HEALTH POLICY

Improving Colorectal Cancer Screening in Primary Care Practice: Innovative Strategies and Future Directions

Carrie N. Klabunde, Ph.D.[1], David Lanier, M.D.[2], Erica S. Breslau, Ph.D.[3], Jane G. Zapka, Sc.D.[4], Robert H. Fletcher, M.D., M.Sc.[5], David F. Ransohoff, M.D.[6], and Sidney J. Winawer, M.D.[7]

[1]Health Services and Economics Branch, Applied Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute, EPN 4005, 6130 Executive Boulevard, Bethesda, MD 20892-7344, USA; [2]Center for Primary Care, Prevention, and Clinical Partnerships, Agency for Healthcare Research and Quality, Rockville, MD, USA; [3]Applied Cancer Screening Research Branch, Behavioral Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute, Bethesda, MD, USA; [4]Biostatistics, Bioinformatics and Epidemiology, Medical University of South Carolina, Charleston, SC, USA; [5]Department of Ambulatory Care and Prevention, Harvard Medical School, Boston, MA, USA; [6]School of Medicine, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA; [7]Department of Medicine, Memorial Sloan-Kettering Cancer Center, New York, NY, USA.

Colorectal cancer (CRC) screening has been supported by strong research evidence and recommended in clinical practice guidelines for more than a decade. Yet screening rates in the United States remain low, especially relative to other preventable diseases such as breast and cervical cancer. To understand the reasons, the National Cancer Institute and Agency for Healthcare Research and Quality sponsored a review of CRC screening implementation in primary care and a program of research funded by these organizations. The evidence base for improving CRC screening supports the value of a New Model of Primary Care Delivery: 1. *a team approach*, in which responsibility for screening tasks is shared among other members of the practice, would help address physicians' lack of time for preventive care; 2. *information systems* can identify eligible patients and remind them when screening is due; 3. *involving patients* in decisions about their own care may enhance screening participation; 4. *monitoring practice performance*, supported by information systems, can help target patients at increased risk because of family history or social disadvantage; 5. *reimbursement* for services outside the traditional provider—patient encounter, such as telephone and e-mail contacts, may foster enhanced screening delivery; 6. *training opportunities* in communication, cultural competence, and use of information technologies would improve provider competence in core elements of screening programs. Improvement in CRC screening rates largely depends on the efforts of primary care practices to implement effective systems and procedures for screening delivery. Active engagement and support of practices are essential for the enormous potential of CRC screening to be realized.

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INTRODUCTION

Evidence from clinical studies[1] and guidelines from national expert groups[2-4] support the use of several modalities to screen average-risk adults aged 50 years and older for colorectal cancer (CRC). The decentralized nature of health care delivery in the United States necessitates that primary care providers play a central role in implementing national guidelines by recommending, performing, and/or referring patients for CRC screening. Yet despite evidence and guidelines, CRC screening rates in the United States are considerably lower than screening rates for other types of cancer (Fig. 1). Although some office-based interventions to increase primary care providers' use of CRC screening tests have been evaluated and shown to be efficacious,[5-11] there is little evidence to suggest that they have been widely adopted into routine practice.[12] Further, many primary care providers are already overburdened with the delivery of a broad range of medical care to their patients.[13,14]

Practice pressures, widespread levels of dissatisfaction, and concern about the future have prompted 2 professional organizations, the Society of General Internal Medicine and the American Academy of Family Physicians, to delineate specific strategies for transforming primary care. These reports[15,16] have particular relevance for CRC screening as the disciplines represented—general internal medicine and family medicine—are the most actively engaged in delivering preventive services to adults. The reports show what primary care practice might look like in the near future, and embrace 6 major elements of a new model of practice which, if implemented, would serve as the groundwork for improving the overall quality of primary care in the U.S. At the same time, the elements of this model describe an infrastructure that could facilitate the introduction into routine primary care of evidence-based strategies aimed at improving CRC screening rates.

Recognizing the critical need for more research to improve the uptake and delivery, and evaluate the short-term outcomes of CRC screening in primary care practice, the National Cancer Institute (NCI) and Agency for Healthcare Research and Quality (AHRQ) issued in December 2001 a program announcement (PAR-02-042/PAR 04-036, Colorectal Cancer

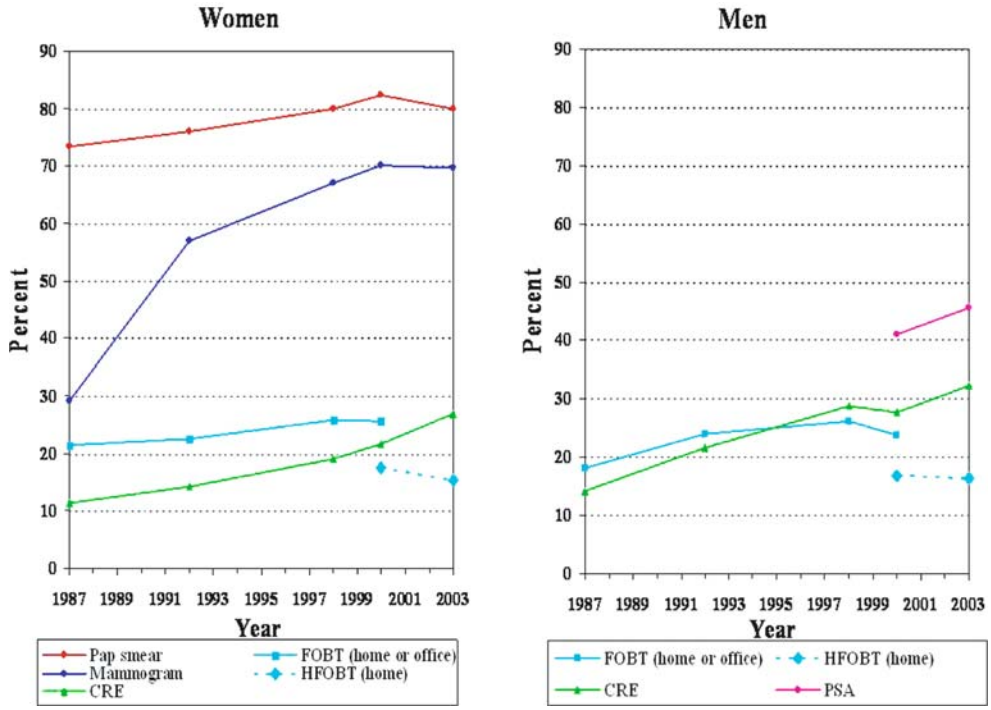

Figure 1. Recent use of cancer screening tests from the 1987, 1992, 2000, and 2003 National Health Interview Surveys. Percentages are standardized to the 2000 projected U.S. population by 5-year age groups. Recent Pap smear is measured within the last 3 years for ages 25+. Recent mammogram is measured within the last 2 years for ages 40+. Recent colorectal endoscopy (CRE) is measured within the last 3 years for ages 50+. Recent fecal occult blood testing (FOBT) is measured within the last year for ages 50+. Recent prostate specific antigen testing (PSA) is measured within the last year for ages 50+.

Screening in Primary Care Practice) under which many innovative studies have been funded (see Appendix A). In April 2005, NCI and AHRQ convened a conference in Rockville, Maryland entitled "Improving Colorectal Cancer Screening Delivery, Utilization, and Outcomes: the State of the Science" that included several of the program's grantees (see Appendix B for a listing of participants). This meeting provided a forum for describing and discussing innovative approaches to implementing CRC screening in primary care practice, challenges to widespread adoption of CRC screening, progress toward evaluating CRC screening at the population level, and research gaps. In this report, we use the framework of the New Model of Primary Care delivery[15,16] to highlight evidence about interventions that could be implemented in primary care settings to increase CRC screening rates, describe current research supported by NCI and AHRQ to improve CRC screening in primary care practice, and note areas where more research is needed.

INNOVATIVE STRATEGIES AND THE REALITIES OF PRIMARY CARE PRACTICE

Through the NCI/AHRQ research program, it is likely that several evidence-based interventions for enhancing CRC screening uptake and delivery in the U.S. will be identified. However, this work—while important and necessary—will ultimately have value only if effective strategies are actually put to use in practice. An assumption of the NCI/AHRQ meeting was that evidence-based CRC screening strategies are more likely to be implemented and sustained when they are applied in the context of general efforts to provide high-quality care. Moreover, almost all of the intervention strategies discussed at the meeting could conceivably support practice improvements for other screening services in addition to CRC. Implementation of the strategies, however, requires a practice's leadership to be prepared, proactive, and committed to providing high-quality care across the continuum of the practice.[17] Many practices may need to make significant changes to their current approaches to care delivery to achieve this.

Assuring that such change occurs may be challenging. More than a decade of research has documented the difficulties physicians encounter in trying to alter established routines of care.[18-20] The knowledge, attitudes, or beliefs of the individual physician were initially thought to be barriers to change, and several studies of methods to improve care delivery have targeted these characteristics. Interventions that focus on the individual physician, however, have shown limited effectiveness in improving outcomes.[21,22] More recent research has cast doubt on the consistency and strength of a relationship between physicians' attitudes and preventive care delivery. It has been shown, for example, that, whereas most primary care physicians rate the delivery of preventive services as important or very important, in actuality, visit- and practice-specific factors largely determine whether these services are provided.[23] Thus, the proposed strategies for improving CRC screening discussed at the NCI/AHRQ meeting primarily target systems of care rather than clinicians' knowledge or attitudes alone.

Clinicians may be more receptive today to changing the way they practice than at any time in the recent past. Numerous observers have concluded that the pressures and frustrations characterizing today's health care environment are providing an impetus for innovation, especially among primary care providers.[24] As corporate interests and a business ethic have come to dominate U.S. health care, most primary care providers are struggling with increasing administrative burdens, lower reimbursement, and demands for brief visits.[25,26] Their willingness to adopt new systems and approaches for improving care delivery may be reinforced by new requirements for measuring and reporting performance and quality. For example, CRC screening has recently been incorporated into several measure sets, including the Health Plan Employer Data Information Set (HEDIS) sponsored by the National Committee for Quality Assurance (http://www.ncqa.org/Programs/HEDIS/index.htm), and the National Quality Forum's recommended "starter set" of clinical performance measures for ambulatory practices (http://www.qualityforum.org/txAmbCare-Summary-SC-TAP.pdf). Such measure sets may be a strong motivator for primary care practices to improve their CRC screening rates.

CRC SCREENING IN THE CONTEXT OF A NEW MODEL OF PRIMARY CARE

The studies funded by NCI and AHRQ address many of the elements of the New Model of Primary Care (Appendix A). A particularly unique and promising feature of this research portfolio is that most of the studies are being undertaken in community-based practices, several within primary care practice-based research networks (http://www.ahrq.gov/research/pbrnfact.htm), and nearly all in multiple clinic or office settings. This portfolio, however, represents a subset of published and in-progress research on CRC screening in primary care. Below, we broaden our consideration of innovative strategies for improving CRC screening in primary care practice by describing the elements of the New Model of Primary Care, highlighting for each the evidence base and research gaps related to CRC screening.

(1) Team approach to care delivery.

What is known. Whereas the physician has traditionally been considered the central figure of most primary care practices, the New Model acknowledges that health care of the future will no longer be delivered by a single individual. Instead, a multidisciplinary team will be used that may include—in addition to the physician—nurses, physician assistants, nurse practitioners, clerical personnel, and other health professionals such as health educators and behavioral scientists.

A team approach can alter the way CRC screening is delivered by directly addressing the physician's lack of time for preventive care. The shifting of certain responsibilities currently assumed to be the physician's (e.g., determining screening eligibility; educating patients about CRC) to other members of the team will become increasingly important as the population ages and the overall number of preventive services that primary care is expected to deliver increases.

Studies have shown that various health care personnel can increase preventive services used in primary care. For example, FOBT screening rates increased substantially when nurses were given responsibility for ordering FOBT.[27] Well-trained nurse practitioners and physician assistants have been shown capable of safely and effectively performing flexible sigmoidoscopy.[28-30] A recent study[11] documented the effectiveness of telephone counseling delivered by preventive care managers in increasing rates of breast, cervical, and CRC screening among low-income women. One evaluation of the use of tools (e.g., prevention checklists, computer monitoring, availability of services), teamwork (i.e., the division of labor within the practice and how the team worked together), and tenacity (i.e., the importance placed on preventive services by 1 or more members of the practice) identified teamwork and tenacity as especially influential in preventive services delivery in primary care settings.[31]

Research gaps. Despite research support for the team approach to delivering CRC screening, adoption has been limited. Although growth in the supply of nonphysician primary care clinicians has been rapid,[24] information on the extent to which team members other than the primary care physician are involved in CRC screening delivery is sparse. In a national survey conducted in 1999–2000, one-quarter of primary care physicians reported using a nurse practitioner or physician assistant to provide screening with FOBT. Few physicians, however, reported using these providers to perform colorectal endoscopy procedures.[32] These findings need to be updated and to incorporate information from advanced practice nurses who may provide preventive care independent of physicians. Further, whereas numerous studies have shown that a recommendation for CRC screening from the primary care physician is a particularly powerful facilitator, it is unknown whether other team members are perceived by patients as equally credible advisors. Colonoscopy rates are increasing relative to other CRC screening tests,[33] and there is concern that this will strain capacity. More research is needed to assess the ability of providers other than gastroenterologists and surgeons to safely and effectively perform this procedure. Finally, further study of primary care physicians' attitudes toward team-based care is warranted given recent findings from a national survey indicating that one-third of primary care physicians believe "the team process makes care more cumbersome".[34]

(2) Advanced information systems.

What is known. Electronic health records (EHRs), considered the central nervous system of the New Model of Primary Care, are crucial because they improve the practice's ability to systematically identify and track patients for various risks and services.[15,16,22] Such systems can identify those eligible for CRC screening, facilitate the use of reminder and recall systems, and enable monitoring of screening utilization, delivery, and outcomes for purposes of performance measurement and quality improvement. Reminder systems, audit, and feedback have all been shown effective in improving screening practice.[22,35,36] The New Model assumes that information systems will be user friendly and appropriate for busy practices and allow all team members to review

and exchange patient data related to screening, thereby making collaboration and communication easier.

Research gaps. Despite growing evidence about EHRs, adoption of information technologies by primary care practices has been slow. Recent data show that less than one-quarter of primary care physicians use EHRs routinely or occasionally; less than half send patients computerized or manual reminder notices about preventive or follow-up care, and few e-mail patients routinely or occasionally.[34,37] Moreover, 1 systematic review concluded that additional research is needed to identify ways of using information technology to reduce demands on appointment face-to-face time in primary care.[38] For practices lacking EHRs, hand-held computers,[39] or other information technology support, the electronic preventive services tracking system (i.e., Patient Electronic Care System) developed for the Bureau of Primary Care, Health Resources and Services Administration (http://www.cpca.org/healthcollabs/documents/PECS_info_packet.pdf), may be useful for efficiently and effectively delivering preventive care, including CRC screening.

(3) Patient-centered care.

What is known. In the New Model of Primary Care, patients are recognized as active participants in their own health care. Information technology advances are helping to transform patients' roles by empowering them to make decisions about prevention and treatment. In particular, the availability of decision aids to inform patients of CRC screening options may enhance patient–physician screening discussions. Decision aids can improve knowledge, foster realistic expectations, and promote active participation in the decision-making process.[40] It has been shown that recommended test options for CRC screening differ in ways that matter to patients—in effectiveness, convenience, safety, availability, and cost[41,42]—and that patient preferences for making decisions about CRC screening are heterogeneous.[43] Some evidence suggests that practices can achieve higher screening rates by allocating adequate time to preventive services discussions.[44-47] In contrast, practices that do not ascertain patient preferences and instead offer just 1 approach to CRC screening may not realize high screening rates.[48,49]

Research gaps. One systematic review of cancer screening studies, however, concluded that "current evidence is insufficient to determine the effectiveness of informed decision-making interventions for individuals in health care settings, for community members outside of health care settings, or for interventions targeted to health care systems and providers".[50] Specifically, it is unknown whether actively involving patients in a discussion of the factors for and against each test option increases CRC screening rates. Whereas discussions about CRC screening are more likely to occur during preventive care visits,[51] most patient visits are for acute rather than preventive care.[52] Such acute care visits very likely afford a less optimal venue for conversations about CRC screening. This is compounded by lack of reimbursement for health maintenance visits by the Medicare program, with the exception of a one-time "Welcome to Medicare" visit for new Medicare Part B enrollees. Thus, there is a need for studies of providers' use of informed decision making for CRC screening in the context of different types of patient visits. Also, given the wide variability in costs of the recommended CRC screening tests and increased requirements for patient cost-sharing, there is need for research examining the influence of out-of-pocket costs on patients' willingness to undergo CRC screening, their choice of screening tests, and providers' propensity to offer screening.[41]

(4) Improved efficiency and quality of services.

What is known. For primary care practices to become more quality and cost accountable, they will require system supports and redesigned, more functional offices. For CRC screening, mechanisms will be required to routinely and consistently recruit eligible patients and monitor outcomes, including adherence. In addition, the effectiveness of identifying and screening those at high risk can be increased through the use of systems that facilitate risk stratification based on family or personal history of adenomas or cancer and by clinical findings. Newer office systems will also be required to facilitate implementation of targeted and tailored interventions for subgroups of patients less likely to accept screening, especially those with low socioeconomic status, low literacy, or those who live in rural areas.

Research gaps. Reviews[22,35] have noted that organizational systems and practice-level interventions targeting providers and patients can increase screening rates. Although it is likely that several of the NCI/AHRQ-sponsored projects will show improvements in CRC screening delivery and quality, there is a need for more research to determine efficient and effective ways of "bundling" CRC screening with other routine preventive services. There also is need for more research in the community-based primary care settings where most U.S. adults receive their care rather than in academic-affiliated practices.

(5) Enhanced practice finances.

What is known. The New Model of Primary Care insists on an alternative to current, traditional fee-for-service financing of health care. By not providing practices with reimbursement for critical parts of the screening process (e.g., counseling about screening; tracking eligibility and test results), most current financing models for primary care have been barriers to screening. Under the New Model, practices would be fairly compensated for everything they do, including cognitive services and services that take place outside of the traditional provider–patient encounter, such as reminder contacts or communications by telephone or e-mail. In addition, the enhanced financial system would offer incentives for better performance, such as improved screening rates and tracking of eligible patients.

Research gaps. Financing reform within the U.S. system remains a formidable challenge. Low reimbursement has been cited as a provider barrier to delivering CRC risk counseling and screening.[53-55] Use of sigmoidoscopy—a procedure historically performed by primary care physicians—is declining rapidly[33,56,57]; to what extent low reimbursement rates for performing the procedure may be contributing to the decline is unknown. FOBT rates have leveled off.[33] Whether this trend will continue with

the newer immunochemical tests—which are reimbursed at a higher rate than standard guaiac-based FOBT—requires further monitoring. It has been shown that greater levels of physician reimbursement are associated with higher rates of preventive services delivery.[58] Moreover, there is interest in pay for performance (P4P) measures as a means of improving the quality of care, but study results to date have been mixed. Evidence for the effectiveness of P4P schemes in fostering improved delivery of cancer screening or other preventive services is needed.[59-63] The complexity of physician reimbursement methods and incentive design may help explain the lack of effect of proposed P4P strategies so far. In sum, there is a great need for more research on how reimbursement influences preventive services delivery, and whether payment systems redesign will provide incentive for primary care providers to improve delivery of these services.

(6) Training opportunities.

What is known. Under the New Model of Primary Care, both clinicians in training and those in practice will have the opportunity to gain background and skills in areas critical to higher quality care. Improved performance by clinicians and office staff in areas such as communication skills, cultural competence, use of information technology, and team/systems management could clearly impact the delivery of effective services, including CRC screening. Efforts are underway to improve the quality of care by focusing on residency training programs. The Accreditation Council for Graduate Medical Education has developed a new initiative emphasizing patient outcomes (http://www.acgme.org/outcome). Although CRC screening is not specifically mentioned in the initiative, it could be encouraged as an example of such core competencies as systems-based practice and practice-based learning and improvement.

Research gaps. More efforts to design and evaluate primary care providers' training needs related to CRC screening are warranted. Studies describing evaluations of the cancer prevention practices and continuing education needs of primary care providers are sparse[64,65]; such studies may have been done recently but are not in published sources. As noted by Sandy and Schroeder,[24] training needs for primary care physicians under the New Model of Primary Care include communication skills, information technology, working in teams, and behavior change counseling. These skills are particularly relevant to and critical for the effective delivery of a complex preventive service like CRC screening. Moreover, interested clinicians may wish to gain skills in performing CRC screening procedures (e.g., endoscopy) as a means of making these services more available to their patients.

CONCLUSION: PROGRESS, BUT GAPS REMAIN

CRC screening is a particularly challenging preventive service to implement in primary care practice. Unlike most other preventive services, there are multiple test options, requiring patients and providers to discuss and select the approach that is most appropriate for, and acceptable to, the patient. There also are procedural complexities. CRC screening is perhaps unique among preventive services in the level of effort required of patients to successfully complete screening. For example, fecal occult blood testing may require dietary restrictions and multiple stool samples, whereas sigmoidoscopy and colonoscopy entail rigorous cleansing of the colon. The use of intravenous sedation during colonoscopy also requires patients to identify someone who can accompany them home post-procedure. These factors combined with unique features of the patient, provider, practice setting, and external environment may explain in part why CRC screening continues to be underutilized.

By increasing CRC screening rates in the United States, substantial reductions in CRC mortality would be realized.[66] Improvement in CRC screening rates is achievable largely through the efforts of primary care practices to implement effective systems and procedures for screening delivery. Within the framework of a New Model of Primary Care, we described evidence-based strategies for provision of CRC screening by primary care practices, and an active, innovative research portfolio that NCI and AHRQ have developed to identify effective new strategies. In particular, studies funded under the NCI/AHRQ initiative will contribute new knowledge about 4 elements of the New Model: team approach to care delivery, advanced information systems, patient-centered care, and improved efficiency and quality of services.

Although progress is evident, much remains to be done, as the challenges of providing services in the context of primary care are very real. As Frame has noted, "an ounce of prevention is a ton of work" (P. Frame, personal communication, June 29, 2006). Clinicians who desire more information about practice redesign and the New Model can go to a Web site developed by the American Academy of Family Physicians: http://www.transformed.com. Whereas this paper has focused on the primary care practice setting, numerous factors at other levels impact the processes of care delivered in individual practices.[17] For example, public policy at the national and state levels can have powerful influence on whether and to what extent certain procedures and services are reimbursed. Both public policy and standards developed by professional organizations can enable or inhibit the provision of services by various provider types or teams. All sectors at many levels, including federal and state policy makers, professional organizations, and local communities, must recognize their roles and responsibilities in fostering and supporting the efforts of primary care providers to deliver responsive and viable preventive services. Only through the active engagement and support of primary care practices will the enormous potential of CRC screening be realized.

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Corresponding Author: *Carrie N. Klabunde, Ph.D; Health Services and Economics Branch, Applied Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute, EPN 4005, 6130 Executive Boulevard, Bethesda, MD 20892-7344, USA (e-mail: klabundc@mail.nih.gov).*

APPENDIX A

Table 1. Appendix A. NCI and AHRQ Funded Studies: Colorectal Cancer Screening in Primary Care Practice

Principal Investigator Name and Grant #	Project Name	Project Description	Elements of Primary Care *
1. Ayanian, John R01 CA112365	Improving Systems for Colorectal Cancer Screening (CRCS)	This study will implement and evaluate interventions to improve systems for colorectal cancer screening (CRCS) in a large multispecialty, multicenter group practice located in eastern Massachusetts. The study will use a randomized controlled design to assess the impact of: (1) providing patient-specific electronic reminders to primary care physicians, (2) mailing reminders to patients, and (3) providing patients with a Web-based tool to estimate their risk for colorectal cancer. It will also determine whether the impact of these interventions is influenced by concurrent efforts of health insurance plans to promote CRCS.	2
2. Ayanian, John R01 CA112367	Improving Surveillance for Colorectal Polyps	To improve surveillance for colorectal polyps at Brigham and Women's Hospital, a randomized intervention will be implemented and evaluated. Computerized data from colonoscopy and pathology reports will identify patients due for repeat colonoscopy and provide reminders to physicians. The study will assess differences in surveillance colonoscopy rates and evaluate variations in the impact of the intervention by patient demographics and site of primary care.	2
3. Burt, Randall R21 CA107216	Increasing CRCS	With the goal of changing physician behavior, this study will examine the effectiveness of an electronic reminder system together with a physician education program to increase rates of CRCS in a large network of community clinics serving a diverse population in Utah.	2
4. Crabtree, Benjamin R01 CA112387	Enhancing CRCS through Learning Teams	An intervention incorporating a Multimethod Assessment Process (MAP) for understanding the unique barriers, opportunities and complexity of diverse primary care practices, and a Reflective Adaptive Process (RAP) involving patients, office staff, and physicians will be developed. The study will evaluate whether the innovative MAP/RAP intervention enhances and sustains rates of CRCS in primary care practice.	1
5. Dietrich, Allen R21 CA100553	Develop a Primary Care CRCS Consortium	Infrastructure and procedures to create a population-based colonoscopy registry within a primary care CRCS consortium will be developed by creating linkages between practice-based research networks in New Hampshire and New York City. Enhancing knowledge and quality of CRCS in primary care and addressing health care disparities in CRCS will be emphasized.	4
6. Dietrich, Allen R01 CA119014	A Randomized Clinical Trial to Increase CRCS in Medicaid Managed Care	Medicaid Managed Care Organizations (MMCOs) will be used to expand the scope of a previously developed Prevention Care Management (PCM) intervention with outreach to MMCO women who seldom use primary care, and inreach to more frequent users of primary care. A randomized controlled trial will assess the impact of the PCM on CRCS status of low-income migrant women age 50–64 years visiting community/migrant health centers in New York City, and will describe the process of PCM. To ensure sustainability, women overdue for screening will be identified using MMCO claims data, and a theory-driven intervention delivered by MMCO staff. Relationships among demographic and MMCO characteristics and CRCS status will be explored. Intervention cost will be assessed as well as cost to increase screening rates.	3
7. Dolan, James R01 CA112366	CRCS Decisions in Primary Care	An Analytic Hierarchy Process (AHP), a multicriteria decision-making method, will be used with average risk patients (n = 650) and their primary care physician (n = 37) to view the trade-offs between the advantages and disadvantages of currently recommended CRCS options. Patients and physicians will be from diverse primary care settings in Rochester NY, Birmingham AL, Indianapolis IN, and the Alabama practice-based continuing medical education network. Additional aims are to determine whether there are differences in decision priorities associated with specific patient or physician factors, and to compare priorities between these 2 groups.	4
8. Elston Lafata, Jennifer R01 CA112379	Understanding CRCS Participation	To inform a new generation of interventions aimed at improving CRCS participation, a mixed-method approach will be used to understand different aspects of shared decision-making regarding CRCS recommendations in a primary care setting. Methods will include direct observation and audio-recording of health maintenance visits (n = 900) in the Detroit Henry Ford Health System to characterize the nature and content of discussions. These results will be used to derive quantitative measures characterizing physician–patient discussions of CRCS. Qualitative measures will be joined with automated claims/laboratory data to determine their relationship to 12-month postvisit CRCS use. A pre- and postvisit survey will assess concordance of patient preferences with visit observations.	3

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Table 1. (continued)

Principal Investigator Name and Grant #	Project Name	Project Description	Elements of Primary Care *
9. Fisher, Deborah R21 CA102379	CRCS Behavior in the VA Population	To enhance the development of a resource for CRCS measures that is validated across multiple settings and populations, the CRCS Behavior Questionnaire will be used to measure CRCS participation. The study will establish cancer screening measures with known validity across multiple settings and populations.	7
10. Fletcher, Robert R21 CA102381	Screening and Family History of CRC	Members of a large, multispecialty group practice (n = 7,000) will be surveyed to assess the prevalence of family history of CRC. A follow-up survey will be sent to members who report a family history. Member's attitudes, beliefs, facilitators, and barriers to timely identification of risk and screening will be assessed. This research will be used to formulate hypotheses regarding barriers to recognizing family history and initiating timely screening, and will suggest potential solutions to be tested in subsequent research.	4
11. Geller, Berta R21 CA107215	Patient-activated CRCS in Primary Care Practice	The feasibility of an Interactive Health Communication tool to activate the CRCS process will be tested within 10 rural primary care settings in Vermont with adults aged 50–80 years and with all levels of literacy (n = 700). Barriers and facilitators of CRCS for patients, physicians, and office practices will be identified and used to develop an intervention and tracking systems to monitor the completion of all recommended CRCS procedures used in primary care practices.	4
12. Goldsmith, Geoffrey R21 CA106936	Multilevel Approaches to Improve CRCS	The effectiveness of a multi-intervention package to increase CRCS will be assessed in rural Arkansas family practices. Intervention components to be evaluated include a videotape with standardized information, licensed practitioner nurses (LPN) with scripted responses to patient resistance to CRC screening, and family physicians with individual endorsement of screening.	3
13. Grover, Frederic/ Pace, Wilson R21 CA107177	Patient-guided Tools to Promote CRCS	The effectiveness of a multilevel intervention to improve 12-month rates of CRCS will be evaluated using a randomized controlled trial. The trial is designed to activate the decision-making process between the provider, patient, and practice to ensure follow through with screening. Mixed methods will be used to describe the factors that influence implementation of the intervention components in primary care.	3
14. Hawley, Sarah R21CA100589	CRCS Preferences in Primary Care	To assess preferences for CRCS options, an educational module and accompanying instrument will be developed to elicit preferences among diverse primary care patient populations using conjoint analysis. Ethnic group differences in preferences will be assessed, with a large, urban primary care practice-based research network serving as the laboratory. Factors associated with variability in CRCS options among different racial/ethnic groups will be identified.	3
15. Hoffman, Richard R21 CA107154	Primary Care CRCS Surveillance System	An electronic primary care CRCS surveillance system will be implemented within the New Mexico Veterans Administration Health Care System, the University of New Mexico School of Medicine, and the Lovelace Sandia Health System. The surveillance system will describe CRCS delivery, utilization, efficiency, and outcomes in primary care practices. Data will be collected on CRCS and outcomes from electronic, clinical, and billing records. Clinical data will be linked to the statewide Surveillance Epidemiology and End Results (SEER) registry, to identify prevalent and incident CRC cases, screening rates, and cancer outcomes.	2
16. Ko, Cynthia R21 CA107157	A Primary-Care Based CRCS Program	A prototype CRCS program, integrating the services of a cancer prevention specialist with a new CRCS module for an existing electronic medical record system, will be developed. Database methods to estimate utilization of CRCS tests, including fecal occult blood testing, flexible sigmoidoscopy, colonoscopy, and double contrast barium enema, in eligible adults seen in the University of Washington neighborhood clinics will be developed and assessed.	2
17. Lane, Dorothy R21 CA100614	CRCS in Primary Care Practice	A continuing medical education (CME) intervention will be designed to improve providers' CRC risk communication, behavioral counseling, and utilization of a systems approach for the delivery of clinical preventive services. Computerized patient records will be used to track provider outcomes and referral linkages. Pre- and post-intervention provider surveys will examine knowledge, attitudes, self-reported practices, physician–patient visit interactions, risk perceptions, risk counseling, and shared decision making with regard to CRCS test options within county health center primary care practices.	3
18. Larkey, Linda R01 CA116467	Narrative vs Numeric Risk/ Storytelling to Promote CRCS in Primary Care Clinics	A randomized controlled trial (n = 600) will be used to examine the effects of Storytelling (ST) versus a Usual Care (UC) numeric form of communication on patient compliance for CRCS referrals. In Step 1, before screening referral, patients will receive via video (a) ST: a culturally rich story about a family with various cancer-related risk and healthy behaviors, and screening patterns or (b) UC: a risk assessment tool for providing the same CRC risk information, but with individual feedback on ratings of relative risk. Step 2 involves receiving information about the prescribed CRCS test and preparation, either as (a) ST: a personal story or (b) UC: a review of topical handouts.	3

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Table 1. (continued)

Principal Investigator Name and Grant #	Project Name	Project Description	Elements of Primary Care *
19. Levy, Barcey R01 CA121067	CRCS Among Patients Attending Rural Family Physicians' Practice	Current rates and modalities of CRCS in rural Iowa primary care practices (n = 20) will be assessed using a practice-based research network. Two sequential randomized clinical trials (RCTs) will test several practical, educational interventions to improve CRCS rates among 2,200 patients. In the first RCT, practices will be randomized to: 1) academic detailing plus a generic CRCS chart reminder, or 2) usual care. Patients (n = 110) within these practices will be randomized to: 1) mailed multimedia education, 2) mailed printed education, or 3) no mailed education. The second RCT will test educational interventions on patients who remain unscreened after the initial RCT. Patients will be randomized to: 1) motivational telephone interview combined with patient-specific chart reminder, 2) patient-specific chart reminder, or 3) usual care. Additionally, physician and patient facilitators and barriers to CRCS will be identified.	3
20. Ling, Bruce R21 CA100533	Patient' Provider Interaction and CRCS	To maximize the delivery and utilization of CRCS in the primary care setting, patient–provider communication styles and perceptions of the patient–provider relationship will be characterized, and their association with CRCS behavior tested. The project will be conducted in the Veterans Administration Pittsburgh Healthcare System primary care clinics and community-based primary care practices and utilize audiotaped clinical encounters developed in a previous project.	3
21. Luckmann, Roger R21 CA107197	Telephone Counseling to Support CRCS	Referral of primary care patients to a tailored telephone counseling service designed for patients of all levels of health literacy and supported by interpreters for low English proficiency patients will be pilot tested and evaluated. Referred patients will receive education about colorectal cancer and CRCS, assistance in making screening decisions, motivational counseling to encourage screening, and follow-up to promote screening adherence.	4
22. Makoul, Gregory R21 CA107242	Tools to Increase CRCS Rates	This study will evaluate acceptance of computer-assisted counseling tools? (CACT) effect on primary care physician's current practices and perceived needs when discussing CRCS. Theory-driven strategies for presenting text and graphics will be designed and a feasibility study conducted to determine acceptability of the CACT in everyday clinical practice, as well as its effect on screening discussions, screening intention, and subsequent screening rates.	3
23. Menon, Usha R21 CA100566	Interactive CRCS Education in Primary Care	The computer-assisted cancer screening kiosk (CACSK) is based on a conceptual framework derived from the Health Belief Model and Transtheoretical Model. The CACSK offers tailored information about CRCS and risk and will be tested for feasibility in primary care clinics (n = 4) among participants (n = 175) randomly assigned to control or intervention conditions.	1
24. Myers, Ron R21 CA102418	Tailored Messaging in CRCS	Tailored messaging will be used to encourage fecal occult blood testing and endoscopic screening in primary care practices (n = 14) in Delaware. Using a quasiexperimental pretest–posttest design, investigators will deliver a tailored screening intervention or a tailored screening kit, a tailored telephone call, and a tailored reminder letter to patients who complete a baseline survey.	4
25. Nease, Donald R21 CA104484	Prompting and Reminding at Encounters for Prevention	This project will assess different methods of delivering computerized reminders for CRCS within 12 community practices that are part of a primary care practice-based research network. Practices will be randomized to 1 of 3 reminder modes: 1) clinician targeted reminders, 2) patient targeted reminders, and 3) both clinician and patient targeted reminders. CRCS rates, clinician, office staff, and patient attitudes and perceptions regarding the reminder system will be assessed.	2
26. Ornstein, Steven R01 CA112389	CRCS in Primary Care Practice	A randomized controlled clinical trail will be conducted within 30 primary care practices in South Carolina to determine whether PPRNet-TRIP (a quality improvement model for successfully translating cardiovascular research into primary care practice) can improve provider recommendation and patient receipt of CRCS. Intervention practices will receive CRCS performance reports and participate in twice-yearly practice site visits and annual research meetings to facilitate the adoption of the PPRNet-TRIP model for CRCS. Control practices will receive CRCS guidelines. A mixed-method process evaluation will be conducted to assess the impact of the intervention and the adoption of PPRNet-TRIP.	4
27. Pignone, Michael R21 CA100613	Web-Based Decision Aid for CRCS	To facilitate CRCS in primary care practice, an integrated tool that uses a personal computer-based decision aid and reminder system will be developed and pilot tested with patients at average risk for CRC. Intervention components will consist of a: 1) patient-directed decision aid, a 2) Web-based reminder system for patients, and an 3) integrated the Web-based reminder system which will be incorporated into a data management system for primary care practices.	3

(*continued on next page*)

Table 1. (continued)

Principal Investigator Name and Grant #	Project Name	Project Description	Elements of Primary Care *
28. Rawl, Susan R01 CA115983	Promoting CRCS Among African Americans	A randomized controlled trial will be conducted among African American men and women (n = 1,248) seen in 2 Midwestern primary care networks, who are non-adherent to CRCS guidelines. The efficacy of a tailored, interactive computer intervention to promote CRCS will be compared to, and combined with, physician recommendations. Subjects will be randomly assigned to receive either: 1) a CRCS brochure; 2) an interactive computer intervention; or 3) the interactive computer intervention plus the brochure. Rates of adherence to FOBT, sigmoidoscopy, and colonoscopy are primary outcomes, assessed at 6 and 15 months. Both process and outcome variables will be assessed.	3
29. Scheid, Dewey R21 CA100518	Improving CRCS in Primary Care	To improve CRCS, "best practices" research methods will be used to identify effective and efficient CRCS processes in a primary care practice-based research network located in Oklahoma. The project will combine the unique experiences, barriers, and knowledge of practicing physicians into 1 or more comprehensive "best practice" methods.	3
30. Shike, Moshe R21 CA100587	Increasing Screening Colonoscopy Among Minority Women	To test the feasibility of using women who undergo CRCS to motivate their spouses to get screened, a model program offering colonoscopy screening to low-income urban African-American women (n = 3,000) at the time of mammography will be examined. Information learned will inform a nationwide project using mammography centers to increase CRCS among poor minority groups.	1
31. Talavera, Gregory R21 CA112368	CRCS in Primary Care Practice	A randomized controlled trial will be conducted among low-income Latinos (n = 600) who present for routine care at a community health center in San Diego. The study will compare the effectiveness of an intensive community health advisor behavioral intervention on participation in CRCS using a patient information handout (minimal intervention) or a healthy diet brochure (usual care). Patients will be randomized into 1 of the 3 intervention groups. A second aim is to develop a culturally sensitive intervention that will increase knowledge, modify culture-bound beliefs, and empower patients with the decision-making ability to participate in any 1 of 3 accepted screening strategies for CRCS.	3
32. Wackerbarth, Sarah R21 CA102349	CRCS Decisions: Patients and Physicians	To examine CRCS utilization and delivery patterns and the underlying decision processes driving CRCS patterns, a survey of a high-risk Appalachian population will be conducted. Behavioral interventions to improve patient–physician decision-making regarding CRCS will be identified using a mixed-method deign incorporating secondary data analysis, interview techniques, and surveys.	3
33. Weller, David R21 CA107544	CRCS: Primary Care Strategies	This research is being conducted in the United Kingdom, and focuses on populations with low uptake of CRCS with FOBT. Using formative research, interventions will be developed for primary care practices that include: 1) tailored print materials in multiple languages that address barriers to CRCS uptake, and 2) nurse facilitators trained to provide cultural and social endorsement with patients from low-uptake groups. The project seeks to develop and establish the feasibility of methods that could be fully tested in a larger trial.	3
34. Woolf, Steven R21CA100517	Patient-reported Barriers to CRCS	To describe reasons for not undergoing CRCS and the importance patients assign to each factor, patients (n = 1,600) will be asked via a postal survey to quantify the relative importance of each factor using a detailed list of potential barriers. An epidemiologic distribution of the relative importance of barriers in the non-adherent primary care population will be produced using multivariate analyses.	3

*1=Team approach to care delivery; 2=Advanced information systems; 3=Patient-centered care; 4=Improved efficiency and quality of service; 5=Enhanced practice finances; 6=Training opportunities; 7=Other.

APPENDIX B

Table 2. Appendix B. Participants in Improving Colorectal Cancer Screening Delivery, Utilization, and Outcomes: the State of the Science

Names of Participants and Degrees	
Wendy Atkin, Ph.D.	T.R. Levin, M.D.
Rachel Ballard-Barbash, M.D., M.P.H.	Barcey Levy, M.D., Ph.D.
Roshan Bastani, Ph.D	David Lieberman, M.D.
Nancy Breen, Ph.D.	Bruce Ling, M.D., M.P.H.
Erica Breslau, Ph.D.	Isaac Lipkus, Ph.D.
Durado Brooks, M.D., M.P.H.	Sharon Manne, Ph.D.
Martin Brown, Ph.D.	Helen Meissner, Ph.D.
Dana Casciotti, M.P.H.	Usha Menon, Ph.D., R.N.
Veronica Chollette, M.S.	Ronald Myers, Ph.D.
Carolyn Clancy, M.D.	Marion Nadel, Ph.D.
Robert Croyle, Ph.D.	Donald Nease, M.D.
Sarah Dash, M.P.H.	Karen Peterson, Ph.D.
Allen Dietrich, M.D.	Katherine Phillips, Ph.D.
Subash Duggirala, M.D.	Michael Pignone, M.D., M.P.H.
Katherine DuHamel, Ph.D.	Paul Pinsky, Ph.D.
Karen Emmons, Ph.D.	David Ransohoff, M.D.
Robert Fletcher, M.D., M.P.H.	Eric Schneider, M.D.
Andrew Freedman, Ph.D.	Moshe Shike, M.D.
Berta Geller, Ed.D.	Stephen Taplin, M.D., M.P.H.
Fred Grover, M.D.	Shin-Ping Tu, M.D., M.P.H.
Sarah Hawley, Ph.D.	Sally Vernon, Ph.D.
Richard Hoffman, M.D., M.P.H.	Sarah Wackerbarth, Ph.D.
Carl Jaffe, M.D.	Sidney Winawer, M.D.
Jon Kerner, Ph.D.	Stephen Woolf, M.D., M.P.H.
Carrie Klabunde, Ph.D.	Robin Yabroff, Ph.D.
Laura Kochevar, Ph.D.	Jane Zapka, Sc.D.
Dorothy Lane, M.D., M.P.H.	Ann Zauber, Ph.D.
David Lanier, M.D., M.P.H.	

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