may approach their access to health services differently than others [106], resulting in current health disparities. The potential of discrimination to affect health care needs to be accounted for and studied as a part of any investigation of CRC screening involving minorities, especially African Americans.

The idea that racial discrimination adversely impacts health dates back to the 18th century; however, it has only been over the last couple of decades that valid and reliable measures of discrimination have been developed [106]. Krieger et al. developed and validated such an instrument for health research [106,107,108], which measures past discrimination as experienced by individuals. They refer to their model as the Experiences of Discrimination (EOD) model. The EOD model is a short, 11-item self-report instrument consisting of two scales: a 2-question Response to Unfair Treatment scale (Cronbach α of 0.45, retest reliability coefficient of 0.35), and a 9-question Discrimination scale (Cronbach α of 0.74, retest reliability coefficient of 0.70). The Response to Unfair Treatment scale asks individuals how they typically respond when treated unfairly (Responses included do you?: ‘keep it to yourself’ or ‘talk to other people

about it'; 'accept it as fact of life' or 'try to do something about it'). The Discrimination scale inquires about the number of times an individual has experienced discrimination, been prevented from doing something, or been hassled or made to feel inferior due to race, ethnicity, or color in nine different situations.

As mentioned in the previous section titled *Physician-Patient Communication*, the IPC survey measures discrimination, using a 'discriminated' 2nd order factor scale, as well as other social-psychological aspects of the physician-patient relationship [12]. The survey asks two questions regarding assumed socio-economic status: 'How often did doctors make assumptions about your level of education?' and 'How often did doctors make assumptions about your income?'. For discrimination due to race/ethnicity, the survey inquires: 'How often did doctors pay less attention to you because of race or ethnicity?' and 'How often did you feel discriminated against by doctors because of your race or ethnicity?'.

Social Support

Social support is defined by Kaplan et al. [109] as the commitment, caring, advice, and aid provided in personal relationships, the sense of being cared for and loved, esteemed and valued as a person, and part of a network of communication and obligation [110]. Since Wolf et al. noted that flexible sigmoidoscopy and colonoscopy procedures place a substantial burden on patients [97], those with strong social support networks may be better able to overcome barriers to screening than those without adequate support. Endoscopy procedures require repeat visits, extensive preparation, and significant time to

explain and engage patients in the process. Therefore, support given to a patient by his/her social circles would help overcome these potential barriers to CRC screening.

A review of the literature addressing adherence to CRC screening recommendations did not find any study that investigated the affect of social support. Several studies looked at factors that are associated with repeated screening [28,111-116] and some of these examined factors that contained elements of social support [28,114]. For example, having a relative or living with another person who is undergoing CRC screening was found to be associated with repeated adherence. These studies also reported that not remembering the time of scheduled screening tests or not having enough time for the procedure were the main reasons given for not adhering with flexible sigmoidoscopy recommendations.

Ross et al. validated a four-question survey to quantitatively measure social support [109]. Their survey measures emotional support, informal health support, and instrumental support (Cronbach α of 0.84). Individuals were asked their level of agreement to the following statements (Responses included: Strongly disagree, Disagree, Neutral/not sure, Agree, Strongly agree):

For emotional support:

- 1) 'I have someone I can turn to for support and understanding when things get rough.'
- 2) 'I have someone I can really talk to.'

For informal health support:

- 3) 'I have someone who would take care of me if I were sick.'

For instrumental support:

- 4) 'I have someone who would help me out with things, like give me a ride, watch the kids or house, or fix something.'

Factors Impacting Physician Recommendation

Patient Adherence

Low patient adherence has not been shown in studies to be a consistent barrier to physicians recommending CRC screening [41]. However, several studies have reported it to be a factor [117-120]. A study by Cooper et al. reported that poor patient acceptance of a physician's recommendation was the most common barrier for recommending screening via flexible sigmoidoscopy [118]. This barrier was indicated by 50% of responding primary care physicians in the study. In a separate study involving 10 states, Cooper et al. also found that primary care physicians reported the most common reason for failure to recommend CRC screening was poor patient acceptance [117].

Physician Demographics

Studies have not consistently reported that a physician's age or gender is significantly associated with CRC screening recommendations [41]. However, those that have reported such a finding found that male and younger physicians tend to recommend flexible sigmoidoscopy more often than female and older physicians. For example, a study by Lewis et al. reported that male physicians were more than twice as likely to recommend flexible sigmoidoscopy as female physicians [90]. They also reported that

younger physicians were more likely to recommend CRC screening tests. Additional studies have shown that physicians who graduated within the last 10 years were more likely to perform FOBT [121] and recent graduates were more likely to perform flexible sigmoidoscopy [122].

Physician Training

Studies show that a physician's specialty is significantly associated with providing a recommendation for CRC screening [41]. Family physicians and internists are more likely to recommend CRC screening than OB/GYNs [90,123], and physicians who are trained to perform flexible sigmoidoscopy are more likely to recommend and/or perform testing with sigmoidoscopy [118,122-125]. In a study by Rodney et al. [126], when flexible sigmoidoscopy training was offered to physicians in family practice, the percentage of CRC screening recommendations for flexible sigmoidoscopy increased by 8 times. This change was accompanied with a large increase in the number of flexible sigmoidoscopies performed [41].

Taken together, internists and family medicine physicians are more likely to recommend more invasive CRC screening methods (e.g., colonoscopy) than other specialties, such as surgeons [127]. However, gastroenterologists are more likely to recommend flexible sigmoidoscopy or colonoscopy for primary screening than primary care physicians [41]. Studies by Sharma et al. [128,129] report that 25% of gastroenterologists would recommend colonoscopy every 10 years compared with 2% of

primary care physicians. Conversely, 2% of gastroenterologists would recommend annual FOBT compared with 50% of primary care physicians.

Physician's Awareness of CRCS Guidelines

A review of studies that included an investigation into a possible association between awareness of CRC screening guidelines and adherence to recommendations indicate that it has a larger affect on flexible sigmoidoscopy than FOBT recommendations [41]. Awareness was found to be significantly associated to adherence [130] in one of two studies that investigated CRC screening recommendations for FOBT [122,130]. However, all three studies that investigated awareness to CRC screening guidelines for flexible sigmoidoscopy reported that it was significant [122,125,130].

Physician's Perception of CRCS Effectiveness

A review of studies that included an investigation into a possible association between perceived CRC screening effectiveness and adherence to recommendations indicate that it also has a larger affect on flexible sigmoidoscopy than FOBT recommendations [41]. Perceived effectiveness was not found to be significantly associated with adherence in any studies that investigated CRC screening recommendations for FOBT [122,130,131]. However, in four studies that investigated perceived effectiveness of CRC screening recommendations for flexible sigmoidoscopy [122,130-132], only one found that perceived effectiveness was not significant [130].

Obstacles to CRCs

The main barriers to CRC screening recommendations that physicians encounter are reported to be a low reimbursement rate [117,119,132] and a lack of available equipment to perform flexible sigmoidoscopy [118,122,132]. Both barriers are reported to have significant associations with adherence. Also, among the studies that investigated the impact of a lack of CRC screening efficacy data upon a physician's decision to recommend screening [122,130,131,133], three studies showed that it had a significant association [122,130,133]. Cost and lack of insurance are reported not to be associated with a physician's recommendation for CRC screening, nor is lack of time [41,122,130-133].

CHAPTER III

METHODS

Methods and Procedures

This pilot study utilized a cross-sectional study design with one subject encounter and two procedures – a self-administered survey and a medical chart review. The single encounter involved receipt of a 70-question passive-consent and self-administered survey that was mailed to all eligible participants. Along with the survey, eligible participants received a cover letter explaining the study, its intent, and potential benefits/risks and requesting their participation in it. The cover letter also stated that their participation was voluntary and that they provided indication of their consent by initialing the survey (see *Instruments C.2*, Question 1) and re-mailing the completed survey in the self-addressed, pre-paid envelope. Those who did not respond to the request were considered to have declined participation in the study. For those participants who returned an initialed survey, \$5.00 was mailed back to them as re-imbusement for their time and effort. The Institutional Review Board of the University of North Texas Health Science Center *at Fort Worth* granted their approval for this study on January 15, 2009.

Sample Size

It was anticipated that approximately 500 participants would be invited to enroll in this cross-sectional study, with a minimum goal of enrolling 50 participants. However,

after reviewing the billing records for potential subjects, only 382 participants were eligible to enroll after applying the study's inclusion/exclusion criteria. An original batch of 200 surveys was sent to a randomized subset of the 382 eligible participants with an expected response rate of 30%. After realizing a response rate of 12%, the remaining 182 eligible participants were also mailed surveys and asked to participate. The study's overall response rate was 11.8% with 45 subjects providing consent and returning surveys. Figure 2 provides an overview of the study's design and enrollment.

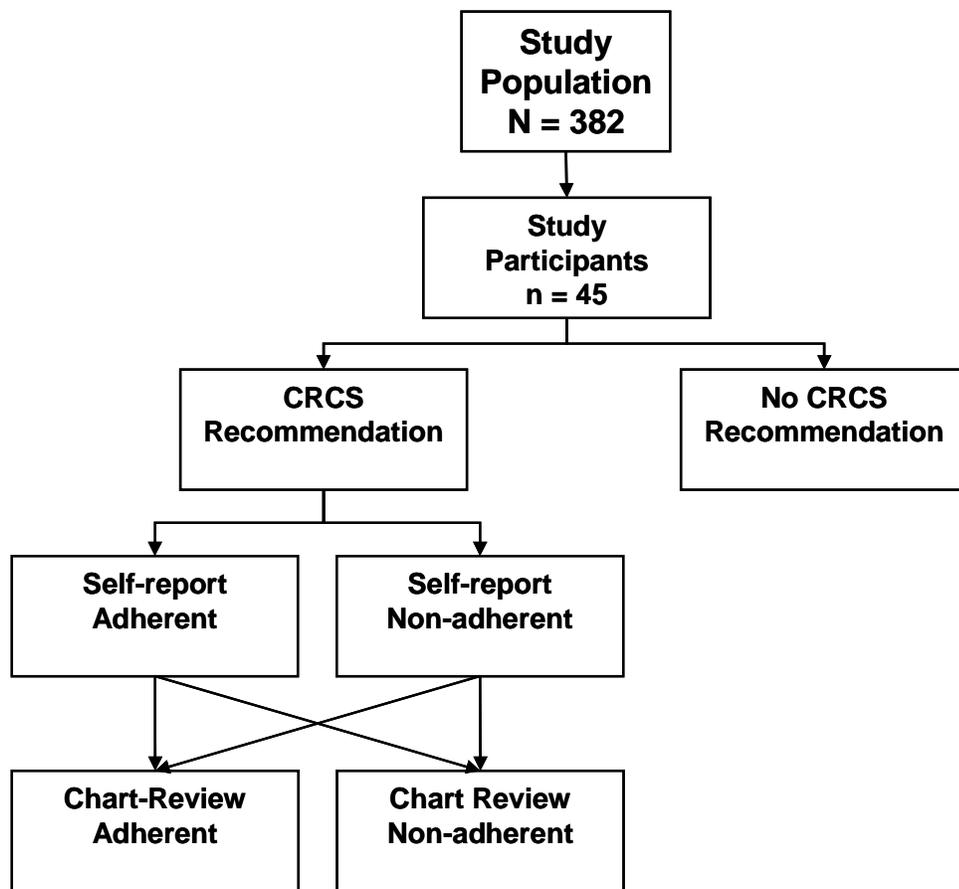


Figure 2. Study Schematic

Power Analysis

A review of 44 articles on CRC screening adherence by Subramanian et al. found CRC screening adherence to physician recommendations to be 50% for flexible sigmoidoscopy, 60% for FOBT, and 75% with colonoscopy [41], with adherence to any CRC screening test approximating 60%.

Two previous studies, which investigated the association of patient/physician relationships on CRC screening adherence, found an odds ratio (OR) of 2.91 (1.10 to 7.78) for a ‘compassionate relationship’ (with adherence to FOBT) [28] and an OR of 1.95 (1.29 to 2.94) for ‘good communication’ (with adherence to FOBT, and/or flexible sigmoidoscopy, and/or colonoscopy) [27].

Utilizing chi-squared analysis, with communication factors as the independent dichotomous variable and adherence as the dichotomous dependent variable, an estimation of the study’s power was obtained. Since the study’s response rate was lower than anticipated, with only 33 participants stating whether they were adherent to the CRC screening recommendation, the power analysis was modified to reflect the reduced sample size. This calculation was performed utilizing simplified analysis, not multivariate analysis. Considering these past studies, the study’s power was expected to be 0.38 (0.05 to 0.88) for a sample size of 33, an α of 0.05, and an expected adherence rate of 60% with an OR of 2.5 (1.1 to 7.9) from past studies [134].

Inclusion/Exclusion Criteria

The American College of Gastroenterology (ACG), the American Cancer Society (ACS), and the United States Preventive Services Task Force (USPSTF) all strongly recommend screening all men and women of average risk for colorectal cancer beginning at 50 years of age [16,17,18]. Accordingly, this study included participants who were males and females over the age of 50 during the 2007 calendar year and were seen by their primary care physician for a preventive visit, well-woman/well-man visit, or yearly physical. Since primary care physicians ideally inform their patients of the need for preventive screening and provide recommendations for it, this study limited the source of the potential population to those who were seen by their family physician for a preventive visit, well-woman/well-man visit, or yearly physical.

Source of Population

The study utilized one population source – the clinics of the Department of Family Medicine at the Texas College of Osteopathic Medicine. These four separate clinics are dispersed within the communities of Fort Worth and include: the Central Family Medicine Clinic, the Seminary Family Medicine Clinic, the Eagle Ranch Family Health Center, and the Westside Family Medicine Clinic. Potential participants were recruited from billings records.

Recruitment of Participants

The investigators worked with the billing staff of the Department of Family Medicine to develop a list of patients that were seen in any of the four family medicine clinics during 2007 and were 50 years of age and older at the time of the visit. The following information was gathered: name, address, date of birth, date of service, provider (i.e., physician), and provider ID. From the provider ID, the clinic site could be inferred. Once this list was generated, a unique identifying number (UIN) was assigned to each of the 382 eligible participants. The list of UINs and associated personal health information was kept secure to ensure patient confidentiality.

All 382 eligible participants were mailed a cover letter explaining the study and that, by providing their initials to Question 1 of the survey, they provided consent to use their responses for research purposes and allow the researchers to review their medical chart for colorectal cancer screening documentation. Those who did not respond to the request were considered to have declined participation in the study. As mentioned previously, this recruitment was carried-out in two phases due to the lower than expected response rate. An original batch of 200 randomized surveys was followed by a second batch containing the remaining 182 eligible participants.

Consent to Study Participation

The cover letter sent with the survey stated that, by responding and returning the initialed survey back to the research office, potential participants had provided consent to utilize their responses and have their medical records accessed to corroborate their

colorectal cancer screening responses. The cover letter also acknowledged that the information collected from the medical charts would include the minimum amount of information needed for the study and would include reviewing clinic notes, test results, and consultation letters for information regarding CRC screening. The investigators received a waiver of written consent from the UNTHSC Institutional Review Board, because the research presented no more than minimal risk of harm to participants and involved no procedures for which written consent is normally required outside of the research context. Additionally, in place of a written consent, passive consent was obtained. Passive consent was considered to have occurred after the consent elements had been communicated to the potential participants (via the cover letter read by the participant) and their choice to participate was reflected by their action (of providing their initials to Question 1 of the survey, completing it, and mailing it back to the research office).

Self-administered Survey

The 70-question survey contained validated scales related to demographics, health history, interpersonal processes of care [12], barriers and facilitators to cancer screening [97,106,109], recent (if any) colorectal cancer (CRC) screening tests, and other health related measures. The survey was mailed to eligible participants. It was estimated to take approximately 25 minutes for the participant to provide consent, answer questions, and mail the survey back to the research center. The surveys included a unique identifying number (UIN) that allowed researchers to link survey responses to a particular

participant. This linkage was essential for corroborating a participant's CRC screening responses to documentation found within their medical chart. The 70-question survey (Appendix B.2) included these instruments:

Demographic and socioeconomic measures:

Demographic and socioeconomic measures included age, gender, race/ethnicity, marital status, education, and income. Although it was hypothesized that communication would be a predictor of adherence, other factors were also thought to play a role and, thus, needed to be accounted for in the analyses.

Access to health care and general health status:

Access to health care, length of time since last routine physical, and personal characteristics involving co-morbid conditions were also inquired about in the survey. Additionally, family history of CRC, prior recommendations for CRC screening, and completed CRC screenings were inquired about. These factors were also thought to be associated with adherence and, therefore, needed to be accounted for in the analyses.

Colorectal Cancer Screening Survey (CSS): [97]

An expanded version of the CSS was used to assess the participant's knowledge and attitudes regarding CRC screening [97]. Wolf et al. reported that their 4-question attitude and 3-question knowledge survey obtained a Cronbach α of 0.73 and 0.59, respectively [97]. This instrument was expanded from its original focus

on flexible sigmoidoscopy and fecal occult blood test to also include colonoscopy and double-contrast barium enema screening tests.

Interpersonal Processes of Care (IPC) survey: [12]

The IPC instrument was utilized to assess the participant's perception of the visit with his/her clinician. This instrument provides a measure of the communication, decision-making, and interpersonal style of the clinician-patient interaction [12]. It also includes a measure of perceived discrimination that occurs specifically in the clinic setting [12]. Stewart et al. reported that reliability coefficients for all domains were > 0.70 [12].

Experiences of discrimination (EOD): [106]

Social inequalities in health are associated with discrimination [106] and may influence adherence to CRC screening recommendations. Therefore, discrimination was controlled for in this study by using a two-item subset of a multi-item self-report questionnaire that measures a person's response to unfair treatment [106]. Krieger et al. reported that their two-item questionnaire obtained a Cronbach α of 0.45 and retest reliability coefficient of 0.35 [106].

Social Support: [109]

Social support was measured by emotional, informal health support, and instrumental support. Emotional support entails actions that individuals do to make another person feel loved and cared for, informal health support involves the knowledge that someone will care for you if sick, and instrumental support

refers to the type of assistance that others may provide [109]. Social support was measured as a scale, using a mean score based on four questions [109]. Ross et al. reported that the four-question survey obtained a Cronbach α of 0.84 [109].

Medical chart review

Once surveys were received by mail, participants who had reported receiving any of the approved colorectal cancer screening tests had their medical chart reviewed by the Student Researcher (SR) to corroborate such reports. Testing results, consult letters, and clinic note documentation were used to corroborate participants' responses of receiving colorectal cancer screening tests.

Data Management and Storage

Each participant was assigned a unique identifying number (UIN) before the study packets were assembled and mailed to eligible participants. The UIN and the participant's consenting initials, provided at Question 1 of the survey (thereby granting consent to participation in the study), were the only identifiers that linked a participant to his/her data. When the survey was returned by the participant, it had only the UIN and the participant's initials on it. Data were then coded and entered into a SPSS Version 15 database [135] with no individual identifiers other than the participant's UIN. The original surveys were kept in a separate and secure location. All data entry was done immediately after a survey was received by mail and immediately preceding the medical chart review. Data were analyzed as a whole, and no names were included in any reports.

All data from this study are housed at the University of North Texas Health Science Center at Fort Worth, Primary Care Research Institute. The data collected and analyzed for this study are specific to this project and will not be used for any other research purposes unless approval is first obtained by the UNTHSC IRB. Patient information (informed consents, surveys, and test results) remain secured.

Data Entry and Quality Control

Data were coded and entered into a SPSS Version 15 database [135] immediately after receiving returned surveys by mail. Coding rules utilized for data entry are provided in Appendix B.4. After initial data entry, data were visually rechecked twice to verify the accuracy of coding and data entry.

Missing Data

Although 38% of surveys had at least one missing data element, this situation did not limit the study's analyses. The majority of individual instrument scores employed by the study were able to be utilized in the final analyses. The survey instruments provided for the calculation of scores utilizing the average of non-missing data elements (see Appendix B.2, B.5, B.6, and B.8), so that missing items did not pose a barrier to analyses. Only the instrument measuring Response to Unfair Treatment required the use of all four responses (see Appendix B.7); however, all surveys had these four data elements complete. Only one (1) survey did not have enough data elements answered to calculate the 'Hurried Communication' and 'Elicited Concerns, Responded' 2nd order scores of the

Interpersonal Processes of Care instrument. Individual data elements that were missing during calculation of a specific statistic were simply not utilized in that particular analysis. This approach allowed the use of non-missing data elements in other analyses, thereby minimizing the impact of missing data elements on the overall analysis of the study.

Self-report vs. Chart-review Adherence

An original intent of the study was to perform final analyses to adherence as found during review of the subject's medical chart (as implied in Figure 2). However, it became quickly apparent that consistent documentation of CRC screening tests within the subject's medical records was suspect. Compounding the problem was the recent merging of paper medical records into scanned electronic medical records (EMRs). While some reviewed EMRs had extensive scanned histories, others included only a few pages. Without the ability to retrieve and review the archived original paper chart, it was impossible to determine if these limited EMRs contained the whole medical history of the subject or just a scanned subset.

Inconsistencies also existed in the manner in which CRC screening tests were documented within the medical records. Only two (2) records utilized the health maintenance portion of the EMR to record CRC screening tests and due dates. One chart indicated in the *physical exam* portion of one of the physician's multiple visit notes that the patient stated that she had a recent colonoscopy. Some EMRs had scanned colonoscopy reports from gastroenterologists, but *all* of these gastroenterologists were

also based at the UNTHSC Patient Care Center (PCC) and, thus, accessible within the same EMR system. One of the gastroenterologists stated that he had recently become aware that his dictated notes were not being sent to the physicians per his request in his automated report system. Therefore, it is possible that some, if not all, subjects that received their CRC screening test(s) with physician's not affiliated with the UNTHSC PCC do not have record of such test(s) in their medical chart because it was never sent to the PCC.

It was decided to perform analyses utilizing the subject's self-reported adherence to CRC screening tests due to these various limitations, where self-report adherence was defined as answering 'yes' to both questions 32 and 33 of the survey (see Appendix B.2). This method is consistent with the overwhelming majority of studies investigating adherence to CRC screening. In their review of 44 articles involving CRC screening adherence, Subramanian et al. found only one (1) that included a chart-review *in addition* to self-reported adherence [41]. This procedure continues to be the standard of practice in studies investigating CRC screening adherence.

Statistical Analysis

SPSS Version 15 [135] was utilized to perform all statistical analyses. Descriptive statistical methods were employed to summarize the interpersonal factors of communication, CRC screening knowledge and attitude, response to unfair treatment, social support, demographic, socioeconomic, health care access, general health status, and CRC screening history characteristics of study subjects. These values were calculated

as percents and counts for both the entire sample and the subset that indicated receiving a CRC screening recommendation (See Appendix C, Tables 3 and 4, respectively). To investigate which factors differentiate adherers from non-adherers of CRC screening recommendations, comparisons were calculated utilizing the t-test for continuous variables and chi-squared/Fisher's Exact Test analysis for categorical variables. Due to the limited sample size, categories were reduced to maximize cell counts for analysis. This differentiation, along with corresponding *p-values*, was calculated for both chart-review adherence and self-report adherence (Appendix C, Tables 5 and 6, respectively).

The strength of association between factors and self-report adherence to CRC screening recommendations was determined through odds ratios (ORs), 95% confidence intervals (CIs), and *p-values* utilizing simple logistic regression (Appendix C, Table 7). Separate simple logistic regression models were generated to assess associations between each of the seven interpersonal factors of communication (IPC) [12], which were independent variables (IV), and the dependent variable (DV), self-report adherence:

DV – Self-report Adherence (dichotomous)

IV – Hurried communication (continuous)

IV – Elicited concerns, responded (continuous)

IV – Explained results/medications (continuous)

IV – Patient-centered decision making (continuous)

IV – Compassionate, respectful (continuous)

IV – Discriminated (continuous)

IV – Disrespectful office staff (continuous)

To evaluate the strength of association between other potential factors and self-report adherence to the CRC screening recommendation, simple logistic regression analyses were conducted for each of these other variables. Determination of inclusion of factors for subsequent multiple regression analyses was based upon their significance in prior studies. Additionally, other factors having a p -value ≤ 0.275 in the simple logistic regression analysis were considered for multiple logistic regression analysis. The original plan was to include factors having p -values ≤ 0.2 [136], but this cut-off point was modified due to the limited number of factors which met the original criteria.

Multiple logistic regression models were then generated to control for confounding associations to the dependent variable, self-report adherence. These models involved the seven interpersonal factors of communication [12], considered in aggregate, along with suspected confounders, historical confounders, and potential confounders that had p -values ≤ 0.275 from the simple logistic regression analyses. The suspected confounders included knowledge of and attitude towards CRC screening [97], response to unfair treatment [106], and social support [109]. The historical confounders included in the multiple regression analysis were age [44-50], education [28,36,42,44,45,49,51-53], family history of CRC [45,46,50,51,53,54,61,62], and co-morbidities [44,45]. (Education and co-morbidities also had p -values of 0.208 and 0.254, respectively.) Additionally, the number of persons living with the subject was included because it possessed a p -value of 0.211.

A manual addition technique was then employed to determine the final set of variables associated with CRC screening adherence based upon the interpersonal factors

of communication. This technique was selected due to the limited size of the dataset. (Including all variables into the model would result in an over-defined set of equations with no unique solution.) Variables were added to the model based upon its significance (maximizing the model's goodness of fit via the Omnibus Tests of Model Coefficients) and contribution to the overall model (maximizing R^2). Figure 3 provides an outline of the process that resulted in the final predictive model based upon the seven interpersonal factors of communication. It was discovered that a significant interaction existed between the variable CRC screening attitude and four (4) of the IPC variables ('Elicited concerns, responded', 'Explained results/medications', Patient-centered decision making', and "Compassionate, respectful'). Table 8 in Appendix C presents interactions between potential model factors. The variable for CRC screening attitude was removed from the model due to this interaction, and the process proceeded unimpeded. No significant interactions were found in the final model (see Table 8, Appendix C), but diagnostics revealed strong collinearity ($VIF < 5.2$). After completion of the final model, the adjusted odds ratios of the model were calculated. They are presented in Appendix C, Table 9.

A second set of predictive models were also created. These models were built by separately considering each interpersonal processes of care factor together with those variables from the simple logistic regression analysis that possessed $p\text{-values} \leq 0.275$. The variables considered for inclusion into the model included 'knowledge of CRC screening', 'education level', 'number of co-morbidities', and 'number of persons living with the subject'. The same manual addition technique was utilized to determine the final set of variables associated with CRC screening adherence, where variables were added to

the models to maximize R^2 and its goodness of fit. No significant interactions were found in the final models (see Table 8, Appendix C), and diagnostics revealed weak collinearity ($VIF < 1.5$). After completion of the individual models, the adjusted odds ratios for each of the models were calculated. They are presented in Appendix C, Table 10.

A third predictive model was also created. This model was built without the constraints of including all or part of the interpersonal processes of care factors or any pre-conceived confounders, such as historical or suspected confounders. The only guideline utilized in building this second model was to include those variables from the simple logistic regression analysis that possessed $p\text{-values} \leq 0.275$. The variables considered for inclusion into the model included ‘hurried communication’ (an IPC factor), ‘knowledge of CRC screening’, ‘education level’, ‘number of co-morbidities’, and ‘number of persons living with the subject’. The same manual addition technique was utilized to determine the final set of variables associated with CRC screening adherence, where variables were added to the model to maximize R^2 and its goodness of fit. Figure 4 provides an outline of the process that resulted in the final predictive model of adherence, including the addition of the variable ‘social support’. Social support was found to increase the model’s goodness of fit and R^2 during determination of adjusted odds ratios. No significant interactions were found in the final model (see Table 8, Appendix C), and diagnostics revealed weak collinearity ($VIF < 1.7$). After completion of the final model, the adjusted odds ratios for the model were calculated. They are presented in Appendix C, Table 11.

The following provides an overview description of the variables utilized in the analyses and models:

Dependent Variables

1. *Self-report Adherence* was a dichotomous dependent variable that could possess the value of 1 (= yes: adherence) or 0 (= no: non-adherence). Self-report adherence to CRC screening recommendations was defined as answering 'yes' to both questions 32 and 33 of the survey (see Appendix B.2).
2. *Chart-review Adherence* was a dichotomous dependent variable that could possess the value of 1 (= yes: adherence) or 0 (= no: non-adherence). Chart-review adherence to CRC screening guidelines was defined as finding a record in a subject's medical chart of having obtained a CRC screening test.

Independent Variables

1. *Hurried Communication* (a 2nd-order factor of the IPC Communication domain) was a continuous independent variable that could possess a value of 1 to 5, where a high scale indicated a worse process [12].
2. *Elicited Concerns, Responded* (a 2nd-order factor of the IPC Communication domain) was a continuous independent variable that could possess a value of 1 to 5, where a high scale indicated a better process [12].

3. ***Explained Results/Medications*** (a 2nd-order factor of the IPC Communication domain) was a continuous independent variable that could possess a value of 1 to 5, where a high scale indicated a better process [12].
4. ***Patient-Centered Decision Making*** (a 2nd-order factor of the IPC Decision Making domain) was a continuous independent covariate that could possess a value of 1 to 5, where a high scale indicated a better process [12].
5. ***Compassionate, Respectful*** (a 2nd-order factor of the IPC Interpersonal Style domain) was a continuous independent covariate that could possess a value of 1 to 5, where a high scale indicated a better process [12].
6. ***Discriminated*** (a 2nd-order factor of the IPC Interpersonal Style domain) was a continuous independent covariate that could possess a value of 1 to 5, where a high scale indicated worse process [12].
7. ***Disrespectful Office Staff*** (a 2nd-order factor of the IPC Interpersonal Style domain) was a continuous independent covariate that could possess a value of 1 to 5, where a high scale indicated a worse process [12].

Covariates

Additional variables were considered to potentially confound the study's results and these covariates were controlled for in the statistical analyses:

1. *CRC Screening Knowledge* was a continuous independent covariate that could possess a value of 0 to 1, where a high scale indicated high knowledge consistent with screening [97].
2. *CRC Screening Attitude* was a continuous independent covariate that could possess a value of 1 to 5, where a low scale indicated an attitude consistent with screening [97]. Final analyses reversed the direction of the scale so that a high scale correlated to an attitude consistent with screening.
3. *Response to Unfair Treatment* was a continuous independent covariate that could possess a value of 0 to 3, where a low scale indicated passive response and a high scale indicated an active response [106].
4. *Social Support* was a continuous independent covariate that could possess a value of 1 to 5, where a low scale indicated a strong support base and a high scale indicated a lack of a support base [109]. Final analyses reversed the direction of the scale so that a high scale correlates to a strong support base.

5. Other variables were considered to potentially confound the study's results. They included age and number of person's living with the subject (continuous independent) and education, family history of colorectal cancer, and co-morbidities (dichotomous independent). These co-morbidities included: high cholesterol, high blood pressure, diabetes, heart disease, lung disease, liver disease, kidney disease, colorectal cancer, other cancer, auto-immune or immune problems, and depression/anxiety.

	R²	Omnibus Tests Model Sig.
Iteration #1		
Interpersonal Processes of Care (IPC)	0.225	0.774
Add		
CRCS Knowledge	0.332	0.626
CRCS Attitude	0.454	0.361
Response to Unfair Treatment	0.295	0.710
Social Support	0.366	0.548
Age	0.225	0.852
Education	0.277	0.760
Family History of CRC	0.249	0.822
Number of Co-morbidities	0.315	0.677
Number living with you	0.369	0.567
Iteration #2		
IPC and Social Support	0.366	0.548
Add		
CRCS Knowledge	0.431	0.505
Response to Unfair Treatment	0.445	0.475
Education	0.375	0.640
Number of Co-morbidities	0.480	0.417
Number living with you	0.532	0.331
Iteration #3		
IPC + Social Support + Number living with you	0.532	0.331
Add		
CRCS Knowledge	0.537	0.409
Response to Unfair Treatment	N/S	N/S
Number of Co-morbidities	N/S	N/S
Final Model		
IPC + Social Support + Number living with you	0.532	0.331

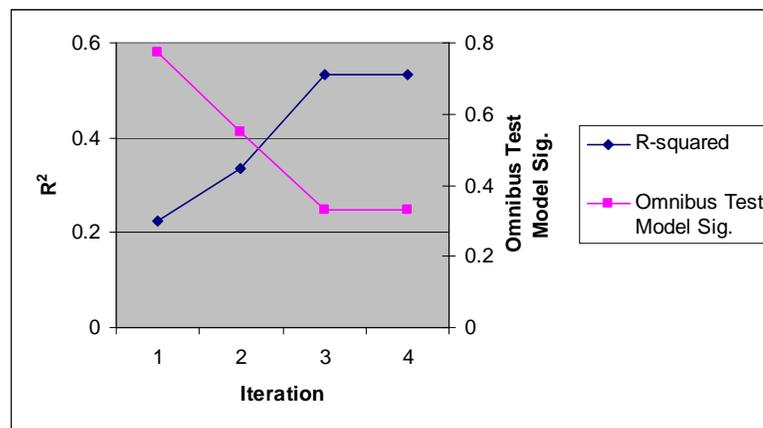


Figure 3. Building a Predictive Model of Adherence utilizing IPC Factors

	R^2	Omnibus Tests Model Sig.
Iteration #1		
Hurried Communication (IPC)	0.126	0.137
CRCS Knowledge	0.112	0.158
Education	0.106	0.175
Number of Co-morbidities	0.086	0.221
Number living with you	0.087	0.224
Iteration #2		
Hurried Communication (IPC)	0.126	0.137
Add		
CRCS Knowledge	0.219	0.139
Education	0.167	0.233
Number of Co-morbidities	0.245	0.113
Number living with you	0.256	0.106
Iteration #3		
Hurried Communication + Number living with you	0.256	0.106
Add		
Number of Co-morbidities	0.338	0.113
Iteration #4		
Hurried Communication + Number living with you	0.256	0.106
Add		
Social Support	0.419	0.051
Final Model		
Hurried Communication + Number living with you + Social Support	0.419	0.051

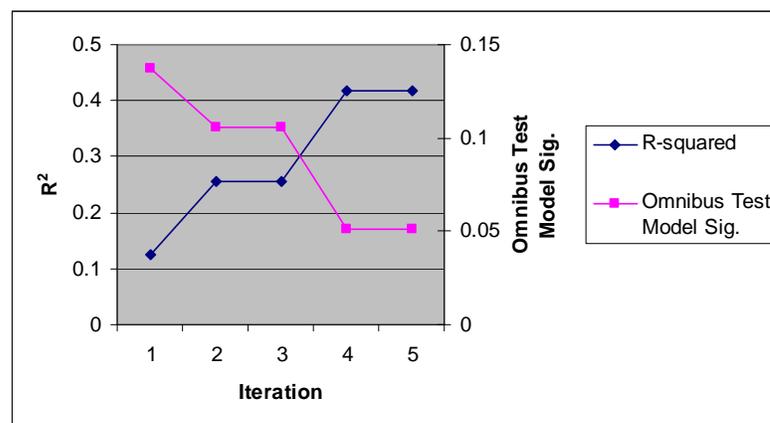


Figure 4. Building a Predictive Model of Adherence

CHAPTER IV

RESULTS

This pilot study recruited 45 subjects from a possible pool of 382 persons who were invited to participate, resulting in an 11.8% response rate. Of the 45 subjects who participated, 36 (80%) answered that they had been given a recommendation for a colorectal cancer (CRC) screening test by their physician. Twenty-nine (80.6%) of those given a recommendation indicated adherence, with four (11.1%) indicating non-adherence and three (8.3%) not providing an answer to the inquiry. One participant indicated that they had a CRC screening test scheduled but not yet performed at the time of the survey. For the purposes of this study, that subject was categorized as adherent.

A review of the subjects' medical chart revealed that all of those reporting non-adherence or not providing an answer had no record of receiving a CRC screening test. An additional ten medical charts were found not to have record of a CRC screening test, even though the subject reported having received one. The resulting chart-review adherence rate to CRC screening guidelines was 52.8% after review of medical charts. Figure 5, on the following page, illustrates participation within the study and overall categorization of subjects by CRC screening recommendation and adherence.

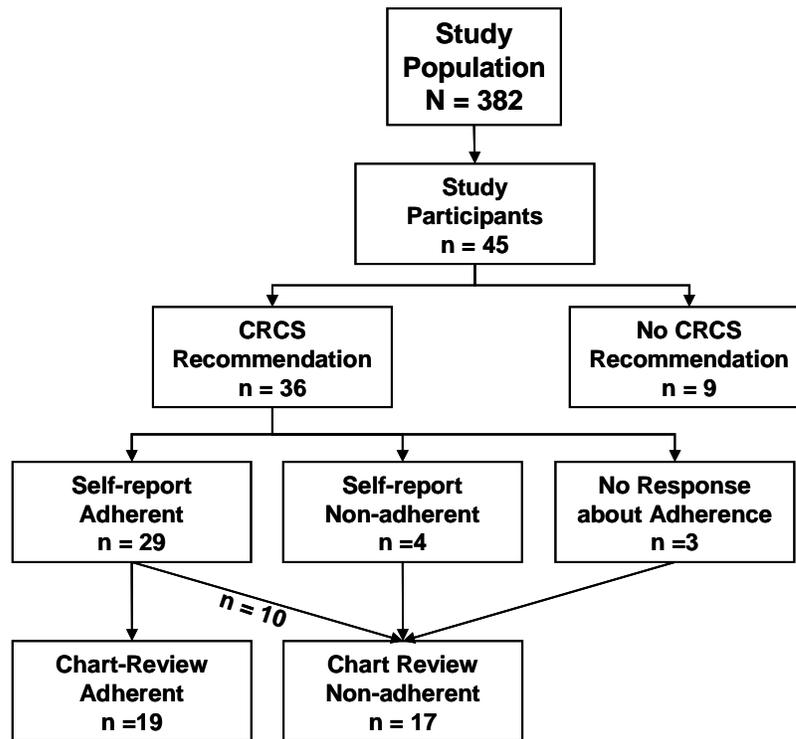


Figure 5. Study Participation

Descriptive Analysis

Study participants tended to be married white women who graduated from high school, were retired or disabled, and had health care coverage which allowed them to regularly see their physician for their multiple co-morbidities. This description was consistent among the study participants regardless of whether or not they had received a recommendation for CRC screening (see Tables 3 and 4).

Of those receiving a CRC screening recommendation, twice as many subjects reported being married. They also indicated living with an average of 1.65 other persons in their household. Only one person reported not graduating from high school, with 16 stating that they had at least graduated from college. Out of the 36 participants who stated that they were given a CRC screening recommendation, 10 reported being employed and

reported employment in various fields of work. The average age of subjects given a CRC screening recommendation was 61.8 years. Seventy-one percent of subjects reported being white, 17% African American, 9% Hispanic/Latino, and 12% another race. Only two subjects stated that they had no co-morbidities, with half of all respondents reporting greater than two co-morbidities. All participants reported having health coverage with 10 reporting various forms of coverage (e.g., Medicare with additional HMO coverage). Twenty-nine of 35 respondents stated that they had seen their physician within the past year for a routine check-up, with only one respondent reporting never having had a routine physical exam. Family history of CRC was reported by 8.3% of respondents, with 4 (11%) of participants indicating that they had a personal history of CRC. Of those reporting having had undergone a CRC screening procedure, 27 (90%) reported having had a colonoscopy, either alone or in combination with another CRC screening test. Another two respondents (6.7%) stated that they did not know what test they had preformed and only one (3.3%) answered having obtained a FOBT. No one reported having a flexible sigmoidoscopy or double-contrast barium enema alone, and two respondents stated that they had undergone all four CRC screening procedures.

The descriptors of the study were stratified by adherence and non-adherence to either chart-review or self-report adherence (see Tables 5 and 6, respectively). The stratification was performed to reveal possible differences between the adherent and non-adherent participants. Stratifying by chart-review adherence revealed no difference between adherent and non-adherent groups. Stratifying by self-report adherence revealed one factor that demonstrated a difference between adherent and non-adherent groups

(knowledge of CRC screening, *p-value* 0.001). However, after further analysis it was determined that the significance of the factor ‘knowledge of CRC screening’ was an artifact of the data, since all those non-adherent to the CRC screening recommendation had the same score of 0.60. This condition produced a null standard deviation (i.e., standard deviation = 0), which resulted in a factor with overly estimated difference between adherent and non-adherent groups.

Factors Associated with Adherence

Simple logistic regression was utilized to develop associative models between individual factors and self-report adherence to CRC screening recommendations. These regression models produced unadjusted odd ratios (ORs), 95% confidence intervals (CIs), and *p-values* for the association between the individual factor of interest and self-report adherence. Table 7 presents the results of these individual regression models. While no factor was found to be significant or trend towards significance, five factors had *p-values* ≤ 0.275 . Participants reporting more than two (2) co-morbidities were less likely to be adherent to the recommendation for CRC screening (OR 0.225, *p-value* 0.254). Those respondents indicating that their physician had attributes of ‘hurried communication’ were more likely to be adherent to the recommendation for CRC screening (OR 5.080, *p-value* 0.230). Participants were less likely to be adherent as the number of people that lived with them increased (OR 0.692, *p-value* 0.211). Those respondents whose final graduation was beyond high school were less likely to be adherent than those with more modest educational attainment (OR 0.216, *p-value* 0.208). Participants who rated their

knowledge of CRC screening as high were more likely to be adherent (OR 31.399, *p-value* 0.173). (However, as noted previously, all those who were non-adherent rated their knowledge as a 0.6. The resulting null standard deviation skewed both the odds ratio and *p-value*.)

Predictive Models of Adherence

Three types of models were developed to predict adherence to CRC screening recommendations. The first model was developed around the seven interpersonal factors of communication, while also considering suspected, historical, and potential confounders (see the Statistical Analysis section of Chapter III). The final form of this model included the factors ‘social support’, and ‘number of persons living with you’. This IPC-based model also included (by definition) all seven interpersonal factors of communication. It obtained an R^2 of 0.532 and a model significance of 0.331 (from the Omnibus Tests of Model Coefficients). None of the model’s factors reached significance or trended toward significance. Table 9 presents the adjusted odds ratios, 95% CIs, and *p-values* for the model.

The second set of models individually considered each of the seven interpersonal factors of communication along with those variables from simple logistic regression analyses that possessed *p-values* ≤ 0.275 . All seven of these models included the factors ‘number of persons living with you’, ‘education level’, and ‘number of co-morbidities’. None of the seven models yielded factors which reached significance or trended toward

significance. Table 10 presents the adjusted odds ratios, 95% CIs, and *p-values* for these models.

The third model placed no constraints on the factors that were considered, except that they included only those variables from simple logistic regression analyses that possessed *p-values* ≤ 0.275 . The final form this model included the factors ‘social support’, ‘number of persons living with you’, and the IPC factor ‘hurried communication’. The third model obtained an R^2 of 0.419 and a model significance of 0.05 (from the Omnibus Tests of Model Coefficients), and all three of its factors trended toward significance. ‘Hurried communication’, ‘social support’, and ‘number of persons living with you’ obtained *p-values* of 0.055, 0.088, and 0.091, respectively. Table 11 presents the adjusted odds ratios, 95% CIs, and *p-values* for all calculated data.

CHAPTER V

DISCUSSION

Despite widely-acknowledged and highly-regarded guidelines and evidence that consistently demonstrate the benefits of colorectal cancer (CRC) screening, adherence rates remain unacceptably low. In 2008, it was estimated that less than 50% of all persons in the United States over the age of 50 had ever undergone a CRC screening test [15]. It was also estimated that 148,810 new diagnoses of CRC were made and 49,940 deaths were attributed to it in the United States in 2008 [14]. With a 5-year survivability of 90% via early detection and treatment [15] and an estimated 60% of all deaths from CRC prevented if everyone were screened per guidelines [15], further understanding of the factors that affect adherence are needed to correct the current situation and reduce morbidity and mortality.

The relationship and trust between physician and patient are key factors in promoting adherence to CRC screening, and the need to investigate such characteristics has been acknowledged [41]. Three such studies have investigated some of the factors that influence a patient's desire, decision, and ability to obtain screening for colorectal cancer when recommended to do so by their physician. One of these studies explored physician influence on patient adherence to colorectal cancer screening recommendations and found an association [26]. Likewise, two other studies have investigated the impact of physician-patient communication on adherence to colorectal cancer screening

recommendations and have demonstrated evidence of an association [27,28]. However, these studies included surveys that broadly measure patient satisfaction of physician communication but did not delve into the specifics of what occurred during the doctor's appointment. Due to this limitation, these surveys did not measure interpersonal factors of communication and how they may impact patient adherence to physician recommendations.

This study attempted to overcome the limitations of prior studies by utilizing the Interpersonal Processes of Care (IPC) instrument to evaluate the extent to which these factors impact a patient's adherence to their physician's recommendation for obtaining a colorectal cancer screen. Although no individual factor reached significance, the IPC factor termed 'hurried communication' did trend toward significance (p-value 0.055) as part of a multivariate model that also included the terms 'social support' and 'number of persons living with you' (R^2 of 0.419 and a model significance of 0.05 from the Omnibus Tests of Model Coefficients). However, the direction of affect was opposite of what was expected: those that rated their physician's communication as 'hurried' were more likely to be adherent. Also, the small sample size contributed to a volatile result as seen by the very large confidence interval (see Table 11).

It is anticipated that hurried communication does not inherently increase adherence but rather some aspect of the physician's communication that reinforced adherence was perceived by the subject to be hurried. For example, a physician has a limited amount of time that they can spend with any one patient. For those patients meeting the criteria for CRC screening, a physician must recommend the test, explain its

importance, and describe the test along with any preparation and post-test expectations. So it is understandable that a physician appears hurried who relays all of this information to his/her patient in a limited amount of time. In contrast, a physician that recommends the same CRC test in passing need not appear as hurried to the patient, but the patient might not internalize the recommendation as strongly as if he/she were given a fuller explanation. Alternatively, the fast and pressured aspect of hurried communication might be taken by some individuals as reinforcing the importance of the test; therefore, they may be more adherent to the recommendation.

As mentioned previously, the factors ‘social support’ and ‘number of persons living with you’ were also part of the final multivariate model. Both of these factors also trended toward significance (‘social support’, *p-value* 0.088; ‘number living with you’, *p-value* 0.091). It is anticipated that the number of persons that live with an individual is a broad representation of his/her social network and an indirect measure of his/her perceived duties within the household. Therefore, it is conceivable from the results of this study that those who have more freedom in their daily responsibilities to undergo time-consuming procedures, such as a colonoscopy, are more apt to be adherent. Likewise, those with strong social support are more likely to be adherent to CRC screening recommendations because they can obtain assistance from others to undergo the procedure.

The results of this study were consistent with prior studies in that gender, ethnicity/race, marital status, and chronic conditions were not found to be associated with adherence to CRC screening recommendations [41]. However, this study found no

association with age, higher education, and family history of CRC. These factors have been consistently shown to be a predictor of adherence [28,36,44-54,61,62], but this study did not uncover an association. The low sample size of this study limited its power, so the finding of no association is not unexpected. With a larger sample of participants it is not anticipated that these associations would deviate from the results of prior studies.

This study also revealed that only 80% of patients at age for CRC screening had been given a recommendation for a CRC screening test or were aware of having been given a recommendation. Since a physician's recommendation is consistently one of the greatest predictors of CRC screening adherence [41], any method that increases the percent of patients given such a recommendation will increase overall patient adherence. Given this study's adherence rate of 80.6% for those given a CRC screening recommendation, an additional 7 of 9 individuals would have been adherent if they had been given such a recommendation by their physician. This study's adherence rate closely matches prior studies which demonstrated an adherence to colonoscopy recommendations of between 70 and 80% [41]. This comparison is appropriate since 90% of respondents underwent a colonoscopy test, either alone or in combination with another test.

The technological advances in health information systems eliminate any reasonable excuse for such a low rate of physician adherence to widely accepted CRC screening recommendation guidelines. Electronic medical records can be made to accommodate the documentation of CRC screening procedures in a health maintenance section of a patient's medical record. This information can then alert the physician when

a patient is due, or past due, for his/her next CRC screen. However, the physician must utilize the health maintenance section for it to be of any value to the patient. Techniques that ease the entry, retrieval, and sharing of data (especially between physicians and medical institutions) and incentivize the physician to utilize such features should be investigated, implemented, and improved. Significant increases in patient health and reductions in health-care costs can be realized if these barriers to technology are removed and/or bridged

The response rate to this self-report study was only 11.8%. While the response rates of mailed surveys are low, it is anticipated that a significantly higher response rate could have been obtained had the design of the mailed survey been different. The key survey questions of this study included the 29 questions of the Interpersonal Processes of Care (IPC) instrument. However, in an attempt to adequately address the various factors that might confound the results of an association between IPC and CRC screening adherence, an addition 41 questions were asked of the potential subject. Therefore, each participant was asked to answer 70 questions at one sitting. Although the length of time needed to answer the questionnaire was estimated to take no more than 25 minutes, the 14 page packet probably appeared overwhelming. A design that might yield a higher response rate would include an initial questionnaire consisting of the IPC instrument and asking potential participants to be part of the study. It would inform them that, if they elected to join, a follow-up survey would be sent for them to fill-out, as well. At both contacts, they would be reimbursed for their time and effort. It is anticipated that a higher response rate would be obtained, allowing for a more robust analysis of data.

Limitations

The aim of this cross-sectional study was to investigate possible associations between a patient's perception of the physician's communication style and his/her adherence to the recommendation for colorectal cancer screening, utilizing a self-report survey of events that occurred in 2007. The use of a self-report survey limited the scope of the study's investigation to participant perceptions of communication rather than actual responses to these events. Due to the inherent nature of these instruments, only subjective measures of communication were obtained, and the potential for recall bias was present. Therefore, care was taken in the design of the study to utilize validated instruments to evaluate these subjective measures and minimize recall bias. Additionally, the study's design had originally planned to minimize recall bias through corroboration of adherence to screening tests by medical record review; however, lack of confidence in the completeness of these records precluded verification of test completion.

Even with the use of validated instruments, recall bias may have been present as indicated by the high percentage of participants indicating that they had received a colonoscopy (90%). Due to the amount of preparation required for this test as well as its invasive nature, it is possible that more individuals recalled having undergone a colonoscopy as opposed to a less invasive test, such as FOBT.

In addition to recall bias, the potential for selection bias was also present. This possibility was supported by the characteristics of the individuals who enrolled in the study. Participants tended to be married white women who graduated from high school, and were retired or disabled. As a group, they also reported a CRC screening adherence

rate that was substantially above the national average (80.6% vs. 50%). Therefore, potential participants who were adherent to their physician's recommendation to obtain a CRC screening test may have been more likely to enroll in the study than those who were not adherent to the recommendation.

As part of the study design, only patients of the four Family Medicine Clinics of the UNT Health Science Center were utilized. Therefore, generalization can only be made to this population of patients. Consequently, only the patients of a single physician group were utilized. Expanding the pool of patients and physicians in future studies may yield different results as biases in communication style affect adherence outcomes. However, it is not anticipated that the validity of this study's results would be diminished by such expansions through the inclusion of more patients and physicians.

The study's survey questionnaire attempted to capture potential underlying factors within the sampled population that could have otherwise affected the study's results (such as age, educational level, and family history of colorectal cancer), and these anticipated factors were controlled for as part of the statistical analyses. However, as a pilot study, it was limited in its size and scope and, as such, it was underpowered. Its modest sample size limited the study's ability to reach significance and reach conclusive results. Therefore, the sampled data may have unknowingly weighted individual results away from the true character of the total population without changing the overall results of the study's multivariate model. Finally, the cross-sectional nature of this pilot study precluded any determination of causality.

CHAPTER VI

CONCLUSIONS

This pilot study revealed no interpersonal factors of communication that were significantly associated with and/or predictive of adherence to a physician's recommendation for a colorectal cancer screen. However, one interpersonal factor, hurried communication, trended towards significance (*p-value* 0.055) when combined in a model that also measured a subject's level of social support and number of persons that lived with them (R^2 of 0.419 and a model significance of 0.05 from the Omnibus Tests of Model Coefficients). Its direction of association was unexpected and revealed that those in the study that were adherent to the recommendation perceived their physician's communication to be more hurried than those who were not adherent.

It is anticipated that hurried communication does not promote adherence but rather an aspect of the physician's communication that reinforced adherence was perceived by the subject as hurried. It is also anticipated that the number of persons that live with an individual is a broad representation of their social network and an indirect measure of their perceived duties within their household. Therefore, it is conceivable from the results of this study that those who have more freedom in their daily responsibilities to undergo a time-consuming procedure, such as a colonoscopy, are more likely to be adherent to CRC screening recommendations as are those with strong social support. Future research should investigate these trends further and explore the affect of

patient responsibilities and time constraints on adherence. If they are found to be significant factors, solutions to such constraints can then be addressed through improved physician-patient interaction.

This study also revealed that only 80% of patients at age for CRC screening had been given a recommendation for a CRC screening test or were aware of having been given a recommendation. Since a physician's recommendation is consistently one of the greatest predictors of CRC screening adherence [41], any method that increases the percent of patients given such a recommendation will increase overall patient adherence. The technological advances in health information systems should increase adherence to accepted guidelines, and new systems should be developed. However, physician's have an essential role to fill for it to be of any value to the patient. Techniques that ease the entry, retrieval, and sharing of data (especially between physicians and medical institutions) and incentivize the physician to utilize such features should be investigated, implemented, and improved.

It is anticipated that the results of this study will add to the collective knowledgebase regarding adherence and colorectal screening efforts. This added knowledge can assist other efforts that aim to improve patient outcomes, contribute to the understanding of barriers to adherence, and aid in the development of future strategies to overcome these barriers.

APPENDIX A
ABBREVIATIONS AND ACRONYMS

ACG – American College of Gastroenterology

ACS – American Cancer Society

AOR – Adjusted Odds Ratio

BRFSS – Behavioral Risk Factor Surveillance System

BM – Bowel Movement

CI – Confidence Intervals

CRC – Colorectal Cancer

CRCS – Colorectal Cancer Screen

CSS – Colorectal Cancer Screening Survey

DCBE – Double-Contrast Barium Enema

DV – Dependent Variable

EMR – Electronic Medical Records

EOD – Experiences of Discrimination

Flex Sig – Flexible Sigmoidoscopy

FOBT – Fecal Occult Blood Test

FS – Flexible Sigmoidoscopy

HMO – Health Maintenance Organization

ID – Identification

IPC – Interpersonal Processes of Care

IRB – Institutional Review Board

IV – Independent Variable

N/A – Not Available

N/S – No Solution

OB/GYN – Obstetrician/Gynecologist

OR – Odds Ratio

PCC – Patient Care Center

SD – Standard Deviation

SEER – Surveillance, Epidemiology, and End Results

SPSS – A statistical analysis tool

SR – Student Researcher

TCOM – Texas College of Osteopathic Medicine

UIN – Unique Identifying Number

UNT – University of North Texas

UNTHSC – University of North Texas Health Science Center at Fort Worth

US – United States

USPSTF – United States Preventive Services Task Force

VA – Veterans Affairs

APPENDIX B
INSTRUMENTS

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INSTRUMENT B.1

Dear potential study participant,

I am a 4th year medical and graduate student at the UNT Health Science Center at Fort Worth, and I am very excited to ask you to be a part of an important study that will investigate how your doctor communicates with you. More specifically, I am studying those communication factors between your doctor and yourself that may affect your decision to have a colorectal cancer screening test done once your doctor has recommended it for you. The study is titled “Understanding the Psychosocial Factors of Communication that Underlie Colorectal Cancer Screening Adherence”, and is being carried-out under the guidance of Dr. Roberto Cardarelli, D.O, M.P.H., who is the study’s principal investigator.

If you agree to participate, the study will analyze your responses to the attached questionnaire. It contains 70 questions that inquire about you, your health, and the communication between your doctor and yourself. It will take approximately 25 minutes to complete. The survey includes a unique identifying number (UIN) that will allow me to review your medical record for colorectal cancer screening documentation and nothing more. Only the research investigators will have access to your information. There is a potential risk for breach of confidentiality. However, the study investigators will take all the necessary precautions to protect your confidentiality as a research participant.

Your participation is voluntary. If you wish to participate in this study, please answer the attached 14-page survey and send it back to me **by February 28, 2009** in the pre-paid, self-addressed envelop. Once your completed and initialed survey has been received, you will be mailed \$5 as a reimbursement for your time and effort. If you do not respond, you are considered to have declined participation in the study.

You can choose to leave the study at any time without penalty or loss of benefits that you are otherwise entitled. Please contact the study investigators at the number below if you wish to withdraw from the study.

Please make sure that you write your initials in the space provided in Question 1, if you plan on participating in this study. This is how you provide your consent to be a part of the study and have your records reviewed for colorectal cancer screening documentation. Without it, we will be unable to use your responses.

If a study-related problem should occur, or if you have any questions at any time about the study, you may contact Dr Roberto Cardarelli, Principal Investigator at 817-735-2625. If you have questions about your rights as a participant in this study you may contact Dr Brian Gladue, Chairman of the Institutional Review Board, University of North Texas Health Science Center at Fort Worth at 817-735-0409.

Thank you for your time, effort, and consideration!

Sincerely,

Michael A. Dunn
Medical Student IV
D.O./M.S. Candidate

INSTRUMENT B.2

University of North Texas Health Science Center
Primary Care Research Institute
Texas College of Osteopathic Medicine
Department of Family Medicine

Understanding the Psychosocial Factors of Communication that Underlie
Colorectal Cancer Screening Adherence

Primary Investigator: Dr Roberto Cardarelli (817) 735-2405

All answers are CONFIDENTIAL. Your doctor or nurse will not know how you answered, and your answers will not affect the medical care you receive. Please mark the most appropriate response for each question below:

UIN: _____

Q1. By initialing here, _____, you give us permission to use your answers in this questionnaire and review your medical records for colorectal cancer screening documentation for the expressed purpose of investigating the communication factors between doctor and patient that may affect the patient's decision to have a colorectal cancer screening test done, as set forth in the above titled study.

Q2. What is your age? _____

Q3. What is your gender?

Female

Male

Q4. Are you Hispanic or Latino?

Yes

No

Q5. Which one of the following groups would you say best represents your race?

- White
- Black/ African American
- Asian
- Native Hawaiian or Pacific Islander
- American Indian or Alaska Native
- Other (please specify): _____

Q6. Are you...? (please select only one)

- Married
- Unmarried

Q7. How many adults and children live with you in your household? _____

Q8. What is the highest grade or year of school that you completed?

- None
- Pre-school
- Grade school
- High school
- College
- Graduate school

Q9. Are you currently...?

- Employed
- Unemployed
- Homemaker
- Student
- Retired
- Disabled

Q10. What is your occupation?

- Labor
- Technical
- Clerical
- Managerial
- Professional
- Trade
- Service
- Student
- Other (please specify): _____
- None

This section is going to ask you questions about your access to health care and general health status.

Q11. Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare or Medicaid?

- Yes
- No
- Don't know/ Not sure

Q12. If so, what kind of coverage do you have?

- Private health insurance
- HMO
- Medicaid/EverCare/Amerigroup
- Medicare
- Other (please specify if able): _____

Q13. If you don't have any kind of coverage, what are some of the reasons why?

- Can't afford to have it
- I don't qualify for government programs
- I don't know if I qualify for government programs
- My employer doesn't provide health benefits
- Other (please specify): _____

Q14. Was there a time during 2007 when you needed to see a doctor but could not because of cost?

- Yes
- No

Q15. About how long has it been since you last visited a doctor for a routine checkup? A routine checkup is a general exam, not an exam for a specific injury, illness, or condition.

- Within the past year (1-12 months ago)
- Within the past 2 years (1-2 years ago)
- Within the past 5 years (1-5 years ago)
- More than 5 years ago
- Never

Q16. Have you ever been told by a healthcare professional that you have any of the following health problems?

- | | | |
|--|-----------------------------|------------------------------|
| High cholesterol | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| High blood pressure | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| Diabetes | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| Heart disease | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| Lung disease | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| Liver disease | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| Kidney disease | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| Colorectal cancer | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| Any other type of cancer | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| Auto-immune problems
(such as Rheumatoid arthritis, Lupus, Inflammatory bowel disease) | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| Immune problems | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| Depression/ Anxiety | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| Other
(please specify: _____) | <input type="checkbox"/> No | <input type="checkbox"/> Yes |

This section is going to ask you questions about your knowledge and attitudes concerning colon cancer screening. Please select the most appropriate response by marking the appropriate box or circling the appropriate number.

Q17. Have you heard of any medical tests to find colon or rectal cancer (also known as colorectal cancer)?

- Yes
- No

Colon cancer is a type of cancer of the large intestine; that is, the part of the body where the stool (or BM or poop) is made. And rectal cancer is a type of cancer of the part of the body where the stool (or BM or poop) goes through when you have a bowel movement (BM).

Q18. Do you know what a double-contrast barium enema is?

- Yes
- No

Double-contrast barium enema is an X-ray type of test that is done after contrast is put into the rectum.

Q19. How worried are you that a double-contrast barium enema might be embarrassing?

Not at all	Not very	Somewhat	Very	Extremely
1	2	3	4	5

Q20. How worried are you that a double-contrast barium enema might be messy?

Not at all	Not very	Somewhat	Very	Extremely
1	2	3	4	5

Q21. How worried are you that a double-contrast barium enema might be painful?

Not at all	Not very	Somewhat	Very	Extremely
1	2	3	4	5

Q22. Do you know what a colonoscopy is?

Yes

No

Colonoscopy is a test that a doctor does using a flexible tube with a camera at the end. The doctor puts the tube in the rectum to check for problems in the rectum and colon. The test is performed under sedation (while the patient is “asleep”).

Q23. How worried are you that a colonoscopy might be embarrassing?

Not at all	Not very	Somewhat	Very	Extremely
1	2	3	4	5

Q24. How worried are you that a colonoscopy might be painful?

Not at all	Not very	Somewhat	Very	Extremely
1	2	3	4	5

Q25. Do you know what a flexible sigmoidoscopy is (also called a “sigmoidoscopy” or “flex sig”)?

Yes

No

Flexible sigmoidoscopy is like a colonoscopy but the tube is shorter and the patient is awake during the test. The doctor puts the tube in the rectum to check for problems in the rectum and colon.

Q26. How worried are you that a flexible sigmoidoscopy might be embarrassing?

Not at all	Not very	Somewhat	Very	Extremely
1	2	3	4	5

Q27. How worried are you that a flexible sigmoidoscopy might be painful?

Not at all	Not very	Somewhat	Very	Extremely
1	2	3	4	5

Q28. Do you know what a Fecal Occult Blood Test (FOBT) is (also known as hemoccult test or guaiac stool test)?

- Yes
- No

FOBT is done at home. A person takes a small sample of stool (or BM or poop) and puts it on a special card. Then the card is returned to the doctor's office and it is tested to see if there is blood in the stool (or BM or poop).

Q29. How worried are you that a FOBT might be messy?

- | | | | | |
|-------------------|-----------------|-----------------|-------------|------------------|
| Not at all | Not very | Somewhat | Very | Extremely |
| 1 | 2 | 3 | 4 | 5 |

Q30. How worried are you that a FOBT might be inconvenient?

- | | | | | |
|-------------------|-----------------|-----------------|-------------|------------------|
| Not at all | Not very | Somewhat | Very | Extremely |
| 1 | 2 | 3 | 4 | 5 |

This section asks you to answer questions about your family's history of colon cancer and your own history of colon cancer screening tests.

Q31. Is there a history of colon cancer in your immediate family (defined ONLY as your parents, siblings, or children)?

- Yes
- No
- Don't know/ Not sure

Q32. Has your doctor ever recommended that you undergo colon cancer screening by **any** of the following tests? *(Please note that the list of tests is continued on next page.)*

Double-contrast barium enema – this is an X-ray-type of test after contrast is put in the rectum.

Colonoscopy – this is test in which a doctor puts a flexible tube in the rectum to look at the entire colon while the patient is sedated.

Flexible sigmoidoscopy – this test is like a colonoscopy in that it uses a flexible tube that a doctor puts in the rectum. It is shorter than the tube used for a colonoscopy, and the patient is awake for the test.

Fecal occult blood test (FOBT)/hemocult test/guaiac stool test – this is a test that is done at home; *a person takes a small sample of stool (or BM or poop) and puts it on a special card. Then the card is returned to the doctor’s office and it is tested to see if there is blood in the stool (or BM or poop).*

- Yes
- No
- Don’t know/ Not sure

If you answered “YES”, please go to the next question (#Q33).

If you answered “NO”, please skip to Question #Q35.

Q33. If yes, did you follow the recommendation and complete the colon cancer screening test?

- Yes
- No
- Not yet, the test is scheduled

Q34. If yes, what colon cancer screening test did you have performed or is currently scheduled?

- Fecal occult blood test (FOBT)/ hemocult test/ guaiac stool test
- Flexible sigmoidoscopy
- Colonoscopy
- Double-contrast barium enema
- Don’t know/ Not sure

The following questions are about your experiences talking with your doctors at UNT Health Family Medicine Clinics during 2007. If you see more than one doctor at the UNT Health Family Medicine Clinics, please answer the following questions about the doctor who recommended and/or ordered the colon cancer screening test. Tell us on average how often they did the following by circling the most appropriate response for each question:

	Never	Rarely	Sometimes	Usually	Always
Q35.	How often did doctors speak too fast?				
	1	2	3	4	5
Q36.	How often did doctors use words that were hard to understand?				
	1	2	3	4	5
Q37.	How often did doctors ignore what you told them?				
	1	2	3	4	5
Q38.	How often did doctors appear to be distracted when they were with you?				
	1	2	3	4	5
Q39.	How often did doctors seem bothered if you asked several questions?				
	1	2	3	4	5
Q40.	How often did doctors really find out what your concerns were?				
	1	2	3	4	5
Q41.	How often did doctors let you say what you thought was important?				
	1	2	3	4	5
Q42.	How often did doctors take your health concerns very seriously?				
	1	2	3	4	5
Q43.	How often did doctors explain your test results such as blood tests, x-rays, or cancer screening tests?				
	1	2	3	4	5
Q44.	How often did doctors clearly explain the results of your physical exam?				
	1	2	3	4	5
Q45.	How often did doctors tell you what could happen if you didn't take a medicine that they prescribed for you?				
	1	2	3	4	5

	Never	Rarely	Sometimes	Usually	Always
Q46.	How often did doctors tell you about side effects that you might get from a medicine?				
	1	2	3	4	5

Now we have some questions about how you and your medical doctors decide about your health care. Again, please answer the following questions about the doctor who recommended and/or ordered the colon cancer screening test. Please tell us on average how often they did the following by circling the most appropriate response for each question:

	Never	Rarely	Sometimes	Usually	Always
Q47.	How often did doctors ask if you would have any problems following what they recommended?				
	1	2	3	4	5
Q48.	How often did doctors ask if you felt you could do the recommended treatment?				
	1	2	3	4	5
Q49.	How often did you and your doctors work out a treatment plan together?				
	1	2	3	4	5
Q50.	If there were treatment choices, how often did doctors ask if you would like to help decide your treatment?				
	1	2	3	4	5

The following questions are about the personal interactions between you and your doctor(s) at the UNT Health Family Medicine Clinics during 2007. Again, please answer the following questions about the doctor who recommended and/or ordered the colon cancer screening test. Please continue to think about your experiences and tell us on average how often they did the following:

	Never	Rarely	Sometimes	Usually	Always
Q51.	How often were doctors compassionate?				
	1	2	3	4	5
Q52.	How often did doctors give you support and encouragement?				
	1	2	3	4	5

	Never	Rarely	Sometimes	Usually	Always
Q53.	How often were doctors concerned about your feelings?				
	1	2	3	4	5
Q54.	How often did doctors really respect you as a person?				
	1	2	3	4	5
Q55.	How often did doctors treat you as an equal?				
	1	2	3	4	5
Q56.	How often did doctors make assumptions about your level of education?				
	1	2	3	4	5
Q57.	How often did doctors make assumptions about your income?				
	1	2	3	4	5
Q58.	How often did doctors pay less attention to you because of your race or ethnicity?				
	1	2	3	4	5
Q59.	How often did you feel discriminated against by doctors because of your race or ethnicity?				
	1	2	3	4	5

The next four questions ask about the doctor's front office staff, meaning the receptionist or the person you talk to on the phone to make an appointment. Please tell us on average how often they did the following by circling the most appropriate response for each question:

	Never	Rarely	Sometimes	Usually	Always
Q60.	How often were office staffs rude to you?				
	1	2	3	4	5
Q61.	How often did office staff talk down to you?				
	1	2	3	4	5
Q62.	How often did office staff give you a hard time?				
	1	2	3	4	5
Q63.	How often did office staff have a negative attitude toward you?				
	1	2	3	4	5

This section is going to ask about how you have been treated, and how you typically respond.

Q64. If you feel you have been treated unfairly, do you usually:
(Select the **best** response)

- Accept it as a fact of life
- Try to do something about it

Q65. And if you feel you have been treated unfairly, do you usually:
(Select the **best** response)

- Talk to other people about it
- Keep it to yourself

The next questions are about how you feel. These are some statements that people have made. For each of the following, please circle the most appropriate response for each question.

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know
Q66. I have someone I can turn to for support and understanding when things get rough.	1	2	3	4	5
Q67. I have someone I can really talk to.	1	2	3	4	5
Q68. I have someone who would help me out with things, like give me a ride, watch the kids or house, or fix something.	1	2	3	4	5
Q69. I have someone who would take care of me if I were sick.	1	2	3	4	5

We have one final question that we would like you to answer. Please circle the most appropriate response.

Q70. Now that you have completed this questionnaire, how likely are you to get a colon cancer screening test done in the future?

Not at all	Not very	Somewhat	Very	Extremely
1	2	3	4	5

You are at the end of the questionnaire.

Thank you for taking the time in answering the questions!

Please mail this back to our office in the provided envelope.

INSTRUMENT B.3

Dear Participant,

Enclosed you will find \$5 dollars as compensation for participating in this research study entitled “Understanding the Psychosocial Factors of Communication that Underlie Colorectal Cancer Screening Adherence,” which was carried out under the guidance of Dr. Roberto Cardarelli at the University of North Texas Health Science Center. We deeply appreciate your time and effort!

If you have any remaining study-related questions, you may contact Dr. Roberto Cardarelli, Principal Investigator, at 817-735-2625. If you have any questions regarding your rights as a participant in this study, you may contact Dr. Brian Gladue, Chairman of the Institutional Review Board –UNTHSC at Fort Worth, at 817-735-0409.

Thank you again!

Sincerely,

Michael A. Dunn
Medical Student IV
D.O./M.S. Candidate

INSTRUMENT B.4

Variable	Rule
Dependent Variable	
Self-report CRCS adherence	0 = Non-adherent 1 = Adherent
Chart-review CRCS adherence	0 = Non-adherent 1 = Adherent
Independent Variables	
Interpersonal Processes of Care	
Hurried communication	Instrument 6
Elicited concerns, responded	Instrument 6
Explained results/medications	Instrument 6
Patient-centered decision making	Instrument 6
Compassionate, respectful	Instrument 6
Discriminated	Instrument 6
Disrespectful office staff	Instrument 6
Covariates	
CRC screening knowledge	Instrument 5
CRC screening attitude	Instrument 5
Response to unfair treatment	Instrument 7
Social support	Instrument 8

Variable	Rule
Socioeconomic Factors	
Marital status	0 = Not married 1 = Married
Number in household	Actual value entered
Education level (completed)	0 = None 2 = Pre-school 3 = Grade school 4 = High school 5 = College 6 = Graduate school
Work status	1 = Employed 2 = Unemployed 3 = Homemaker 4 = Student 5 = Retired 6 = Disabled
Occupation	0 = None 1 = Labor 2 = Technical 3 = Clerical 4 = Managerial 5 = Professional 6 = Trade 7 = Service 8 = Student 9 = Other; free text entry

Variable	Rule
Demographic/Socioeconomic Factors	
Age	Actual value entered (in years)
Gender	1 = Male 2 = Female
Hispanic/Latino?	0 = No 1 = Yes
Race	1 = White 2 = Black/ African American 3 = Asian 4 = Native Hawaiian/ Pacific Islander 5 = American Indian/ Alaska Native 6 = Other; free text entry
General Health Status	
Co-morbid Conditions	
High cholesterol	0 = No, 1 = Yes
High blood pressure	0 = No, 1 = Yes
Diabetes	0 = No, 1 = Yes
Heart disease	0 = No, 1 = Yes
Lung disease	0 = No, 1 = Yes
Liver disease	0 = No, 1 = Yes
Kidney disease	0 = No, 1 = Yes
Colorectal cancer	0 = No, 1 = Yes
Other cancer	0 = No, 1 = Yes
Auto-immune problems	0 = No, 1 = Yes
Immune problems	0 = No, 1 = Yes
Depression/anxiety	0 = No, 1 = Yes
Other	0 = No, 1 = Yes; free text entry
Number of co-morbid conditions	0 = ≤ 2 co-morbidities 1 = > 2 co-morbidities

Variable	Rule
Health Care Access	
Health care coverage?	0 = None 1 = Yes 2 = Don't know/ not sure
Type of coverage	1 = Private 2 = HMO 3 = Medicaid/ EverCare/ Amerigroup 4 = Medicare 5 = Multiple 6 = Other; free text entry
Reason for no coverage	0 = Have coverage 1 = Can't afford 2 = Don't qualify for gov't programs 3 = Don't know if I qualify 4 = My employer doesn't provide 5 = Other; free text entry
Cost prohibited seeing doctor in 2007?	0 = No 1 = Yes
Last routine checkup	0 = Never 1 = < 1 year ago 2 = 1-2 years ago 3 = 2-5 years ago 4 = > 5 years ago

Variable	Rule
CRC History	
Family history of CRC?	0 = No 1 = Yes 2 = Don't know/ not sure
Did doctor recommend CRC screen?	0 = No 1 = Yes 2 = Don't know/ not sure
Type of CRC screen obtained	0 = Don't know/ not sure 1 = FOBT 2 = FS 3 = Colonoscopy 4 = DCBE 5 = FOBT + Colonoscopy 6 = FS + Colonoscopy 7 = FOBT + FS + Colonoscopy 8 = FOBT + Colonoscopy + DCBE 9 = All four tests

INSTRUMENT B.5

2nd order factor (scale) 1st order factor (scale)	Variable	Value	Average the number of non-missing numbers (Questionnaire Item #)
Knowledge			17, 18, 22, 25, 28
Heard of tests for CRC?	Q17_CRCS	0,1*	
Know of DCBE?	Q18_DCBE	0,1*	
Know of colonoscopy?	Q22_Colonoscopy	0,1*	
Know of flex sig?	Q25_FlexSig	0,1*	
Know of FOBT?	Q28_FOBT	0,1*	
Attitude			19, 20, 21, 23, 24, 26, 27, 29, 30
Worried DCBE would be embarrassing?	Q19_Embarrassing	1-5**	
Worried DCBE would be messy?	Q20_Messy	1-5**	
Worried DCBE would be painful?	Q21_Painful	1-5**	
Worried colonoscopy would be embarrassing?	Q23_Embarrassing	1-5**	
Worried colonoscopy would be painful?	Q24_Painful	1-5**	
Worried flex sig would be embarrassing?	Q26_Embarrassing	1-5**	
Worried flex sig would be painful?	Q27_Painful	1-5**	
Worried FOBT would be messy?	Q29_Messy	1-5**	
Worried DCBE would be inconvenient?	Q30_Inconvenient	1-5**	
<p>Scale scores for each respondent are calculated as the mean of the corresponding non-missing items High knowledge values reflect knowledge consistent with screening Low attitude values reflect attitudes consistent with screening</p> <p style="text-align: center;"> * 0 = No ** 1 = Not at all 1 = Yes 2 = Not very 3 = Somewhat 4 = Very 5 = Extremely </p>			

INSTRUMENT B.6

<i>DOMAIN</i> 2nd order factor (scale) 1st order factor (scale)	Direction of scoring*	Average the number of non-missing numbers (IPC Item #)	Average the number of non-missing numbers (Questionnaire Item #)
<i>COMMUNICATION</i>			
Hurried communication	-	1, 2, 3, 4, 5	35, 36, 37, 38, 39
Lack of clarity	-	1, 2	35, 36
Hurried, distracted	-	3, 4, 5	37, 38, 39
Elicited concerns, responded	+	6, 7, 8	40, 41, 42
Explained results/medications	+	9,10, 11, 12	43, 44, 45, 46
Explained results	+	9, 10	43, 44
Explained medications	+	11, 12	45, 46
<i>DECISION MAKING</i>			
Patient-centered decision making	+	13, 14, 15, 16	47, 48, 49, 50
Asked patient	+	13, 14	47, 48
Worked together	+	15, 16	49, 50
<i>INTERPERSONAL STYLE</i>			
Compassionate, respectful	+	17, 18, 19, 20, 21	51, 52, 53, 54, 55
Emotional support, compassion	+	17, 18, 19	51, 52, 53
Respectfulness	+	20, 21	54, 55
Discriminated	-	22, 23, 24, 25	56, 57, 58, 59
Assumed SES	-	22, 23	56, 57
Discriminated due to race/ethnicity	-	24, 25	58, 59
Disrespectful office staff	-	26, 27, 28, 29	60, 61, 62, 63
No items are reversed to create the summary scales Scale scores for each respondent are calculated as the mean of the corresponding non-missing items * - indicates high score is worse process, + indicates high score is better process			

INSTRUMENT B.7

<i>Unfair Treatment Scale</i> Sub-factor scale Sub-factor value	Variable	Value	Sum the value for non-missing numbers (Questionnaire Item #)
<i>Unfair Treatment</i>			64, 65
Unfair Treatment, part I	Q64_EOD01		
Try to do something about it		2	
Accept it as a fact of life		0	
Unfair Treatment, part II	Q64_EOD02		
Talk to other people about it		1	
Keep it to yourself		0	
Unfair Treatment scale for each respondent is calculated as the sum of the corresponding items BOTH questions 64 and 65 must be answered for calculation of the 'Unfair Treatment' scale			

Possible values for Unfair Treatment scale:

- | | | |
|----------------------------------|---|--------------|
| 1) Do something + Talk to others | 3 | Most active |
| 2) Do something + Keep to self | 2 | Active |
| 3) Accept + Talk to others | 1 | Passive |
| 4) Accept + Keep to self | 0 | Most passive |

INSTRUMENT B.8

<i>Social Support Scale</i> Sub-factor scale	Variable	Value	Average the number of non-missing numbers (Questionnaire Item #)
<i>Social Support</i>			66, 67, 68, 69
Have someone I can turn to	Q66_SS01	1-5*	
Have someone I can really talk to	Q67_SS02	1-5*	
Have someone to assist me	Q68_SS03	1-5*	
Have someone to care for me if sick	Q69_SS04	1-5*	
<p>Social Support scale for each respondent is calculated as the average of the corresponding items Low value indicates strong support base; high value indicates low support base: 1 = Strongly Agree 2 = Agree 3 = Neutral/ Don't Know 4 = Disagree 5 = Strongly Disagree</p>			

APPENDIX C

TABLES OF STUDY RESULTS

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Table 2. Interpretation of Survey Factors

Variable	Interpretation
Independent Variables	
Interpersonal Processes of Care	
Hurried communication	Higher score ~ worse outcome
Elicited concerns, responded	Higher score ~ better outcome
Explained results/medications	Higher score ~ better outcome
Patient-centered decision making	Higher score ~ better outcome
Compassionate, respectful	Higher score ~ better outcome
Discriminated	Higher score ~ worse outcome
Disrespectful office staff	Higher score ~ worse outcome
Covariates	
CRC screening knowledge	Higher score ~ better outcome
CRC screening attitude	Higher score ~ better outcome
Response to unfair treatment	Higher score ~ better outcome
Social support	Higher score ~ better outcome

Table 3. Descriptive Analysis of Study Characteristics (N = 45)

Variable	<i>Mean (SD)</i>
Interpersonal Processes of Care	
Hurried communication	1.80 (0.75)
Elicited concerns, responded	4.11 (1.12)
Explained results/medications	3.89 (1.02)
Patient-centered decision making	3.38 (1.19)
Compassionate, respectful	4.00 (1.03)
Discriminated	1.74 (1.01)
Disrespectful office staff	1.73 (1.06)
Covariates	
CRC screening knowledge	0.67 (0.28)
CRC screening attitude	3.85 (1.02)
Response to unfair treatment	2.41 (0.97)
Social support	4.02 (1.02)

Table 3. Descriptive Analysis of Study Characteristics (continued)

Variable	<i>n (%)</i>
Socioeconomic Factors	
Marital status	
Not married	14 (31.8)
Married	30 (68.2)
Number living with you: mean (SD)	1.47 (1.45)
Education level (completed)	
None	2 (4.5)
Pre-school	...
Grade school	4 (9.1)
High school	22 (50.0)
College	11 (25.0)
Graduate school	5 (11.4)
Work status	
Employed	13 (28.9)
Unemployed	...
Homemaker	4 (8.9)
Student	...
Retired	16 (35.6)
Disabled	12 (26.7)
Occupation	
None	19 (42.2)
Labor	2 (4.4)
Technical	...
Clerical	2 (4.4)
Managerial	4 (8.9)
Professional	5 (11.1)
Trade	3 (6.7)
Service	1 (2.2)
Student	...
Other	9 (20.0)

Table 3. Descriptive Analysis of Study Characteristics (continued)

Variable	<i>n (%)</i>
Demographic/Socioeconomic Factors	
Age: mean (SD)	62.3 (7.84)
Gender	
Male	19 (42.2)
Female	26 (57.8)
Hispanic/ Latino?	
No	39 (90.7)
Yes	4 (9.3)
Race	
White	31 (70.5)
Black/ African American	8 (18.2)
Asian	2 (4.5)
Native Hawaiian/ Pacific Islander	...
American Indian/ Alaska Native	...
Other	3 (6.8)
General Health Status	
Co-morbid Conditions	
High cholesterol	20 (50.0)
High blood pressure	32 (72.7)
Diabetes	13 (32.5)
Heart disease	9 (22.5)
Lung disease	5 (12.5)
Liver disease	3 (7.7)
Kidney disease	4 (9.8)
Colorectal cancer	5 (11.1)
Other cancer	6 (15.4)
Auto-immune problems	8 (19.5)
Immune problems	2 (5.1)
Depression/anxiety	17 (41.5)
Other	11 (27.5)

Table 3. Descriptive Analysis of Study Characteristics (continued)

Variable	<i>n (%)</i>
General Health Status	
Number of co-morbid conditions	
≤ 2 Co-morbidities	21 (47.7)
> 2 Co-morbidities	23 (52.3)
Health Care Access	
Health care coverage?	
No	...
Yes	45 (100.)
Don't know/ not sure	...
Type of coverage	
Private	7 (15.9)
HMO	7 (15.9)
Medicaid/ EverCare/ Amerigroup	3 (6.8)
Medicare	7 (15.9)
Multiple	12 (26.7)
Other	8 (17.8)
Reason for no coverage	
Have coverage	45 (100.)
Can't afford	...
Don't qualify for gov't programs	...
Don't know if I qualify for gov't programs	...
My employer doesn't provide coverage	...
Other	...
Cost prohibited seeing doctor in 2007?	
No	37 (84.1)
Yes	7 (15.9)
Last routine checkup	
Never	1 (2.3)
< 1 year ago	37 (84.1)
1-2 years ago	3 (6.8)
2-5 years ago	3 (6.8)
> 5 years ago	...

Table 3. Descriptive Analysis of Study Characteristics (continued)

Variable	<i>n (%)</i>
CRC History	
Family history of CRC?	
No	36 (80.0)
Yes	5 (11.1)
Don't know/ not sure	4 (8.9)
Did doctor recommend CRC screen?	
No	5 (11.4)
Yes	36 (81.8)
Don't know/ not sure	3 (6.8)
Type of CRC screen obtained	
Don't know/ not sure	3 (9.4)
FOBT	1 (3.1)
FS	...
Colonoscopy	17 (53.2)
DCBE	...
FOBT + Colonoscopy	5 (15.7)
FS + Colonoscopy	1 (3.1)
FOBT + FS + Colonoscopy	2 (6.2)
FOBT + Colonoscopy + DCBE	1 (3.1)
All four tests	2 (6.2)
Adherence to CRCS Recommendation	
Self-report CRCS adherence	
Non-adherent	4 (8.9)
Adherent	30 (66.7)
Test is scheduled	1 (2.2)
No CRCS recommendation given	7 (15.6)
No response	3 (6.6)
Chart-review CRCS adherence*	
Non-adherent	25 (55.6)
Adherent	20 (44.4)

* In this one instance, adherence is to CRCS guidelines, not recommendation.

**Table 4. Descriptive Analysis of Study Characteristics:
Participants with CRC Screening Recommendation (n = 36)**

Variable	<i>Mean (SD)</i>
Interpersonal Processes of Care	
Hurried communication	1.77 (0.74)
Elicited concerns, responded	4.18 (1.06)
Explained results/medications	4.01 (0.97)
Patient-centered decision making	3.53 (1.18)
Compassionate, respectful	4.06 (1.07)
Discriminated	1.71 (0.98)
Disrespectful office staff	1.74 (1.07)
Covariates	
CRC screening knowledge	0.75 (0.22)
CRC screening attitude	3.91 (0.97)
Response to unfair treatment	2.56 (0.88)
Social support	4.03 (1.08)

**Table 4. Descriptive Analysis of Study Characteristics:
Participants with CRC Screening Recommendation (continued)**

Variable	<i>n (%)</i>
Socioeconomic Factors	
Marital status	
Not married	11 (31.4)
Married	24 (68.6)
Number living with you: mean (SD)	1.65 (1.56)
Education level (completed)	
None	...
Pre-school	...
Grade school	1 (2.9)
High school	18 (51.4)
College	11 (31.4)
Graduate school	5 (14.3)
Work status	
Employed	10 (27.8)
Unemployed	...
Homemaker	4 (11.1)
Student	...
Retired	14 (38.9)
Disabled	8 (22.2)
Occupation	
None	14 (38.9)
Labor	1 (2.8)
Technical	...
Clerical	1 (2.8)
Managerial	4 (11.1)
Professional	5 (13.9)
Trade	2 (5.6)
Service	1 (2.8)
Student	...
Other	8 (22.2)

**Table 4. Descriptive Analysis of Study Characteristics:
Participants with CRC Screening Recommendation (continued)**

Variable	<i>n (%)</i>
Demographic/Socioeconomic Factors	
Age: mean (SD)	61.8 (7.32)
Gender	
Male	17 (47.2)
Female	19 (52.8)
Hispanic/ Latino?	
No	31 (91.2)
Yes	3 (8.8)
Race	
White	25 (71.4)
Black/ African American	6 (17.1)
Asian	1 (2.9)
Native Hawaiian/ Pacific Islander	...
American Indian/ Alaska Native	...
Other	3 (8.6)
General Health Status	
Co-morbid Conditions	
High cholesterol	17 (53.1)
High blood pressure	24 (68.6)
Diabetes	11 (34.4)
Heart disease	6 (18.8)
Lung disease	5 (15.6)
Liver disease	2 (6.5)
Kidney disease	2 (6.3)
Colorectal cancer	4 (11.1)
Other cancer	6 (19.4)
Auto-immune problems	6 (18.8)
Immune problems	1 (3.2)
Depression/anxiety	13 (40.6)
Other	9 (29.0)

**Table 4. Descriptive Analysis of Study Characteristics:
Participants with CRC Screening Recommendation (continued)**

Variable	<i>n (%)</i>
General Health Status	
Number of co-morbid conditions	
≤ 2 Co-morbidities	17 (48.6)
> 2 Co-morbidities	18 (51.4)
Health Care Access	
Health care coverage?	
No	...
Yes	36 (100.)
Don't know/ not sure	...
Type of coverage	
Private	6 (17.1)
HMO	5 (14.3)
Medicaid/ EverCare/ Amerigroup	1 (2.9)
Medicare	5 (14.3)
Multiple	10 (28.6)
Other	8 (22.9)
Reason for no coverage	
Have coverage	36 (100.)
Can't afford	...
Don't qualify for gov't programs	...
Don't know if I qualify for gov't programs	...
My employer doesn't provide coverage	...
Other	...
Cost prohibited seeing doctor in 2007?	
No	30 (85.7)
Yes	5 (14.3)
Last routine checkup	
Never	1 (2.9)
< 1 year ago	29 (82.9)
1-2 years ago	3 (8.6)
2-5 years ago	2 (5.7)
> 5 years ago	...

**Table 4. Descriptive Analysis of Study Characteristics:
Participants with CRC Screening Recommendation (continued)**

Variable	<i>n (%)</i>
CRC History	
Family history of CRC?	
No	30 (83.3)
Yes	3 (8.3)
Don't know/ not sure	3 (8.3)
Did doctor recommend CRC screen?	
No	...
Yes	36 (100.)
Don't know/ not sure	...
Type of CRC screen obtained	
Don't know/ not sure	2 (6.7)
FOBT	1 (3.3)
FS	...
Colonoscopy	16 (53.3)
DCBE	...
FOBT + Colonoscopy	5 (16.7)
FS + Colonoscopy	1 (3.3)
FOBT + FS + Colonoscopy	2 (6.7)
FOBT + Colonoscopy + DCBE	1 (3.3)
All four tests	2 (6.7)
Adherence to CRCS Recommendation	
Self-report CRCS adherence	
Non-adherent	4 (12.1)
Adherent	28 (84.8)
Test is scheduled	1 (2.9)
Chart-review CRCS adherence	
Non-adherent	17 (47.2)
Adherent	19 (52.8)

Table 5. Study Characteristics Stratified by Chart-review Adherence

	Adherent (n=19) Mean (SD)	Non-Adherent (n=17) Mean (SD)	<i>p-value</i>
Interpersonal Processes of Care			
Hurried communication	1.75 (0.77)	1.79 (0.73)	0.876
Elicited concerns, responded	4.19 (1.12)	4.17 (1.00)	0.943
Explained results/medications	3.89 (0.96)	4.15 (0.99)	0.435
Patient-centered decision making	3.63 (1.17)	3.41 (1.21)	0.583
Compassionate, respectful	4.05 (1.07)	4.06 (1.10)	0.986
Discriminated	1.76 (1.25)	1.65 (0.61)	0.721
Disrespectful office staff	1.79 (1.23)	1.69 (0.90)	0.788
Covariates			
CRC screening knowledge	0.77 (0.24)	0.73 (0.19)	0.596
CRC screening attitude	4.00 (0.90)	3.80 (1.07)	0.552
Response to unfair treatment	2.68 (0.82)	2.41 (0.94)	0.359
Social support	4.18 (1.13)	3.87 (1.04)	0.390

Table 5. Study Characteristics Stratified by Chart-review Adherence (continued)

	Adherent (n=19) n (%)	Non-Adherent (n=17) n (%)	<i>p-value</i>
Socioeconomic Factors			
Marital status			0.478 ^a
Not married	5 (26.3)	6 (37.5)	
Married	14 (73.7)	10 (62.5)	
Number living with you: mean (SD)	1.50 (1.30)	1.81 (1.83)	0.567
Education level (completed)			0.251 ^a
≤ High school	12 (63.2)	7 (43.8)	
> High school	7 (36.8)	9 (56.3)	
Work status			0.336 ^c
Employed/ Homemaker	7 (36.8)	7 (41.2)	
Retired	6 (31.6)	8 (47.1)	
Disabled	6 (31.6)	2 (11.8)	
Occupation			0.270 ^a
None	9 (47.4)	5 (29.4)	
Other	10 (52.6)	12 (70.6)	

Table 5. Study Characteristics Stratified by Chart-review Adherence (continued)

	Adherent (n=19) n (%)	Non-Adherent (n=17) n (%)	<i>p-value</i>
Demographic/Socioeconomic Factors			
Age: mean (SD)	60.0 (5.91)	63.8 (8.34)	0.128
Gender			0.516 ^a
Male	8 (42.1)	9 (52.9)	
Female	11 (57.9)	8 (47.1)	
Hispanic/ Latino?			1.000 ^b
No	16 (88.9)	15 (93.8)	
Yes	2 (11.1)	1 (6.2)	
Race			0.950 ^c
White	14 (73.7)	11 (68.8)	
Black/ African American	3 (15.8)	3 (18.8)	
Other	2 (10.5)	2 (12.5)	
General Health Status			
Chronic Health Problems			
High cholesterol	9 (52.9)	8 (53.3)	0.982 ^a
High blood pressure	13 (68.4)	11 (68.8)	0.983 ^a
Diabetes	7 (38.9)	4 (28.6)	0.712 ^b
Heart disease	4 (22.2)	2 (14.3)	0.672 ^b
Lung disease	3 (16.7)	2 (14.3)	1.000 ^b
Liver disease	0 (0.0)	2 (14.3)	0.196 ^b
Kidney disease	1 (5.6)	1 (7.1)	1.000 ^b
Colorectal cancer	...	...	...
Other cancer	4 (22.2)	2 (15.4)	1.000 ^b
Auto-immune problems	4 (22.2)	2 (14.3)	0.672 ^b
Immune problems	0 (0.0)	1 (7.7)	0.419 ^b
Depression/anxiety	8 (42.1)	5 (38.5)	1.000 ^b
Other	4 (22.2)	5 (38.5)	0.433 ^b

Table 5. Study Characteristics Stratified by Chart-review Adherence (continued)

	Adherent (n=19) n (%)	Non-Adherent (n=17) n (%)	<i>p-value</i>
General Health Status			
Number of co-morbid conditions			0.877 ^a
≤ 2 Co-morbidities	9 (47.4)	8 (50.0)	
> 2 Co-morbidities	10 (52.6)	8 (50.0)	
Health Care Access			
Health care coverage?			...
No	...	...
Yes	19 (100.)	17 (100.)	
Type of coverage			0.186 ^c
Private	4 (21.1)	2 (12.5)	
HMO	2 (10.5)	3 (18.7)	
Government provided	10 (52.6)	4 (25.0)	
Multiple sources	3 (15.8)	7 (43.8)	
Reason for no coverage			...
Have coverage	19 (100.)	17 (100.)	
Other	...	...
Cost prohibited seeing doctor in 2007?			1.000 ^b
No	15 (83.3)	15 (88.2)	
Yes	3 (16.7)	2 (11.8)	
Last routine checkup			1.000 ^b
≤ 1 year ago	16 (84.2)	13 (81.3)	
> 1 year ago	3 (15.8)	3 (18.7)	

Table 5. Study Characteristics Stratified by Chart-review Adherence (continued)

	Adherent (n=19) n (%)	Non-Adherent (n=17) n (%)	<i>p-value</i>
CRC History			
Family history of CRC?			1.000 ^b
No	17 (89.5)	13 (92.9)	
Yes	2 (10.5)	1 (7.1)	
Did doctor recommend CRC screen?			...
No	...	...
Yes	19 (100.)	17 (100.)	
Type of CRC screen obtained			0.341 ^c
FOBT	0 (0.0)	1 (9.1)	
FS	...	...
Colonoscopy	11 (64.7)	5 (45.5)	
DCBE	...	...
Multiple tests	6 (35.3)	5 (45.5)	

a – Chi-squared Test

b – Fisher’s Exact Test

c – Contains cell counts < 5; statistical robustness not ensured

Table 6. Study Characteristics Stratified by Self-report Adherence

	Adherent (n=29) Mean (SD)	Non-Adherent (n=4) Mean (SD)	<i>p-value</i>
Interpersonal Processes of Care			
Hurried communication	1.79 (0.74)	1.30 (0.60)	0.220
Elicited concerns, responded	4.20 (0.97)	3.92 (1.95)	0.791
Explained results/medications	4.00 (0.96)	4.13 (1.44)	0.815
Patient-centered decision making	3.59 (1.12)	3.63 (1.89)	0.963
Compassionate, respectful	4.05 (1.06)	4.15 (1.57)	0.866
Discriminated	1.80 (1.05)	1.44 (0.72)	0.509
Disrespectful office staff	1.76 (1.12)	1.69 (0.94)	0.904
Covariates			
CRC screening knowledge	0.77 (0.23)	0.60 (0.00)	0.001
CRC screening attitude	3.88 (0.92)	3.33 (1.28)	0.292
Response to unfair treatment	2.48 (0.95)	2.75 (0.50)	0.588
Social support	4.21 (0.98)	3.81 (0.99)	0.456

Table 6. Study Characteristics Stratified by Self-report Adherence (continued)

	Adherent (n=29) n (%)	Non-Adherent (n=4) n (%)	<i>p-value</i>
Socioeconomic Factors			
Marital status			1.000 ^b
Not married	9 (32.1)	1 (25.0)	
Married	19 (67.9)	3 (75.0)	
Number living with you: mean (SD)	1.41 (1.42)	2.50 (2.38)	0.198
Education level (completed)			0.295 ^b
≤ High school	17 (60.7)	1 (25.0)	
> High school	11 (39.3)	3 (75.0)	
Work status			0.210 ^c
Employed/ Homemaker	10 (34.5)	3 (75.0)	
Retired	12 (41.4)	0 (0.0)	
Disabled	7 (24.1)	1 (25.5)	
Occupation			0.136 ^b
None	13 (44.8)	0 (0.0)	
Other	16 (55.2)	4 (100.)	

Table 6. Study Characteristics Stratified by Self-report Adherence (continued)

	Adherent (n=29) n (%)	Non-Adherent (n=4) n (%)	<i>p-value</i>
Demographic/Socioeconomic Factors			
Age: mean (SD)	62.2 (7.20)	60.8 (8.88)	0.707
Gender			1.000 ^b
Male	14 (48.3)	2 (50.0)	
Female	15 (51.7)	2 (50.0)	
Hispanic/Latino?			1.000 ^b
No	24 (88.9)	4 (100.)	
Yes	3 (11.1)	0 (0.0)	
Race			0.524 ^c
White	20 (71.4)	3 (75.0)	
Black/ African American	5 (17.9)	0 (0.0)	
Other	3 (10.7)	1 (25.0)	
General Health Status			
Chronic Health Problems			
High cholesterol	13 (52.0)	3 (75.0)	0.606 ^b
High blood pressure	18 (64.3)	3 (75.0)	1.000 ^b
Diabetes	9 (36.0)	1 (25.0)	1.000 ^b
Heart disease	5 (20.0)	0 (0.0)	1.000 ^b
Lung disease	4 (16.0)	1 (25.0)	0.553 ^b
Liver disease	0 (0.0)	1 (25.0)	0.143 ^b
Kidney disease	1 (4.0)	0 (0.0)	1.000 ^b
Colorectal cancer	...	...	...
Other cancer	5 (20.8)	0 (0.0)	1.000 ^b
Auto-immune problems	5 (20.8)	0 (0.0)	1.000 ^b
Immune problems	1 (4.0)	0 (0.0)	1.000 ^b
Depression/anxiety	10 (38.5)	1 (25.0)	1.000 ^b
Other	5 (20.0)	3 (75.0)	0.052 ^b

Table 6. Study Characteristics Stratified by Self-report Adherence (continued)

	Adherent (n=29) n (%)	Non-Adherent (n=4) n (%)	<i>p-value</i>
General Health Status			
Number of co-morbid conditions			0.319 ^b
≤ 2 Co-morbidities	16 (57.1)	1 (25.0)	
> 2 Co-morbidities	12 (42.9)	3 (75.0)	
Health Care Access			
Health care coverage?			...
No	...	...
Yes	29 (100.)	4 (100.)	
Type of coverage			0.829 ^c
Private	4 (14.3)	1 (25.0)	
HMO	4 (14.3)	0 (0.0)	
Government provided	12 (42.9)	2 (50.0)	
Multiple sources	8 (28.6)	1 (25.0)	
Reason for no coverage			...
Have coverage	29 (100.)	4 (100.)	
Other	...	...
Cost prohibited seeing doctor in 2007?			1.000 ^b
No	24 (85.7)	4 (100.)	
Yes	4 (14.3)	0 (0.0)	
Last routine checkup			1.000 ^b
≤ 1 year ago	23 (82.1)	3 (75.0)	
> 1 year ago	5 (17.9)	1 (25.0)	

Table 6. Study Characteristics Stratified by Self-report Adherence (continued)

	Adherent (n=29) n (%)	Non-Adherent (n=4) n (%)	<i>p-value</i>
CRC History			
Family history of CRC?			0.349 ^b
No	25 (92.6)	3 (75.0)	
Yes	2 (7.4)	1 (25.0)	
Did doctor recommend CRC screen?			...
No	...	...
Yes	29 (100.)	4 (100.)	
Type of CRC screen obtained			0.449 ^c
FOBT	1 (3.7)	0 (0.0)	
FS	...	...
Colonoscopy	16 (59.3)	0 (0.0)	
DCBE	...	...
Multiple tests	10 (37.0)	1 (100.)	

a – Chi-squared Test

b – Fisher’s Exact Test

c – Contains cell counts < 5; statistical robustness not ensured

Table 7. Unadjusted Odds Ratios of Factors Associated with Self-report Adherence (n = 33)

	Adherent to CRCS Recommendation		
	OR	95% CI	<i>p-value</i>
Interpersonal Processes of Care			
Hurried communication	5.080	0.357 – 72.269	0.230
Elicited concerns, responded	1.242	0.523 – 2.949	0.623
Explained results/medications	0.871	0.286 – 2.656	0.808
Patient-centered decision making	0.978	0.401 – 2.389	0.962
Compassionate, respectful	0.915	0.338 – 2.474	0.861
Discriminated	1.634	0.386 – 6.920	0.505
Disrespectful office staff	1.067	0.386 – 2.953	0.901
Covariates			
CRC screening knowledge	31.399	0.219 – 4.491E+3	0.173
CRC screening attitude	1.854	0.588 – 5.848	0.292
Response to unfair treatment	0.642	0.130 – 3.166	0.586
Social support	1.433	0.562 – 3.654	0.451

Table 7. Unadjusted Odds Ratios of Factors Associated with Self-report Adherence (continued)

	Adherent to CRCS Recommendation		
	OR	95% CI	<i>p-value</i>
Socioeconomic Factors			
Marital status			
Not married	...	...	...
Married	0.704	0.064 – 7.742	0.774
Number living with you	0.692	0.288 – 1.232	0.211
Education level (completed)			
≤ High school	...	...	...
> High school	0.216	0.020 – 2.347	0.208
Work status			
Employed/ Homemaker	...	...	...
Retired	N/S	N/S	N/S
Disabled	2.100	0.179 – 24.596	0.555
Occupation			
None	...	...	...
Other	N/S	N/S	N/S

Table 7. Unadjusted Odds Ratios of Factors Associated with Self-report Adherence (continued)

	Adherent to CRCs Recommendation		
	OR	95% CI	<i>p-value</i>
Demographic/Socioeconomic Factors			
Age	1.031	0.885 – 1.200	0.698
Gender			
Male	...	...	...
Female	1.071	0.132 – 8.670	0.948
Hispanic/ Latino?			
No	...	...	...
Yes	N/S	N/S	N/S
Race			
White	...	...	...
Black/ African American	N/S	N/S	N/S
Other	0.450	0.035 – 5.868	0.542
General Health Status			
Chronic Health Problems			
High cholesterol	0.361	0.033 – 3.962	0.405
High blood pressure	0.600	0.055 – 6.558	0.675
Diabetes	1.687	0.152 – 18.714	0.670
Heart disease	N/S	N/S	N/S
Lung disease	0.571	0.047 – 6.983	0.661
Liver disease	N/S	N/S	N/S
Kidney disease	N/S	N/S	N/S
Colorectal cancer	N/S	N/S	N/S
Other cancer	N/S	N/S	N/S
Auto-immune problems	N/S	N/S	N/S
Immune problems	N/S	N/S	N/S
Depression/anxiety	1.875	0.171 – 20.609	0.607
Other	0.083	0.007 – 0.982	0.048

Table 7. Unadjusted Odds Ratios of Factors Associated with Self-report Adherence (continued)

	Adherent to CRCS Recommendation		
	OR	95% CI	<i>p-value</i>
General Health Status			
Number of co-morbid conditions			
≤ 2 Co-morbidities	...	...	...
> 2 Co-morbidities	0.225	0.023 – 2.711	0.254
Health Care Access			
Health care coverage?			
No	...	...	...
Yes	N/S	N/S	N/S
Type of coverage			
Private	...	...	...
HMO	N/S	N/S	N/S
Government Provided	1.500	0.106 – 21.312	0.765
Multiple	2.000	0.098 – 41.003	0.653
Reason for no coverage			
Have coverage	...	...	...
Other	N/S	N/S	N/S
Cost prohibited seeing doctor in 2007?			
No	...	...	...
Yes	N/S	N/S	N/S
Last routine checkup			
≤ 1 year ago	...	...	...
> 1 year ago	0.652	0.056 – 7.642	0.734

Table 7. Unadjusted Odds Ratios of Factors Associated with Self-report Adherence (continued)

	Adherent to CRCS Recommendation		
	OR	95% CI	<i>p-value</i>
CRC History			
Family history of CRC?			
No	...	...	...
Yes	0.240	0.016 – 3.510	0.297
Did doctor recommend CRC screen?			
No	...	...	...
Yes	N/S	N/S	N/S
Type of CRC screen obtained			
FOBT	...	...	...
FS	N/S	N/S	N/S
Colonoscopy	N/S	N/S	N/S
DCBE	N/S	N/S	N/S
Multiple tests	N/S	N/S	N/S

Table 8. Interactions Discovered while Building Adherence Models

	IPC: Hurried	IPC: Elicited	IPC: Explained	IPC: PCDM	IPC: Compassion	IPC: Discriminated	IPC: Disrespectful	CSS: Attitude	Education Level	Co-Morbidities	Social Support	Number Living with you
IPC: Hurried								Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
IPC: Elicited								<i>p-value</i> 0.005	Not Significant	Not Significant	Not Significant	Not Significant
IPC: Explained								<i>p-value</i> 0.003	Not Significant	Not Significant	Not Significant	Not Significant
IPC: PCDM								<i>p-value</i> 0.001	Not Significant	Not Significant	Not Significant	Not Significant
IPC: Compassion								<i>p-value</i> 0.001	Not Significant	Not Significant	Not Significant	Not Significant
IPC: Discriminated								Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
IPC: Disrespectful								Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Attitude	Not Significant	<i>p-value</i> 0.005	<i>p-value</i> 0.003	<i>p-value</i> 0.001	<i>p-value</i> 0.001	Not Significant	Not Significant		Not Significant	Not Significant	Not Significant	Not Significant
Education Level	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant		Not Significant	<i>p-value</i> 0.015	Not Significant
Co-Morbidities	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant		Not Significant	Not Significant
Social Support	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	<i>p-value</i> 0.015	Not Significant		Not Significant
Number Living with you	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	



Interaction between IPC factors not investigated

Table 9. Adjusted, Predictive Model utilizing IPC Factors in Aggregate for Self-report Adherence[§]

	Adherent to CRCS Recommendation		
	AOR*	95% CI*	<i>p-value</i> *
Interpersonal Processes of Care			
Hurried communication	70.664	0.169 – 2.952E+4	0.167
Elicited concerns, responded	12.190	0.032 – 4.683E+3	0.410
Explained results/medications	0.014	0.000 – 226.015	0.386
Patient-centered decision making	0.673	0.002 – 229.241	0.894
Compassionate, respectful	2.150	0.071 – 64.680	0.659
Discriminated	0.341	0.013 – 9.289	0.523
Disrespectful office staff	1.058	0.168 – 6.641	0.952
Covariates			
Social Support	9.124	0.474 – 179.133	0.142
Number living with you	0.212	0.013 – 3.352	0.271

[§] Model: n=30, R² of 0.532, and a model significance of 0.331 from the Omnibus Tests of Model Coefficients

* Variables in table adjusted for: Interpersonal Processes of Care, ‘social support’, and ‘number living with you’

Table 10. Adjusted, Predictive Models utilizing Individual IPC Factors for Self-report Adherence^{\$}

	Adherent to CRCS Recommendation		
	AOR*	95% CI*	<i>p-value</i> *
Interpersonal Processes of Care			
Hurried communication	3.653	0.153 – 87.096	0.423
Elicited concerns, responded	1.118	0.437 – 2.858	0.816
Explained results/medications	0.932	0.267 – 3.255	0.912
Patient-centered decision making	1.036	0.389 – 2.755	0.944
Compassionate, respectful	0.960	0.314 – 2.941	0.944
Discriminated	0.553	0.066 – 4.672	0.587
Disrespectful office staff	1.624	0.363 – 7.269	0.526

^{\$} Model: n=30

* Each separate model adjusted for: ‘number living with you’, ‘education level’, and ‘number of co-morbidities’

Table 11. Adjusted, Predictive Model for Self-report Adherence^{\$}

	Adherent to CRCS Recommendation		
	AOR*	95% CI*	<i>p-value</i>*
Hurried communication	21.438	0.931 – 493.692	0.055
Social support	3.754	0.822 – 17.141	0.088
Number living with you	0.474	0.199 – 1.127	0.091

^{\$} Model: n=30, R² of 0.431, and a model significance of 0.05 from the Omnibus Tests of Model Coefficients

* Variables in table adjusted for: ‘hurried communication’, ‘social support’, and ‘number living with you’

REFERENCES

1. Compliance Action Program. American Heart Association. <http://www.americanheart.org>; accessed December 2008.
2. Woolf SH, Johnson RE. The Break-Even Point: When Medical Advances Are Less Important Than Improving the Fidelity With Which They Are Delivered. *Annals of Family Medicine*; 2005, 3:545-552.
3. Patient Compliance. *The Merck Manual of Diagnosis and Therapy*; Section 22, Chapter 301: <http://www.merck.com/mrkshared/mmanual>.
4. Tabor PA, Lopez DA. Comply with Us: Improving Medication Adherence. *Journal of Pharmacy Practice*; 2004, 17(3):167-181.
5. Cline CM, Bjorck-Linne AK, et al. Non-compliance and Knowledge of Prescribed Medication in Elderly Patients with Heart Failure. *European Journal of Heart Failure*; 1999, 1(2):145-9.
6. Improving Compliance. *The Merck Manual of Medical Information – Second Home Edition*, Online Medical Library: <http://www.merck.com/mmhe>.
7. Lee M, Kemp JA, et al. A Randomized Control Trial of Enhanced Patient Compliance Program for *Helicobacter pylori* Therapy. *Archives of Internal Medicine*; 1999, 159: 2312-6.
8. Miller N, et al. The Multilevel Compliance Challenge: Recommendations for a Call to Action. A Statement for Healthcare Professionals. American Heart Association. 2001.
9. O’Connell MB, Johnson JF. Evaluation of Medical Knowledge in elderly Patients. *Annals of Pharmacotherapy*; 1992, 26(7): 919-921.
10. Pawar M. Five Tips for Generating Patient Satisfaction and Compliance. *Family Practice Management*. American Academy of Family Physicians; June 2005.
11. Stewart RB, Caranasos GJ. Medication Compliance in the Elderly. *The Medical Clinics of North America*; 1989, 73(6): 1551-63.

12. Stewart AL, Napoles-Springer A, Perez-Stable EJ, et al. Interpersonal Processes of Care in Diverse Populations. *The Milbank Quarterly*. 1999; 77(3): 305-331.
13. Jemal et al. Annual Report to the Nation on the Status of Cancer, 1975 – 2005, Featuring Trends in Lung Cancer, Tobacco Use, and Tobacco Control. *JNCI*. 2008; 100(23): 1672-1694.
14. *American Cancer Society. Colorectal Cancer Facts & Figures 2008-2010*. Atlanta:American Cancer Society, 2008.
15. Colorectal Cancer Screening Rates, Centers for Disease Control and Prevention, Department of Health and Human Services, http://www.cdc.gov/cancer/colorectal/statistics/screening_rates.htm; site accessed February 22, 2009.
16. Screening for colorectal cancer, U.S. Preventive Services Task Force. <http://www.ahrq.gov/clinic/uspstf/uspsscolo.htm#summary>; accessed December 2008.
17. Levin B, Lieberman DA, McFarland, et al. Screening and Surveillance for the Early Detection of Colorectal Cancer and Adenomatous Polyps, 2008: A Joint Guideline from the American Cancer Society, the US Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology. *CA Cancer J Clin*. 2008; 58(3):130-160.
18. Rex DK, Johnson DA, Anderson JC, Schoenfeld PS, Burke CA, Inadomi JM. American College of Gastroenterology Guidelines for Colorectal Cancer Screening 2008. *Am J Gastroenterol*. 2009; 104:739-750.
19. Smith D. Compliance Packaging: A Patient Education Tool. *American Pharmacy*. 1989; 29(2).
20. Strandberg LR. Drugs as a Reason for Nursing Home Admission. *American Health Care Association Journal*. 1984; 10(20).
21. The Forgetful Patient: The High Cost of Improper Patient Compliance. Schering Report IX. 1987.
22. Making Cancer Health Disparities History: Report of the Trans-HHS Cancer Health Disparities Progress Review Group. U.S. Department of Health and Human Services. March 2004.

23. National Healthcare Disparities Report. U.S. Department of Health and Human Services Agency for Healthcare Research and Quality. Rockville, Maryland. 2003.
24. Garnett WR, Davis LJ, et al. Effect of Telephone Follow-up on Medication Compliance. *American Journal of Hospital Pharmacy*; 1981, 38(5):676-9.
25. Lau HS, Beuning KS, et al. Non-compliance in Elderly People: Evaluation of Risk Factors by Longitudinal Data Analysis. *Pharmacy World & Science*; 1996, 18(2): 63-68.
26. Lawsin C, DuHamel K, Weiss A, Rakowski W, Jandork L. Colorectal Cancer Screening among Low-Income African Americans in East Harlem: A Theoretical Approach to Understanding Barriers and Promoters to Screening. *Journal of Urban Health*. 2006; 84(1): 32-44.
27. Katz ML, James AS, Pignone MP, Hudson MA, Jackson E, Oates V, Campbell MK. Colorectal cancer screening among African American church members: A qualitative and quantitative study of patient-provider communication. *BMC Public Health*. 2004; 4:62.
28. O'Malley AS, Forrest CB, Mandelblatt J. Adherence of Low-income Women to Cancer Screening Recommendations: The Roles of Primary Care, Health Insurance, and HMOs. *Journal of General Internal Medicine*. 2002; 17:144-154.
29. Seeff L, Nadel M, Blackman D, Pollack LA. Colorectal cancer test use among persons aged 50 years and older – United States, 2001. *MMWR* 2003; 52:193–6.
30. Ghafoor A, Jemal A, Cokkinides V, et al. Cancer statistics for African Americans. *CA Cancer J Clin*. 2002; 52(6):326-341.
31. Troisi RJ, Freedman AN, Devesa SS. Incidence of colorectal carcinoma in the US; an update of trends by gender, race, age, subsite, and stage, 1975-1994. *Cancer*. 1999; 85(8):1670-1676.
32. Theuer CP, Wagner JL, Taylor TH, et al., Racial and ethnic colorectal cancer patterns affect the cost-effectiveness of colorectal cancer screening in the United States. *Gastroenterology*. 2001; 120(4):848-856.
33. Parker SL, Davis KJ, Wingo PA, Ries LA, Heath CW Jr. Cancer statistics by race and ethnicity. *CA Cancer J Clin*. 1998; 48(1):31-48.

34. *Cancer Facts & Figures for African Americans 2005-2006*. Atlanta, GA:American Cancer Society; 2005.
35. *Cancer Prevention & Early Detection Facts and Figures*. Atlanta, GA:American Cancer Society; 2005.
36. Vijan S, Hwang EW, Hofer TP, Hayward RA. Which colon cancer screening test? A comparison of costs, effectiveness, and compliance. *Am J Med*. 2001; 111:593– 601.
37. Crott R. The cost-effectiveness of screening for colorectal cancer. *Expert Rev. Pharmacoeconomics Outcomes Res*. 2001; 1:157 – 66.
38. Pignone M, Saha S, Hoerger T, Mandelblatt J. Cost-effectiveness analyses of colorectal cancer screening: a systematic review for the U.S. Preventive Services Task Force. *Ann Intern Med*. 2002; 137:96– 104.
39. Lieberman DA. Cost-effectiveness model for colon cancer screening. *Gastroenterology*. 1995; 109:1781 –90.
40. Frazier AL, Colditz GA, Fuchs CS, Kuntz KM. *JAMA*. 2000; 284(15):1954– 61.
41. Subramanian S, Klosterman M, Amonkar MM, Hunt TL. Adherence with colorectal cancer screening guidelines; a review. *Preventive Medicine*. 2004; 38:536-550.
42. Breen N, Wagener DK, Brown ML, Davis WW, Ballard-Barbash R. Progress in cancer screening over a decade: results of cancer screening from the 1987, 1992, and 1998 National Health Interview Surveys. *J Natl Cancer Inst*. 2001; 93:1704–1713.
43. Morrow GR, Way J, Hoagland AC, Cooper R. Patient compliance with self-directed Hemoccult testing. *Prev Med*. 1982; 11:512–20.
44. Bernstein AB, Thompson GB, Harlan LC. Differences in rates of cancer screening by usual source of medical care. Data from the 1987 National Health Interview Survey. *Med Care*.1991; 29:196– 209.
45. Brown ML, Potosky AL, Thompson GB, Kessler LG. The knowledge and use of screening tests for colorectal and prostate cancer: data from the 1987 National Health Interview Survey. *Prev Med*.1990; 19:562– 74.

46. Myers RE, Trock BJ, Lerman C, Wolf T, Ross E, Engstrom PF. Adherence to colorectal cancer screening in an HMO population. *Prev Med.* 1990; 19:502–14.
47. Myers RE, Ross EA, Wolf TA, Balslem A, Jepson C, Miller L. Behavioral interventions to increase adherence in colorectal cancer screening. *Med Care.* 1991;29:1039– 50.
48. Myers RE, Ross E, Jepson C, Wolf T, Balslem A, Millner L, et al. Modeling adherence to colorectal cancer screening. *Prev Med.* 1994; 23:142–51.
49. Polednak AP. Knowledge of colorectal cancer and use of screening tests in persons 40 – 74 years of age. *Prev Med.* 1990; 19:213– 26.
50. Thrasher JF, Cummings KM, Michalek AM, Mahoney MC, Moysich KB, Pillittere DM. Colorectal cancer screening among individuals with and without a family history. *J Public Health Manag Pract.* 2002; 8:1– 9.
51. Hsia J, Kemper E, Kiefe C, Zapka J, Sofaer S, Pettinger M, et al. The importance of health insurance as a determinant of cancer screening: evidence from the Women’s Health Initiative. *Prev Med.* 2000; 31:261– 70.
52. Jepson C, Kessler LG, Portnoy B, Gibbs T. Black– white differences in cancer prevention knowledge and behavior. *Am J Public Health.* 1991; 81:501– 4.
53. Lemon S, Zapka J, Puleo E, Luckmann R, Chasan-Taber L. Colorectal cancer screening participation: comparisons with mammography and prostate-specific antigen screening. *Am J Public Health.* 2001; 91:1264– 72.
54. Kelly RB, Shank JC. Adherence to screening flexible sigmoidoscopy in asymptomatic patients. *Med Care.* 1992; 30:1029– 42.
55. Cardarelli R, Thomas JE. Having a Personal Health Care Provider and Receipt of Colorectal Cancer Testing. *Annals of Family Medicine.* 2009; 7(1):5-10.
56. Mandel IG, Franks P, Dickinson JC. Screening guidelines in a family medicine program: a five-year experience. *J Fam Pract.* 1982; 14:901– 7.
57. Maxwell AE, Bastani R, Warda US. Demographic predictors of cancer screening among Filipino and Korean immigrants in the United States. *Am J Prev Med.* 2000; 18:62 –8.
58. Zapka JG, Puleo E, Vickers-Lahti M, Luckmann R. Healthcare system factors and colorectal cancer screening. *Am J Prev Med.* 2002; 23:28– 35.

59. Ruffin MT, Gorenflo DW, Woodman B. Predictors of screening for breast, cervical, colorectal, and prostatic cancer among community-based primary care practices. *J Am Board Fam Pract.* 2000; 13:1 –10.
60. Potosky AL, Breen N, Graubard BI, Parsons PE. The association between health care coverage and the use of cancer screening tests. Results from the 1992 National Health Interview Survey. *Med Care.* 1998; 36:257– 70.
61. McCarthy BD, Moskowitz MA. Screening flexible sigmoidoscopy: patient attitudes and compliance. *J Gen Intern Med.* 1993; 8:120–5.
62. Powe BD. Fatalism among elderly African Americans. Effects on colorectal cancer screening. *Cancer Nurs.* 1995; 18:385–92.
63. Lewis SF, Jensen NM. Screening sigmoidoscopy. Factors associated with utilization. *J Gen Intern Med.* 1996; 11:542– 4.
64. Brawarsky P, Brooks DR, Mucci LA, Wood PA. Effect of physician recommendation and patient adherence on rates of colorectal cancer testing. *Cancer Detec Prev.* 2004; 28(4):260-268.
65. Holt Jr WS. Factors affecting compliance with screening sigmoidoscopy. *J Fam Pract.* 1991; 32:585– 9.
66. Janz NK, Wren PA, Schottenfeld D, Guire KE. Colorectal cancer screening attitudes and behavior: a population-based study. *Prev Med.* 2003; 37(6 Pt 1):627-634.
67. Klabunde CN, Frame PS, Meadow A, Jones E, Nadel M, Verson SW. A national survey of primary care physicians' colorectal cancer screening recommendations and practices. *Prev Med.* 2003; 36(3)352-362.
68. Klabunde CN, Schenck AP, Davis WW. Barriers to colorectal cancer screening among Medicare consumers. *Am J Prev Med.* 2006; 30(4):313-319.
69. Levy BT, Dawson J, Hartz AJ, James PA. Colorectal cancer testing among patients cared for by Iowa family physicians. *Am J Prev Med.* 2006; 31(3):193-201.
70. Mandelson MT, Curry SJ, Anderson LA, Nadel MR, Lee NC, Rutter CM, et al. Colorectal cancer screening participation by older women. *Am J Prev Med.* 2000; 19(3):149-154.

71. Seeff LC, Nadel MR, Klabunde CN, et al. Patterns and predictors of colorectal cancer test use in the adult U.S. population. *Cancer*. 2004; 100(10):2093-2103.
72. Weitzman ER, Zapka J, Estabrook B, Goins KV. Risk and reluctance: understanding impediments to colorectal cancer screening. *Prev Med*. 2001; 32:502-13.
73. Yepes-Rios M, Reimann JO, Talavera AC, Ruiz de EA, Talavera GA. Colorectal cancer screening among Mexican Americans at a community clinic. *Am J Prev Med*. 2006; 30(3):204-210.
74. Leard LE, Savides TJ, Ganiats TG. Patient preferences for colorectal cancer screening. *J Fam Pract*. 1997; 45(3):205-208.
75. Safran DG, Kosinski M, Tarlov AR, et al. The Primary Care Assessment Survey: tests of data quality and measurement performance. *Med Care*. 1998; 36:728-739.
76. Bloch S, Ashwanden P, Neugut AI, Field M, Rubin M, Apfelbaum T, et al. Utilizing television to promote a community colon cancer screening program. *Prog Clin Biol Res*. 1990; 339:311-323.
77. Friedman LC, Everett TE, Peterson L, Ogbonnaya KI, Mendizabal V. Compliance with fecal occult blood test screening among low-income medical outpatients: a randomized controlled trial using a videotaped intervention. *J Cancer Educ*. 2001; 16:85-88.
78. Madlon-Kay DJ. Improving the periodic health examination: use of a screening flow chart for patients and physicians. *J Fam Pract*. 1987; 25:470-473.
79. Pignone M, Harris R, Kinsinger L. Videotape-based decision aid for colon cancer screening. A randomized, controlled trial. *Ann Intern Med*. 2000; 133:761-769.
80. Struewing JP, Pape DM, Snow DA. Improving colorectal cancer screening in a medical residents' primary care clinic. *Am J Prev Med*. 1991; 7:75-81.
81. Tilley BC, Vernon SW, Myers R, Glanz K, Lu M, Hirst K, et al. The Next Step Trial: impact of a worksite colorectal cancer screening promotion program. *Prev Med*. 1999; 28:276-283.

82. Weinrich SP, Weinrich MC, Stromborg MF, Boyd MD, Weiss HL. Using elderly educators to increase colorectal cancer screening. *Gerontologist*. 1993; 33:491-496.
83. Anderson LM, May DS. Has the use of cervical, breast, and colorectal cancer screening increased in the United States? *Am J Public Health*. 1995; 85:840-842.
84. Community intervention trial for smoking cessation (COMMIT): II. Changes in adult cigarette smoking prevalence. *Am J Public Health*. 1995; 85:193-200.
85. Fortmann SP, Taylor CB, Flora JA, Jatulis DC. Changes in adult cigarette smoking prevalence after 5 years of community health education: the Stanford Five-City Project. *Am J Epidemiol*. 1993; 137:82-96.
86. Brenes GA, Paskett ED. Predictors of stage of adoption for colorectal cancer screening. *Prev Med*. 2000; 31:410-416.
87. Farrands PA, Hardcastle JD, Chamberlin J, Moss S. Factors affecting compliance with screening for colorectal cancer. *Community Med*. 1984; 6:12-19.
88. Vernon SW. Participation in colorectal cancer screening: a review. *J Natl Cancer Inst*. 1997; 89:1406-1422.
89. Vernon SW, Myers RE, Tilley BC, Li S. Factors associated with perceived risk in automobile employees at increased risk of colorectal cancer. *Cancer Epidemiol Biomarkers Prev*. 2001; 10(1):35-43.
90. Lewis JD, Asch DA, Ginsberg GG, Hoops TC, Kochman ML, Bilker WB, et al. Primary care physicians' decisions to perform flexible sigmoidoscopy. *J Gen Intern Med*. 1999; 14:297-302.
91. Beeker C, Kraft JM, Southwell BG, Jorgensen CM. Colorectal cancer screening in older men and women: qualitative research findings and implications for intervention. *J Commun Health*. 2000; 25:263-278.
92. Price JH. Perceptions of colorectal cancer in a socioeconomically disadvantaged population. *J Commun Health*. 1993; 18:347-362.
93. Leard LE, Savides TJ, Ganiats TG. Patient preferences for colorectal cancer screening. *J Fam Pract*. 1997; 45:205-208.
94. Ling BS, Moskowitz MA, Wachs D, Pearson B, Schroy PC. Attitudes toward colorectal cancer screening tests. *J Gen Intern Med*. 2001; 16:822-830.

95. Pignone M, Bucholtz D, Harris R. Patient preferences for colon cancer screening. *J Gen Intern Med.* 1999; 14:432-437.
96. Vernon SW, Myers RE, Tilley BC. Development and validation of an instrument to measure factors related to colorectal cancer screening adherence. *Cancer Epidemiol Biomarkers Prev.* 1997; 6:825-832.
97. Wolf et al. Development of a Brief Survey on Colon Cancer Screening Knowledge and Attitudes Among Veterans. *Prev Chronic Dis.* 2005; 2(2):1-10.
98. Cooper GS, Yuan Z, Rimm AA. Racial disparity in the incidence and case-fatality of colorectal cancer: analysis of 329 United States counties. *Cancer Epidemiol Biomarkers Prev.* 1997; 6(4):283-285.
99. Ionescu MV, Carey F, Tait IS, Steele RJ. Socioeconomic status and stage at presentation of colorectal cancer. *Lancet.* 1998; 352:1439.
100. Mandelblatt J, Andrews H, Kao R, Wallace R, Kerner J. The late-stage diagnosis of colorectal cancer: demographic and socioeconomic factors. *Am J Public Health.* 1996; 86(12):1794-1797.
101. Tavani A, Fioretti F, Franceschi S, Gallus S, Negri E, Montella M, et al. Education, socioeconomic status and risk of cancer of the colon and rectum. *Int J Epidemiol.* 1999; 28(3):380-385.
102. Center for Disease Control and Prevention. National Health Interview Survey Public Data Use File 2000. National Center for Health Statistics.
103. Polite BN, Dignam JJ, Olopade OI. Colorectal cancer model of health disparities: understanding mortality differences in minority populations. *J Clin Oncol.* 2006; 24(14):2179-2187.
104. Ries LAG, Eisner MP, Kosary CL, et al. *SEER Cancer Statistics Review, 1975-2002.* Bethesda, Maryland: National Cancer Institute; 2005.
105. American Cancer Society. *Colorectal Cancer Facts and Figures Special Edition, 2005.* Atlanta: American Cancer Society, Inc.; 2005.
106. Krieger N, Smith K, Naishadham D, et al. Experiences of discrimination: validity and reliability of a self-report measure for population health research on racism and health. *Soc Sci Med.* 2005; 61: 1576-1596.

107. Krieger N. Racial and gender discrimination: risk factors for high blood pressure? *Soc Sci Med.* 1990; 30:1273-1281.
108. Krieger N, Sidney S. Racial discrimination and blood pressure: The CARDIA study of young black and white adults. *Am J Public Health.* 1996; 86:1370-1378.
109. Ross CE, Van Willigen M. Education and the subjective quality of life. *J Health Soc Behav.* 1997; 38:275-297.
110. Kaplan HB, Robbins C, Martin SS. Antecedents of psychological distress in young adults: self-rejection, deprivation of social support and life events. *Journal of Health and Social Behavior.* 1983; 24:230-244.
111. DiPalma AM, Barnes SE, DiPalma JA. Patient participation in colon cancer screening programs. *South. Med J.* 1998; 91:342-344.
112. Mandel JS, Bond JH, Church TR, Snover DC, Bradley GM, Schuman LM, et al. Reducing mortality from colorectal cancer by screening for fecal occult blood. Minnesota Colon Cancer Control Study. *N Engl J Med.* 1993; 328:1365-1371.
113. Myers RE, Balshem AM, Wolf TA, Ross EA, Millner L. Adherence to continuous screening for colorectal neoplasia. *Med Care.* 1993; 31:508-519.
114. Thomas W, White CM, Mah J, Geisser MS, Church TR, Mandel JS. Longitudinal compliance with annual screening for fecal occult blood. Minnesota Colon Cancer Control Study. *Am J Epidemiol.* 1995; 142:176-182.
115. Weissfeld JL, Ling BS, Schoen RE, Bresalier RS, Riley T, Prorok PC. Adherence to repeat screening flexible sigmoidoscopy in the Prostate, Lung, Colorectal, and Ovarian (PLCO) Cancer Screening Trial. *Cancer.* 2002; 94:2569-2576.
116. Winawer SJ, Zauber AG, Ho MN, O'Brien MJ, Gottlieb LS, Sternberg SS, et al. Prevention of colorectal cancer by colonoscopic polypectomy. The National Polyp Study Workgroup. *N Engl J Med.* 1993; 329:1977-1981.
117. Cooper GS, Fortinsky RH, Hapke R, Landefeld CS. Primary care physician recommendations for colorectal cancer screening. Patient and practitioner factors. *Arch Intern Med.* 1997; 157:1946-1950.

118. Cooper GS, Fortinsky RH, Hapke R, Landefeld CS. Factors associated with the use of flexible sigmoidoscopy as a screening test for the detection of colorectal carcinoma by primary care physicians. *Cancer*. 1998; 82:1476-1481.
119. Cooper GS, Yuan Z, Veri L, Rimm AA, Stange KC. Colorectal carcinoma screening attitudes and practices among primary care physicians in counties at extremes of either high or low cancer case-fatality. *Cancer*. 1999; 86:1669-1674.
120. Cummings KM, Jaen CR, Funch DP. Family physicians' beliefs about screening for colorectal cancer using the stool guaiac slide test. *Public Health Rep*. 1984; 99:307-312.
121. Bergner M, Allison CJ, Diehr P, Ford LG, Feigl P. Early detection and control of cancer in clinical practice. *Arch Intern Med*. 1990; 50:431-436.
122. Schroy III PC, Geller AC, Crosier WM, Page M, Sutherland L, Holm LJ, et al. Utilization of colorectal cancer screening tests: a 1997 survey of Massachusetts internists. *Prev Med*. 2001; 33:381-391.
123. Hawley ST, Levin B, Vernon SW. Colorectal cancer screening by primary care physicians in two medical care organizations. *Cancer Detec Prev*. 2001; 25:309-318.
124. Lewis JD, Ginsberg GG, Hoops TC, Kochman ML, Bilker WB, Strom BL. Flexible sigmoidoscopy training and its impact on colorectal cancer screening by primary care physicians. *Arch Fam Med*. 2000; 9:420-425.
125. Schoen RE, Weissfeld JL, Kuller LH. Sigmoidoscopy use among primary care physicians. *Prev Med*. 1995; 24:249-254.
126. Rodney WM, Beaber RJ, Johnson R, Quan M. Physician compliance with colorectal cancer screening (1978– 1983): the impact of flexible sigmoidoscopy. *J Fam Pract*. 1985; 20:265-269.
127. Czaja R, McFall SL, Warnecke RB, Ford L, Kaluzny AD. Preferences of community physicians for cancer screening guidelines. *Ann Intern Med*. 1994; 120:602-608.
128. Sharma VK, Vasudeva R, Howden CW. Colorectal cancer screening and surveillance practices by primary care physicians: results of a national survey. *Am J Gastroenterol*. 2000; 95:1551-1556.

129. Sharma VK, Corder FA, Fancher J, Howden CW. Survey of the opinions, knowledge, and practices of gastroenterologists regarding colorectal cancer screening and use of the fecal occult blood test. *Am J Gastroenterol.* 2000; 95:3629-3632.
130. Hawley ST, Foxhall L, Vernon SW, Levin B, Young JE. Colorectal cancer screening by primary care physicians in Texas: a rural-urban comparison. *J Cancer Educ.* 2001; 16:199-204.
131. Clasen CM, Vernon SW, Mullen PD, Jackson GL. A survey of physician beliefs and self-reported practices concerning screening for early detection of cancer. *Soc Sci Med.* 1994; 39:841-849.
132. Lewis JD, Asch DA. Barriers to office-based screening sigmoidoscopy: does reimbursement cover costs? *Ann Intern Med.* 1999; 130:525-530.
133. Schroy PC, Heeren T, Bliss CM, Pincus J, Wilson S, Prout M. Implementation of on-site screening sigmoidoscopy positively influences utilization by primary care providers. *Gastroenterology.* 1999; 117:304-311.
134. Dupont WD, Plummer WD. PS Power and Sample Size Program available for Free on the Internet. *Controlled Clin Trials.* 1997; 18:274. PS Power and Sample Size Calculations Version 2.1.31, 2003.
135. SPSS Version 15.0, Chicago, IL, 2003.
136. Ramji F, Cotterchio M, et al. Association between Subject Factors and Colorectal Cancer Screening Participation in Ontario, Canada. *Cancer Detection and Prevention.* 2005; 29:221-226.