



Published in final edited form as:

*Med Decis Making*. 2012 ; 32(1): 198–208. doi:10.1177/0272989X11406285.

## Primary Care Colorectal Cancer Screening Recommendation Patterns: Associated Factors and Screening Outcomes

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### Abstract

**Background**—The relationship of primary care provider’s (PCP) CRC screening strategies to completion of screening is poorly understood.

**Objective**—To describe PCP test recommendation patterns, associated factors, and their relationship to patient test completion.

**Design**—This cross-sectional study used a PCP survey, in-depth PCP interviews, and electronic medical records.

**Setting**—Kaiser Permanente Northwest HMO.

**Participants**—132 PCPs and 49,259 eligible patients aged 51–75.

**Measurements**—Patterns related to PCP CRC screening recommendations, based upon frequency of recommending fecal occult blood testing (FOBT), flexible sigmoidoscopy (FS), and colonoscopy. We compared PCP demographics, CRC screening-test influences, concerns, decision making and counseling processes, and rates of patient CRC screening completion by PCP group.

**Results**—We identified four CRC screening-recommendation groups: a “Balanced” group (n=54; 40.9%) that recommended the tests nearly equally; an “FOBT” group (n=31; 23.5%) that largely recommended FOBT; an “FOBT& FS” (n=25; 18.9%); and a “Colonoscopy & FOBT” (n=22; 16.7%) group that recommended these tests nearly equally. Internal medicine (vs. family medicine) PCPs were more common in groups recommending endoscopy more frequently. The FOBT and FOBT&FS groups were most influenced by clinical guidelines. Groups recommending

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Prior presentations: The findings were presented at the Society of General Internal Medicine Annual meeting in Minneapolis, Minnesota, April 28, 2010.

Contributors: We would like to thank the many primary care clinicians at Kaiser Permanente Northwest who gave of their valuable time to respond to the study survey and the many physician leaders and staff who assisted with the project: Michael Kositch MD, Thomas Hickey MD, Maureen Wright MD, Heather Block, Stephanie Schoap, and Andre Smith. We would also like to thank Leslie Bienen for editorial assistance, Dixie Sweo for administrative support, and Mary Rix for project management.

more endoscopy were most concerned that FOBT generates a lot of false positives and FOBT misses a lot of cancers. The FOBT and FOBT&FS groups were more likely to recommend a specific screening strategy compared to the Colonoscopy & FOBT and Balanced groups, which were more likely to let the patient decide. CRC screening rates did not differ by group.

**Limitations**—Small numbers within PCP groups

**Conclusions**—Specialty, the influence of guidelines, test concerns, and the “jointness” of the test selection decision distinguished CRC screening recommendation patterns. All patterns were associated with similar overall screening rates.

## Keywords

colorectal cancer screening; primary care recommendations

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## Introduction

Colorectal cancer (CRC) is the third most common cancer and the second leading cause of cancer-related death in the United States. (1) Early detection of high-risk pre-cancerous lesions through appropriate screening is associated with decreased incidence of and mortality from CRC. (2–4) The US Preventive Services Task Force (USPSTF) recommends that men and women of average risk begin screening for CRC at age 50. There is good direct evidence for the effectiveness of fecal occult blood testing (FOBT), fair direct evidence for the effectiveness of sigmoidoscopy, and indirect evidence for the combined use of FOBT and sigmoidoscopy, and colonoscopy alone, in reducing CRC mortality.(5)

The majority of the U.S. population at risk for CRC is not being screened.(6;7) More than half of adults age 50 and older in the US have received a CRC screening test, but only about 35–45% receive screening tests at recommended intervals. Physician recommendation for CRC screening(8–11) has consistently been shown to be a strong predictor of screening. However, clinicians likely utilize varying testing and counseling strategies to address CRC screening (12;13) and the nature of their recommendations, communication, and counseling may be important to patient screening completion.(9;14;15) Yet, surprisingly little is known about these screening recommendation strategies. A recent survey of US physicians revealed that 99% routinely recommend CRC screening, with 95% routinely recommending colonoscopy, 80% recommending FOBT, and 26% recommending sigmoidoscopy; other strategies are rarely recommended.(16) Just over half of PCPs report recommending two screening modalities, with the remainder fairly evenly split between reporting recommending three or one screening modalities.(16) Even less is known about what factors influence physicians’ strategies or the impact of different strategies on CRC screening use. Our objective was to describe the different CRC screening recommendation strategies reported by PCPs, factors associated with these strategies, and the association of each strategy with practice-level CRC screening rates among an insured patient population.

## Methods

The study design and procedures were approved by the study site’s Institutional Review Board.

### Study site and data sources

The study was conducted at Kaiser Permanente Northwest (KPNW), a not-for-profit health maintenance organization (HMO) in the Pacific Northwest with about 485,000 members. KPNW’s membership is similar to the local insured community.(17) Electronic records provided clinician and patient data. KPNW maintains a CRC screening clinical practice

guideline based upon the recommendations of the USPSTF. (5) Each of the USPSTF-recommended CRC screening modalities is a covered benefit, although FOBT is encouraged in lower risk individuals.

### Study design and participants

This cross-sectional study used a PCP survey, electronic health record data and in-depth interviews with PCPs. We identified PCPs who had active patient panels from January 2007-July 2009 and who had at least 20 patients eligible for CRC screening every six months during this period (N=195). In August 2009 each PCP meeting the criteria received up to 2 electronic survey copies via email, followed by up to 2 mailed paper questionnaires. The latter included an enclosed chocolate bar as a token of appreciation. 144 PCPs (73.8%) returned the survey. Of those, 132 (91.6%) completed all questions about their frequency of recommending the various CRC screening tests and are included in the analyses.

### Study Measures

**Patient panel outcomes**—For the primary outcome, we assessed CRC screening rates for each PCP over six months among eligible paneled patients who were due or overdue for screening as of January 2009. First, we identified 122,661 patients aged 51–75 as of January 1, 2009 who were HMO members for at least 12 months prior to and 6 months after this date. To the extent feasible, we then limited this group to those who were at average risk for CRC, and therefore in whom any of the guideline-recommended CRC-screening methods was appropriate. Therefore, we excluded those who had any of the following: 1) colonoscopy within 10 years (n=35,067), 2) flexible sigmoidoscopy or double-contrast barium enema (DCBE) within 5 years (n=26,063), or 3) FOBT screening within the past 12 months (n=16,894), (n=44,637). We then excluded 4,150 patients because of medical conditions/medications suggesting they were inappropriate for CRC screening (including through FOBT). These included: 1) active CRC/GI risk factors (n=2,835) in the previous 12 months (referral for chronic diarrhea, esophageal reflux, iron deficiency, polyp follow-up/rectal surgery, diagnosis of prior CRC or adenomatous polyps, diagnosis of HIV/AIDS, 2) medical conditions (n=192) for which routine screening was not indicated (end-stage renal disease, hospice care, receipt of total colectomy), 2) use of medications (n=1,123) in the previous 4 months (plavix, warfarin) that elevated risk of a false positive FOBT (n=40,487). Finally, we limited the population to those who were members of the 132 PCP patient panels (final N=21,964; 166±68). CRC screening as an outcome was defined as the receipt of any of FOBT (stool guaiac or fecal immunochemical test), FS, colonoscopy, or DCBE from January 1-June 30 2009. We also assessed the incidence of screening by each procedure individually.

The secondary outcome was CRC screening among eligible patients, consistent with the Health Employer Data and Information Set (HEDIS) CRC screening quality measure. (18) This was defined as the receipt of any of FOBT during the measurement year [July 2008-June 2009], FS, or DCBE during that year or the four years prior, colonoscopy that year or the nine years prior among the study PCP's 49,259 eligible patients (without a history of CRC or total colectomy, and with 24 months of prior membership) aged 51–80 from July 2008-June 2009 (373±117 per PCP).

**PCP survey and demographic variables**—Our PCP variables are based upon concepts identified in the Diagnostic Evaluation Model of CRC screening, i.e. that physician background and experience, cognitive and psychological representations, social support and influence, practice environment and patient characteristics affect physician screening intention, and that the latter two factors interact to directly affect screening behavior.(19)

**Frequency of recommending CRC screening methods:** We assessed these variables by asking providers' about how often (on a scale of 1-never to 5-all the time) each possible CRC screening test or test combination (FOBT, FS, Colonoscopy, FOBT+FS, Other) was recommended to average-risk asymptomatic patients.

**Influences on CRC screening method selection:** These variables were assessed by a series of questions that elicited information about the degree to which (on a scale of 1-no influence to 5-strong influence) training/education, colleagues, personal experience with failed screening methods, trust in the recommendation and skill level of endoscopists, organizational guidelines and expectations, and experience working in the community influence PCP choice of a particular CRC screening exam.

**Concerns about CRC screening methods:** We assessed additional factors (concerns related to patient adherence, test performance, and associated complications) that might influence clinicians to recommend a specific CRC screening test. For each of FOBT, FS, and Colonoscopy we asked, "To what degree do you agree (from 1-strongly disagree to 5-strongly agree) with the statements (1) "it is unclear whom to screen and how often to screen, (2) "[the test] misses a lot of cancers", and (3) "patients don't tend to complete" [this test]. For FS and Colonoscopy we also included a survey item reflective of agreement with the statement "patients often have complications."

**Decision making about CRC screening:** We asked questions about how often (on a scale of 1-never to 5-all the time) did certain aspects of PCP CRC screening communication occur with patients. Three questions related to the "jointness" of decision making were also included (i.e. how often they (1) let the patient decide which screening method to use; (2) recommended a specific method; and (3) came to a joint decision.

**CRC screening counseling:** Seven questions assessed how PCPs address different elements of CRC screening counseling (12). In factor analyses, 7 elements loaded on a single factor (60.6% of the variance explained) with all factors loadings greater than .67: benefits of screening; screening frequency; information about discomfort; accuracy; complications; and checking for patient understanding/confirming patient agreement with the method selected. We created a single counseling score by taking the mean of the responses to the 7 questions (Cronbach's alpha=.89).

**PCP demographic variables:** We collected data on previous community practice experience (outside of KPNW, coded yes or no) and hours per week in clinical care (≥ 25 or <25 hours per week) by survey. PCP gender; age; years in practice at KPNW; primary care specialty [internal medicine [IM] or family practice [FP]; and patient panel size were extracted from electronic databases.

Study PCPs were recruited for in-depth, semi-structured interviews by electronic mail and follow-up phone calls. Interviews were conducted in person, using an interview guide, (20) and analyzed by a trained qualitative research specialist (JS) blinded to PCP CRC screening recommendations or outcomes. All interviews were transcribed and content-analyzed using standard qualitative analysis techniques (20–25), and aided by the use of a qualitative research software program (26).

## Statistical Analysis

PCP-reported frequency of recommending FOBT, FS & FOBT, and Colonoscopy were used in a cluster analysis to determine if groups of PCPs had similar patterns of recommending CRC screening methods. Responses to recommending FS only were not utilized in the

cluster analysis because of the high degree of correlation with responses to recommending both FS & FOBT ( $r=.84$ ). We used hierarchical cluster analysis with Ward's Method and squared Euclidean distances in SPSS 15.0 to extract clusters. We based our decision on the number of clusters to retain in the final solution on the agglomeration schedule and interpretability. The hierarchical cluster analysis was followed with a K-means cluster analysis, using the final cluster centers from Ward's method and a discriminant analysis predicting cluster group membership from the frequency of recommending variables to assess the fit of the final cluster solution. To validate the interpretation of the clusters we compared actual completed screening by each CRC screening method between the clusters using analysis of variance with post hoc tests. We used ANOVA and chi-square tests to compare the clusters on PCP demographics and panel characteristics, screening influences, test concerns, CRC screening "jointness" of decision variables, CRC screening counseling content scale score and PCP CRC screening rates. We considered  $p<0.05$  to be statistically significant.

## Results

### PCP Clusters Based on Recommendations of CRC Screening Modalities

Hierarchical cluster analysis found 4 interpretable clusters based upon PCP-reported frequency of recommending FOBT, FOBT&FS, and Colonoscopy (Figure). The final cluster solution with K-means clustering fit the data well, with 97% of the cases correctly classified based on a discriminant analysis predicting cluster group membership. The "Balanced" cluster ( $n=54$ ; 40.9%) recommended FOBT, FOBT & FS, and Colonoscopy screening methods nearly equally. The "FOBT" cluster ( $n=31$ ; 23.5%) largely recommended FOBT and had the lowest frequency of recommending Colonoscopy. The "FOBT & FS" cluster ( $n=25$ ; 18.9%) recommended FOBT and FOBT&FS nearly equally. The "Colonoscopy & FOBT" ( $n=22$ ; 16.7%) cluster recommended these tests nearly equally and had the lowest frequency of recommending FS&FOBT.

Table 1 presents the average percent of patients due or overdue for CRC screening by recommending-pattern cluster over 6 months. The clusters are significantly different in the rates of actual completed screening of FOBT, FOBT&FS, FS only, and Colonoscopy and any endoscopy in the directions consistent with interpretation and naming of the clusters.

### Physician Factors Associated with Recommendation Groups

Table 2 compares the demographic and patient panel characteristics of the PCP clusters. The groups were significantly different only with respect to specialty, with more PCPs in the Balanced cluster and Colonoscopy&FOBT cluster in IM (vs. FP). These two clusters also tended to have more community practice experience ( $p=.056$ ).

There were significant differences among the four clusters in physician-reported CRC screening test choice influences, test-related concerns, and "jointness" of decision-making, whereas the groups were similar in their reported communication (CRC counseling scale score) (significant results in Table 3). Of the surveyed test choice influences (training/education, discussions with colleagues, personal experiences with failure of screening methods, trust in endoscopy specialists, organizational (KPNW) guidelines and expectations, and experience working in the community), only guidelines and expectations was a statistically significant influence. The FOBT cluster was most influenced by clinical guidelines, followed by the FOBT & FS cluster. The clusters did not differ in concerns about colonoscopy, but did differ in concerns about FOBT and FS. The most strongly endorsed concerns were that "FOBT generates a lot of false positives" (in the Balanced cluster) and that "FOBT misses a lot of cancers" (in the FOBT & FS and Balanced clusters). The FOBT

cluster had the least concerns about being unclear whom to screen and how often to screen with FOBT, that FOBT misses a lot of cancers, and that FOBT generates a lot of false positives. The FOBT cluster also most strongly endorsed concerns about being unclear whom to screen and how often to screen with FS, and that FS patients often have complications.

The clusters differed in reported “jointness” of decision-making. The FOBT and FOBT&FS clusters more frequently reported recommending a specific screening strategy, and the Colonoscopy&FOBT and Balanced clusters more frequently reported letting the patient decide (consistent with the interpretation of these latter clusters).

Post hoc analyses (data not shown) comparing FP with IM PCPs found that (among all PCPs) IM PCPs had more concerns about FOBT (3.17 vs. 2.75;  $p=0.014$ ) and FS missing a lot of cancers (3.35 vs. 3.01;  $p=0.024$ ), and FOBT having false positives (3.33 vs. 2.94;  $p=0.014$ ). FP PCPs had more concerns that colonoscopy patients often have complications (2.58 vs. 2.31;  $p=0.022$ ). Personal experience was a stronger influence for IM PCPs (2.90 vs. 2.29;  $p=0.003$ ).

A total of 20 PCPs were interviewed (results by cluster in Table 4). Content analysis from the provider interviews supports the quantitative findings, including the influence of KPNW guidelines, the tendency for the FOBT and FOBT&FS clusters to be more likely to recommend a specific strategy; and the more mutual or “joint” approach to decision-making of the Balanced cluster. Additionally, the qualitative data support that influence and interpretation of recommendations from “local” organizational experts are also factors in shaping providers’ test preferences and approach with patients, particularly for the FOBT and FOBT&FS clusters. Furthermore, PCPs in the FOBT&FS cluster were most concerned about overburdening the system with colonoscopies, which may contribute to their more frequent recommendations of non-colonoscopy screening methods to patients. While the Colonoscopy&FOBT group described recommending yearly FOBT, this group also strongly stated the importance and need for some additional scoping, and preferred the completeness of colonoscopy to that of FS. Providers in the Balanced group described feeling “more free” to discuss and recommend all screening options with patients, allowing them to engage in a more patient-driven approach rather than recommending a specific strategy based on resource constraints or test concerns.

### **Association of CRC Screening Recommendation Clusters with Overall CRC screening rates**

The mean CRC screening rates per PCP among those due and overdue, using the CRC screening HEDIS measure (by any method) by cluster, are displayed in Table 5. The FOBT cluster trended towards the highest screening rate among those due or overdue and the Balanced cluster trended toward the highest HEDIS rate but the differences among clusters were not statistically significant.

## **Discussion**

Our analyses of self-reported CRC screening test recommendations made by PCPs in a large integrated care setting demonstrated that recommendations fell into four primary patterns. These patterns were associated with types of CRC screening tests completed by patients. However, the groups did not differ significantly in their overall practice-level CRC screening rates. This finding is compatible with previous studies that found that the most important consistent predictor of CRC screening is provider recommendation (27). Given the literature and the findings from the current study, it is reasonable to conclude that provider recommendation to screen, and not the specific nature of the recommended

screening test, is the major driver of screening. Many patients likely ultimately follow through on their physician's CRC screening test recommendations, no matter which test is recommended. Thus, the important and simple message for health care practitioners is to enthusiastically recommend CRC screening in a way that works in the context of current practice standards within individual practice settings. These primary findings are unique. We were unable to compare our primary findings to others' because we were unable to identify other research that compared PCP-reported specific CRC screening recommendation strategies to actual screening rates. One national study of PCP screening practices revealed that recommending FOBT and colonoscopy was the most common reported practice pattern (50.3%), followed by colonoscopy only in 15% and FOBT, FS, and colonoscopy in 14%, but did not relate these patterns to overall practice screening rates. (16) Our data also suggest that clinicians will be the major drivers of the mix of CRC screening tests used and therefore ultimately of the cost-effectiveness of CRC screening in the community (as patient test completion appears to largely follow PCP recommendation patterns).

We found that concerns about FOBT, along with the influence of guidelines, appear to be the strongest factors differentiating those groups recommending more FOBT from those recommending more endoscopy. Another study actually found that provider concerns about FOBT accuracy reduced the likelihood of CRC screening. (28) Test concerns will be important leverage points for policy and practice leaders to influence the mix of CRC screening tests recommended in the future. For example, to increase the use of fecal tests clinicians will likely want to see improved sensitivity and specificity, with this information clearly conveyed through influential clinical practice guidelines and organizational procedures.

We are unable to determine the direction of cause and effect between our findings related to the decision-making style and pattern of screening recommendations, but our qualitative data strongly suggest that, in the cases of the Balanced and FOBT&Colonoscopy groups, the decision making style (belief in patient choice) is a primary factor leading to the pattern of testing. In the latter group patient "choice" is more purposefully limited by the PCPs, (should the patient desire endoscopy) because of the PCP's test beliefs (i.e. their preference for colonoscopy over flexible sigmoidoscopy). In the cases of the FOBT and FOBT&FS groups, the PCPs appear to use their decision-making style (recommending a specific screening method) to get the patient to be screened using the test the PCP prefers.

Finally, the PCP groups did not differ in the extent to which they included all the possible counseling elements about CRC screening. All groups often provided information about the benefits and recommended frequency of screening, and gave less information about test discomfort, accuracy, and complications. Other research supports this common communication pattern.(29;30) It is possible that multiple counseling approaches, thoughtfully delivered in the context of complex factors such as physician-patient relationship and history, perceived patient SES, literacy, numeracy, and PCP perceptions of patient desired counseling style, do achieve similar results as long as the clinician enthusiastically recommends CRC screening. Other studies have found that patient perception of clinician "spending sufficient time", providing an "adequate explanation" (31) or good "information", (32) assessing patient understanding during CRC screening counseling, (33) and answering patients questions adequately (14) have been positively associated with receipt of CRC screening. In contrast, discussing pros and cons and eliciting patient preferences, (12) and providing screening choices (14) reduced screening likelihood. Our results need to be interpreted with caution. The PCPs in our study indicated that they frequently included many of the CRC screening counseling elements. Other studies have found that clinicians often do not include many of the elements of CRC screening informed decision making (12), and overestimate the elements that they do include. (34)

This study has several limitations. The study site, as an integrated group practice that is culturally strongly guideline-focused, may have less variation in practice than other environments. The findings may not therefore be completely generalizable. In particular, there were few PCPs who reported mostly recommending colonoscopy, and thus we had a limited ability to evaluate that practice pattern. The study included a small number of PCPs in each group, especially for the qualitative data gathering. Also, the study's retrospective design introduces several weaknesses. For the primary outcome, we attempted to distinguish true CRC screening from diagnostic testing but we may not have been completely successful in this regard. However, this study has multiple strengths, such as a very high PCP participation rate, clinically documented screening versus patient report, the ability to validate clinician stated recommendations through data on specific screening test use, and enough variation in CRC screening practice to generate clearly identifiable practice patterns.

In conclusion, although the Balanced recommendation style was the most common, the other three styles were common as well; patterns were primarily distinguished by specialty of the PCP, the influence of guidelines and test concerns, (especially related to FOBT test performance) and decision making style. Each of the four physician recommendation patterns identified here appeared to be equally effective in accomplishing CRC screening. As more information becomes available about the relative cost-effectiveness of older versus newer technologies, communicating this information to clinicians in a manner that considers their diverse influences, test-related concerns, and decision-making styles will be important for improving community CRC screening rates.

## Acknowledgments

Funders: This project was supported by grant # R01CA132709 from the National Cancer Institute. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Cancer Institute or the National Institutes of Health. The funding organization was not involved in the design or conduct of the research; the collection, management, analysis, or interpretation of the data; or the preparation, review, or approval of this manuscript. Dr. Feldstein had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

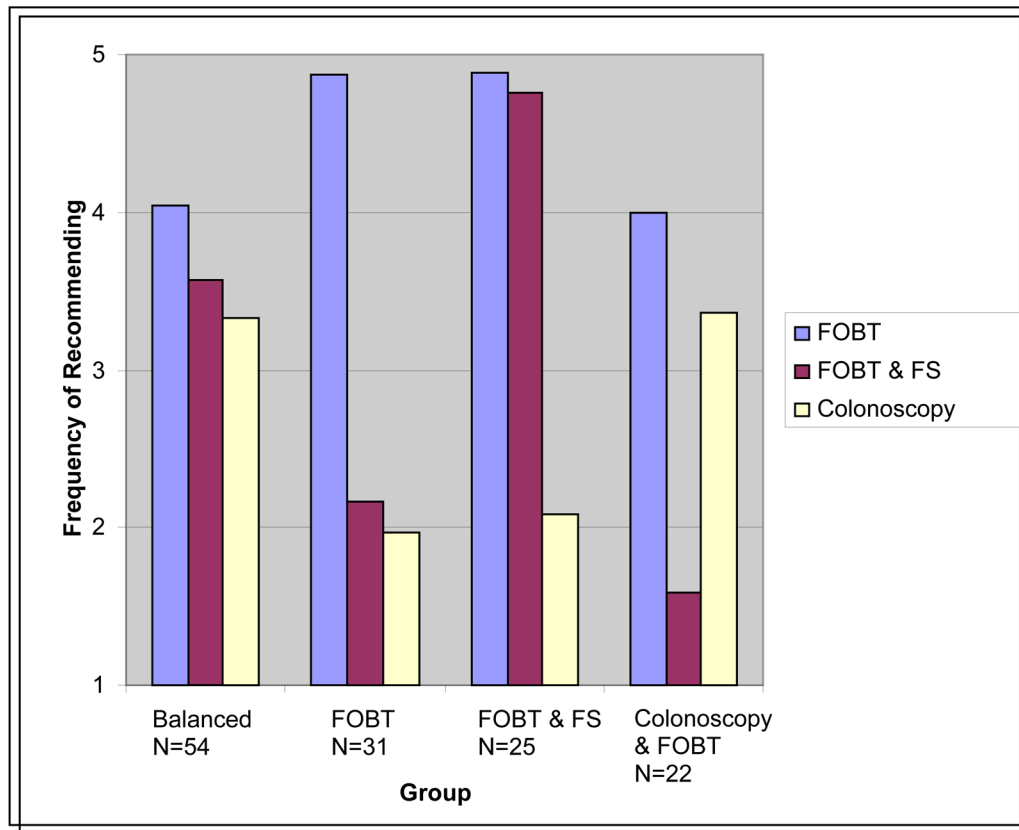
## Reference List

1. Jemal A, Tiwari RC, Murray T, Ghafoor A, Samuels A, Ward E, et al. Cancer statistics, 2004. *CA Cancer J Clin.* 2004 Jan; 54(1):8–29. [PubMed: 14974761]
2. Winawer SJ, Flehinger BJ, Schottenfeld D, Miller DG. Screening for colorectal cancer with fecal occult blood testing and sigmoidoscopy. *J Natl Cancer Inst.* 1993 Aug 18; 85(16):1311–8. [PubMed: 8340943]
3. Mandel JS, Church TR, Bond JH, Ederer F, Geisser MS, Mongin SJ, et al. The effect of fecal occult-blood screening on the incidence of colorectal cancer. *N Engl J Med.* 2000 Nov 30; 343(22):1603–7. [PubMed: 11096167]
4. Atkin WS, Cuzick J, Northover JM, Whynes DK. Prevention of colorectal cancer by once-only sigmoidoscopy. *Lancet.* 1993 Mar; 341(8847):736–40. [PubMed: 8095636]
5. US Preventive Services Task Force, Agency for Healthcare Research and Quality. Topic Page. Rockville, MD: 2009 Mar. Screening for Colorectal Cancer. Available from: URL: <http://www.ahrq.gov/clinic/uspstf/uspcolo.htm>
6. Hewitson P, Glasziou P, Irwig L, Towler B, Watson E. Screening for colorectal cancer using the faecal occult blood test, Hemoccult. *Cochrane Database Syst Rev.* 2007; (1):CD001216. [PubMed: 17253456]
7. Shapiro JA, Seeff LC, Thompson TD, Nadel MR, Klabunde CN, Vernon SW. Colorectal cancer test use from the 2005 National Health Interview Survey. *Cancer Epidemiol Biomarkers Prev.* 2008 Jul; 17(7):1623–30. [PubMed: 18628413]



8. Seeff LC, Nadel MR, Klabunde CN, Thompson T, Shapiro JA, Vernon SW, et al. Patterns and predictors of colorectal cancer test use in the adult U.S. population. *Cancer*. 2004 May 15; 100(10): 2093–103. [PubMed: 15139050]
9. Klabunde CN, Vernon SW, Nadel MR, Breen N, Seeff LC, Brown ML. Barriers to colorectal cancer screening: a comparison of reports from primary care physicians and average-risk adults. *Med Care*. 2005 Sep; 43(9):939–44. [PubMed: 16116360]
10. Brenes GA, Paskett ED. Predictors of stage of adoption for colorectal cancer screening. *Prev Med*. 2000 Oct; 31(4):410–6. [PubMed: 11006067]
11. Wee CC, McCarthy EP, Phillips RS. Factors associated with colon cancer screening: the role of patient factors and physician counseling. *Prev Med*. 2005 Jul; 41(1):23–9. [PubMed: 15916989]
12. Ling BS, Trauth JM, Fine MJ, Mor MK, Resnick A, Braddock CH, et al. Informed decision-making and colorectal cancer screening: is it occurring in primary care? *Med Care*. 2008 Sep; 46(9 Suppl 1):S23–S29. [PubMed: 18725829]
13. Dunn AS, Shridharani KV, Lou W, Bernstein J, Horowitz CR. Physician-patient discussions of controversial cancer screening tests. *Am J Prev Med*. 2001 Feb; 20(2):130–4. [PubMed: 11165455]
14. Lafata JE, Divine G, Moon C, Williams LK. Patient-physician colorectal cancer screening discussions and screening use. *Am J Prev Med*. 2006 Sep; 31(3):202–9. [PubMed: 16905030]
15. McQueen A, Bartholomew LK, Greisinger AJ, Medina GG, Hawley ST, Haidet P, et al. Behind closed doors: physician-patient discussions about colorectal cancer screening. *J Gen Intern Med*. 2009 Nov; 24(11):1228–35. [PubMed: 19763699]
16. Klabunde CN, Lanier D, Nadel MR, McLeod C, Yuan G, Vernon SW. Colorectal cancer screening by primary care physicians: recommendations and practices, 2006–2007. *Am J Prev Med*. 2009 Jul; 37(1):8–16. [PubMed: 19442479]
17. Freeborn, DK.; Pope, C. *Promise and Performance in Managed Care: The Prepaid Group Practice Model*. Baltimore, MD: Johns Hopkins University Press; 1994.
18. Colorectal cancer screening: percentage of adults 50 to 80 years of age who had appropriate screening for colorectal cancer. HEDISR 2009: Healthcare Effectiveness Data & Information Set. 2010; 1 & 2
19. Myers RE, Turner B, Weinberg D, Hauck WW, Hyslop T, Brigham T, et al. Complete diagnostic evaluation in colorectal cancer screening: research design and baseline findings. *Prev Med*. 2001 Oct; 33(4):249–60. [PubMed: 11570828]
20. Erlandson, DA.; Harris, EL.; Skipper, BL.; Allen, SD. *Doing Naturalistic Inquiry: A Guide to Methods*. Newbury Park, Calif: Sage Publications, Inc; 1993.
21. Patton, MQ. *Qualitative research and evaluation methods*. 3. Thousand Oaks: Sage Publications; 2002.
22. Seidman, I. *Interviewing as qualitative research: A guide for researchers in education and social sciences*. New York: Teachers college Press; 1991.
23. Denzin, N.; Lincoln, Y. *The Sage Handbook of Qualitative Research*. 3. Thousand Oaks, CA: Sage Publications; 2005.
24. Strauss, AL.; Corbin, JM. *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: Sage Publications; 1990.
25. Wolcott, HF. *Transforming Qualitative Data: Description, Analysis, and Interpretation*. Thousand Oaks, Calif: Sage Publications, Inc; 1994.
26. ATLAS.ti Visual Qualitative Data Analysis [computer program]. Version 5.9. Berlin: 1997.
27. Holden, DJ.; Harris, R.; Porterfield, DS.; Jonas, DE.; Morgan, LC.; Reuland, D., et al. Evidence Report/Technology Assessment No 190 AHRQ Publication No 10-E-002. Rockville, MD: Agency for Healthcare Research and Quality; Feb. 2010 Enhancing the Use and Quality of Colorectal Cancer Screening. Feb. Report No.: AHRQ 190
28. Dulai GS, Farmer MM, Ganz PA, Bernards CA, Qi K, Dietrich AJ, et al. Primary care provider perceptions of barriers to and facilitators of colorectal cancer screening in a managed care setting. *Cancer*. 2004 May 1; 100(9):1843–52. [PubMed: 15112264]

29. Wackerbarth SB, Tarasenko YN, Joyce JM, Haist SA. Physician colorectal cancer screening recommendations: an examination based on informed decision making. *Patient Educ Couns.* 2007 Apr; 66(1):43–50. [PubMed: 17098393]
30. Canada RE, Turner B. Talking to patients about screening colonoscopy--where conversations fall short. *J Fam Pract.* 2007 Aug; 56(8):E1–E9. [PubMed: 17669281]
31. Carcaise-Edinboro P, Bradley CJ. Influence of patient-provider communication on colorectal cancer screening. *Med Care.* 2008 Jul; 46(7):738–45. [PubMed: 18580394]
32. O'Malley AS, Forrest CB, Feng S, Mandelblatt J. Disparities despite coverage: gaps in colorectal cancer screening among Medicare beneficiaries. *Arch Intern Med.* 2005 Oct 10; 165(18):2129–35. [PubMed: 16217003]
33. Ling BS, Klein WM, Dang Q. Relationship of communication and information measures to colorectal cancer screening utilization: results from HINTS. *J Health Commun.* 2006; 11(Suppl 1): 181–90. 181–90. [PubMed: 16641083]
34. Wolf MS, Baker DW, Makoul G. Physician-patient communication about colorectal cancer screening. *J Gen Intern Med.* 2007 Nov; 22(11):1493–9. [PubMed: 17851721]



**Figure.**  
The four prevalent PCP CRC screening recommendation patterns  
FOBT- fecal occult blood test, FS-flexible sigmoidoscopy

**Table 1**  
Percent of patients due and overdue for CRC screening screened by each method by PCP cluster

Patient* Screening Rate by Method (%)	Cluster				p-value
	Balanced	FOBT	FOBT & Flex Sig	Colonoscopy & FOBT	
FOBT only	13.1 <sup>a</sup>	18.8 <sup>a,b,c</sup>	12.6 <sup>b</sup>	15.6 <sup>e</sup>	<.001
FOBT & FS	1.6 <sup>a,b</sup>	0.4 <sup>a,c</sup>	1.9 <sup>c,d</sup>	0.1 <sup>b,d</sup>	<.001
FS only	1.6 <sup>a,b,c</sup>	0.5 <sup>a,d,e</sup>	2.4 <sup>b,d,f</sup>	0.1 <sup>c,e,f</sup>	<.001
Colonoscopy	3.3 <sup>a,b</sup>	1.7 <sup>a,c</sup>	2.0 <sup>b</sup>	3.3 <sup>c</sup>	.006
Any endoscopy <sup>‡</sup>	6.47 <sup>ab</sup>	2.58 <sup>ac</sup>	6.29 <sup>cd</sup>	3.54 <sup>bd</sup>	<.001
DCBE	0.00	0.06	0.00	0.02	.050

Means within a row with the same superscript (a,b,c,d) are significantly different from one another based on LSD post hoc tests

\* Mean % per PCP of patients due or over-due for CRC screening as of January 1, 2009 who were screened by June 30, 2009

<sup>‡</sup> Endoscopy- either FS, FS+FOBT, or colonoscopy

FOBT- fecal occult blood test. FS-flexible sigmoidoscopy, DCBE-double contrast barium enema

**Table 2**

PCP Demographic and Patient Panel Characteristics by Group

	Group				p-value
	Balanced	FOBT	FOBT & Flex Sig	Colonoscopy & FOBT	
Female (%)	37.0	45.2	64.0	50.0	.161
Specialty (% IM) *	63.0	29.0	44.0	50.0	.024
Community practice experience † (%)	70.4	54.8	40.0	68.2	.056
25 hrs/week clinical practice (%)	85.2	71.0	76.0	77.3	.457
Age; mean (SD)	48.7 (8.1)	50.1 (8.4)	49. (8.9)	51.3 (5.4)	.591
Years at site; mean (SD)	11.7 (7.5)	13.4 (7.3)	11.2 (7.3)	12.7 (7.1)	.651
Patient panel Size; mean n (SD)	2,437 (450)	2357 (394)	2316 (426)	2259 (381)	.347

\* IM- internal medicine, the remainder of participants are in family practice

† Prior medical practice outside of study site (Kaiser Permanente Northwest)

**Table 3**  
Significant across group differences in CRC screening test influences, concerns, decision-making and communication

CRC screening element Mean (SD)	Cluster				p-value
	Balanced	FOBT	FOBT & FS	Colonoscopy & FOBT	
<b>Influences*</b>					
KP Guidelines Influence	3.83 <sup>ab</sup> (0.97)	4.52 <sup>a</sup> (0.68)	4.42 <sup>b</sup> (0.83)	4.14 (0.99)	.003
<b>Test concerns<sup>‡</sup></b>					
FOBT unclear who & how often to screen	1.98 <sup>a</sup> (0.85)	1.43 <sup>ab</sup> (0.63)	2.16 <sup>b</sup> (1.18)	1.86 (0.73)	.012
FOBT misses a lot of cancers	3.26 <sup>a</sup> (1.00)	2.29 <sup>abc</sup> (0.82)	3.33 <sup>b</sup> (0.82)	2.86 <sup>c</sup> (1.08)	<.001
FOBT generates a lot of false positives	3.51 <sup>abc</sup> (0.85)	2.84 <sup>a</sup> (0.93)	2.92 <sup>b</sup> (1.04)	2.95 <sup>c</sup> (0.90)	.003
FS unclear whom & how often to screen	2.26 <sup>ac</sup> (0.947)	3.00 <sup>ab</sup> (1.20)	2.08 <sup>bd</sup> (0.91)	2.85 <sup>cd</sup> (1.04)	.001
FS patients often have complications	2.02 <sup>ad</sup> (0.67)	2.52 <sup>ab</sup> (0.93)	1.84 <sup>bc</sup> (0.62)	2.43 <sup>cd</sup> (0.75)	.001
<b>“Jointness” of decision making<sup>‡</sup></b>					
Let the patient decide	3.37 <sup>ab</sup> (0.78)	2.90 <sup>ac</sup> (1.04)	2.78 <sup>bd</sup> (1.00)	3.43 <sup>cd</sup> (0.93)	.017
Recommend a specific method	3.78 <sup>ab</sup> (0.83)	4.19 <sup>a</sup> (0.75)	4.46 <sup>b</sup> (0.59)	3.81 <sup>c</sup> (0.68)	.001
Joint decision	3.87 (0.59)	3.90 (0.91)	4.26 (1.01)	4.05 (0.83)	.232
<b>Communication<sup>§</sup></b>					
Counseling Scale Score	3.95 (0.65)	3.94 (0.82)	3.96 (0.67)	3.90 (0.45)	.991

\* Influences (Scale 1 no influence to 5 strong influence)

<sup>‡</sup> Test Concerns (Scale 1 strongly disagree to 5 strongly agree)

<sup>‡</sup> Decision making- How often does each of the following occur (Scale 1- never to 5-all the time)?

<sup>§</sup> Communication- Counseling scale score based upon mean score of all the items: How often does each of the following occur in CRC screening discussion (Scale 1- never to 5-all the time)?: explain benefit of screening, recommended frequency, information about discomfort, accuracy, complications, check for patient understanding and confirm patient agreement with method selected

-Means within a row with the same superscript (a,b,c,d) are significantly different from one another based on LSD post hoc tests  
FOBT- fecal occult blood test, FS-flexible sigmoidoscopy

**Table 4**  
Qualitative Interview Data: PCP Cluster CRC Counseling & Decision-Making by Screening Test (N=20)

Interviewees by Cluster	FOBT Beliefs	Flexible sigmoidoscopy Beliefs	Colonoscopy Beliefs	CRC screening counseling/ decision-making approach
<b>Balanced (n=9) (FP=4; IM=5)</b>	<ul style="list-style-type: none"> <li>belief in efficacy of yearly stool test</li> <li>always encourages yearly stool test</li> </ul>	<ul style="list-style-type: none"> <li>expressed belief FS is "as good" as colonoscopy with less patient risk and burden</li> </ul>	<ul style="list-style-type: none"> <li>tends to not recommend as the first line of screening for low-risk patients</li> <li>willing to refer patients if they ask for it</li> <li>experiences greater organizational acceptance and accessibility as a screening option for low-risk patients than in the past</li> </ul>	<ul style="list-style-type: none"> <li>likes to discuss and encourage some form of scoping, whether that be FS or colonoscopy</li> <li>explains none of the 3 screening options are "perfect" but that all 3 are acceptable screening methods</li> <li>gives all 3 screening options as choices to patients after describing risk/benefit and practical issues (scheduling) with patients</li> <li>tends to let the patient guide/decide which screening option feels most appropriate for them</li> </ul>
<b>FOBT (n=3) (FP=2; IM=1)</b>	<ul style="list-style-type: none"> <li>belief in efficacy of yearly stool test</li> <li>always encourages yearly stool test</li> </ul>	<ul style="list-style-type: none"> <li>tends to not emphasize or recommend to patients</li> <li>believes it is less accurate than colonoscopy with the same patient risks and burden</li> <li>believes FS does not "add anything" to yearly stool cards</li> <li>believes the organizational recommendation is to move away from FS as a screening option</li> </ul>	<ul style="list-style-type: none"> <li>believes it is the preferred method of scoping over FS</li> <li>willing to refer patients for screening colonoscopy if patient asks or is willing</li> <li>experiences greater organizational acceptance and accessibility as a screening option for low-risk patients than in the past</li> </ul>	<ul style="list-style-type: none"> <li>always tries to "sell" the stool test as the first line of screening in low-risk patients</li> <li>doesn't typically discuss FS as an option</li> <li>always discusses the risks and benefits of FOBT and colonoscopy</li> </ul>
<b>FOBT&amp;FS (n=5) (FP=3; IM=2)</b>	<ul style="list-style-type: none"> <li>belief in efficacy of yearly stool test</li> <li>always encourages yearly stool test</li> <li>believes FOBT is the "bare minimum" but encourages scoping as well</li> </ul>	<ul style="list-style-type: none"> <li>Belief in the efficacy of FS as screening method</li> <li>Believes FS is equal to or just as good as colonoscopy, especially if paired w/ stool test</li> <li>Believes it is a test that is less risky and burdensome to patients and with good benefit</li> <li>Believes FS&amp;FOBT combination is the screening</li> </ul>	<ul style="list-style-type: none"> <li>believes this is not a "perfect" or risk free test</li> <li>believes that there is not a clear recommendation organizationally or nationally that this is the best screening option for low-risk patients</li> <li>concerned the risks of the test may outweigh the benefits to low-risk patients</li> </ul>	<ul style="list-style-type: none"> <li>tends to recommend the FS&amp;FOBT combination for patients asking for guidance or expressing uncertainty as to which scoping procedure to obtain</li> <li>emphasizes the accuracy of FS along with benefits of it over colonoscopy, including:</li> </ul>

Interviewees by Cluster	FOBT Beliefs	Flexible sigmoidoscopy Beliefs	Colonoscopy Beliefs	CRC screening counseling/ decision-making approach
<p><b>Colonoscopy &amp; FOBT (n=3); (IM=1; FP=2)</b></p>	<ul style="list-style-type: none"> <li>always encourages yearly stool test</li> <li>expresses some concern over the accuracy of the test as a "stand alone" screening option</li> <li>believes FOBT is the "bare minimum" and often encourages scoping as well</li> <li>finds it challenging to get patients to complete the stool test</li> </ul>	<p>approach recommended by organizational experts</p> <ul style="list-style-type: none"> <li>believes FS is not as good as colonoscopy</li> <li>believes FS has the same level of preparation and risk burden to the patient with potentially less benefit</li> <li>concerned FS is not as accurate of a scoping procedure and that the data shows it misses cancer</li> </ul>	<ul style="list-style-type: none"> <li>concerned about not over-referring for colonoscopies and potentially burdening the system</li> <li>will refer patients for colonoscopy if they ask for/demand one</li> <li>strong belief colonoscopy is the best scoping method and is preferable over FS</li> <li>willing to refer patients for screening colonoscopies if patient asks or is willing</li> <li>experiences greater organizational acceptance and accessibility as a screening option for low-risk patients than in the past</li> </ul>	<p>less preparation time; less potential bowel damage / perforation risk; fewer issues with sedation; easier to access; and less life burden (time off work)</p> <ul style="list-style-type: none"> <li>along with FOBT, likely to encourage colonoscopy at some point with patients</li> <li>emphasizes the accuracy of colonoscopies</li> <li>tends to talk patients out FS or not recommend it at all</li> <li>always discusses the risks and benefits of colonoscopy and FOBT</li> </ul>

FOBT-fecal occult blood test, FS-flexible sigmoidoscopy, IM- internal medicine, FP-family practice



**Table 5**

Percent of patients due or overdue for CRC screening\* who were screened over six months\* and HEDIS<sup>†</sup> CRC screening measure by PCP group

Screening Rate by Method (%) (95% CI)	Group			p-value
	Balanced	FOBT	FOBT & Flex Sig	
CRC screening among those due and overdue*	19.8 (18.3–21.3)	21.7 (19.8–23.7)	19.1 (16.9–21.4)	.256
CRC screening HEDIS measure <sup>‡</sup>	63.9 (61.8 – 64.3)	62.9 (60.8–65.1)	61.7 (57.6–65.8)	.660

\* Patients due or over-due for CRC screening in January 2009 who were screened by FOBT, FS, Colonoscopy or DCBE by June 30, 2009

<sup>†</sup> Consistent with the Health Employer Data and Information Set (HEDIS) CRC screening measure the percentage of patients aged 51–80 without a history of CRC or total colectomy, with 24 months of prior membership during July 2008-June 2009 who had FOBT that year, FS or DCBE during that year or the four years prior, Colonoscopy that year or the nine years prior. FOBT- fecal occult blood test, FS-flexible sigmoidoscopy, DCBE-double contrast barium enema, CI- confidence interval