Interventions to Improve Cancer Screening
Commentary from a Health Services Research Perspective

K. Robin Yabroff, PhD, MBA

Introduction

Based on evidence demonstrating that early detection and treatment can reduce mortality, regular screening for breast, cervical, and colorectal cancers has been widely recommended by most preventive services organizations for the past several decades.[1–3] However, use of mammography, Pap smear, and any of the recommended colorectal cancer screening modalities remains sub-optimal.[4,5] Patients without recent screening tend to be poor, uneducated, minority, or without health insurance or a usual source of care.[6] Lack of understanding of screening benefits, fear of a cancer diagnosis, concerns about inconvenience, and forgetfulness are also associated with less screening.[6] Thus, interventions that address patient barriers to initiating and maintaining regular cancer screening are important public health strategies to reduce cancer morbidity and mortality.

As shown in the systematic reviews conducted by Baron and colleagues[7,8] for the Task Force on Community Preventive Services (the Task Force), many categories of patient-directed interventions are associated with improved screening. The Task Force found sufficient evidence to recommend interventions that increase patient demand for cancer screening, including reminders, small media with educational or motivational information (i.e., videos and printed materials such as letters, brochures, or newsletters), and one-on-one education. The Task Force also found sufficient evidence to recommend interventions that lead to the reduction of structural or economic barriers to cancer screening and the reduction of out-of-pocket costs for at least one type of cancer screening test.[9] This comprehensive information will be valuable for public health professionals and researchers in a variety of settings.

As noted in their analytic framework for assessing interventions, screening is a necessary first step in a process of care, but is not sufficient for early detection and improved outcomes.[7,8] Patients who experience barriers to screening are also likely to have similar barriers throughout the cancer-control continuum, including risk assessment and primary prevention, regular screening, follow-up of abnormal results, diagnosis, primary and adjuvant treatment, and post-treatment surveillance.[6] Understanding the broader healthcare delivery context can help identify challenges to the implementation of demand- and access- enhancing interventions and key areas for future research.

Health Services Research Framework for Evaluating Cancer Screening

Figure 1 adapts and extends behavioral models of access to medical care[10,11] to illustrate the public policy, community environment, and healthcare delivery setting contexts that influence provider–patient interactions leading to the receipt of cancer screening, and ultimately, improved cancer outcomes.[6,12] The federal and state public policy level in the model includes legislation, reimbursement, and regulatory environments, as well as fiscal constraints that may affect healthcare budgets. For example, the CDC-funded and state-based Breast and Cervical Cancer Early Detection Program provides screening and case management services for a portion of low-income uninsured women.[13] State and year-to-year differences in implementation and coordination of the program, and its integration in the community environment and local healthcare delivery and provider network settings will affect local barriers to cancer screening, their potential resolution, and the proportion of eligible women screened. Other national policies, such as practice guidelines and requirements for monitoring cancer screening services for quality of care measurement (i.e., Health plan Employer Data and Information Set [HEDIS]),[14] will also influence the delivery of screening services through other levels of the model, and in particular, factors that influence whether providers make guideline-consistent screening recommendations and ensure that screening has occurred.

The community and social-environment level of the model includes geographic, social, and local health insurance characteristics (e.g., types of employers and their health insurance coverage policies). The local

From the Division of Cancer Control and Population Sciences, National Cancer Institute, Bethesda, Maryland

Address correspondence and reprint requests to: K. Robin Yabroff, PhD, MBA, Health Services and Economics Branch/Applied Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute, Executive Plaza North, Room 4005, 6130 Executive Boulevard, MSC 7344, Bethesda MD 20892-7344. E-mail: yabroffr@mail.nih.gov.

0749-3797/08/$–see front matter
doi:10.1016/j.amepre.2008.04.006

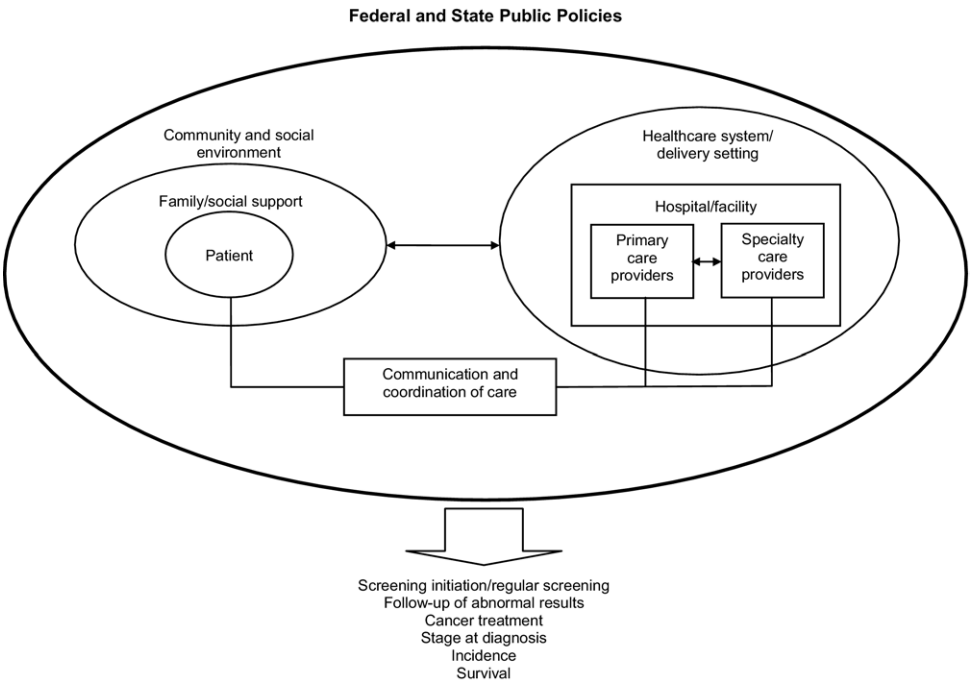

Figure 1. Health services research framework for evaluating cancer screening.

healthcare delivery setting includes health plans, hospitals, and local primary care and specialty provider supply. Outside of a health plan, information systems and patient records are rarely linked across these multiple providers and practice settings. Even within health plans or organized practice settings, tracking and reminder systems for screening are rare,[15] and many failures in the screening process occur during the transitions in care.[16,17]

In the provider level of the model, primary care providers communicate recommendations for screening intervals and follow-up care if any, by referring patients to specialty providers (i.e., radiologists, obstetrician–gynecologists, and gastroenterologists) and coordinating the receipt of recommended care. Importantly, patients with insurance may change providers and health plans, and their medical records may not follow these transitions. For patients without health insurance and/or a usual source of care, navigation of the healthcare system in pursuit of cancer screening is more complex. Finally, as illustrated in Figure 1, demand- and access-enhancing interventions can be evaluated in relationship to the process measures of screening initiation, regular screening, follow-up of abnormal results, guideline-consistent treatment, and outcome measures of the stage of disease at diagnosis, survival, and reduction in mortality. Because regular cervical and colorectal cancer screening and treatment can also eliminate pre-invasive disease,[2,3] reduction in the incidence of invasive disease is another potential outcome of regular screening for these cancers.

Challenges to the Dissemination of Effective Interventions to Improve Cancer Screening

The Task Force identified many important challenges to implementing demand- and access-enhancing interventions[7,8] and suggested that decision makers consider the local context when identifying feasible intervention approaches to improve cancer screening.[9] Adoption of patient-directed interventions to improve screening will also be influenced by factors at multiple levels of federal and state policies, community and social environment, the local healthcare delivery setting, and providers.

As noted in the systematic reviews,[7,8] ensuring access to follow-up care is a challenge to the implementation of interventions to increase screening. Patients with barriers to screening may require additional interventions to ensure the receipt of timely and complete follow-up care for abnormal results and guideline-consistent cancer treatment following a cancer diagnosis. Provider and healthcare delivery system barriers to screening may also require interventions. Linking patient-, provider-, and healthcare system-directed interventions to improve screening with follow-up and treatment interventions at multiple levels is a major challenge to ensuring guideline-consistent care throughout the cancer control continuum.

For categories of interventions that most commonly occur within a health plan or practice—such as patient reminders—ensuring provider recommendations of guideline-consistent screening, system capacity for conducting screening and tracking of results, and the

integration of the screening process within routine primary care is a challenge. For categories of interventions that occur outside of the primary care setting and potentially across multiple practice settings, ensuring coordination of cancer screening services is even more complex. For example, mammography vans or "mammovans" are separate entities for the delivery of screening. Interpretation of the current mammogram and recommendation for future screening schedules or follow up of abnormal results may require prior mammography films for comparison, risk-factor assessment, and screening history. How is this information coordinated between the mammovan and other settings? How are findings and recommendations reported to primary care providers and patients? How are patients who miss appointments for subsequent screening and follow-up of abnormal results identified?

Lack of coordination and the tracking of patients across health delivery settings and providers also presents a challenge for the evaluation of longer-term impact of interventions to increase cancer screening on reducing the stage at diagnosis and increasing survival following diagnosis, and in the case of cervical and colorectal cancer screening, the potential impact on reducing the incidence of invasive disease. These longer-term outcomes are critical for local health departments and health plans making decisions about which interventions to implement to improve cancer screening, yet these linked data are mostly unavailable.

As noted in the systematic reviews, few intervention studies assessed the costs associated with intervention delivery.[7,8] Yet this information is particularly useful to health plans, practices, and state and local health departments in deciding whether or not to implement interventions, in identifying specific categories of intervention, and for which cancers. Further, intervention studies rarely distinguish between receipt of a test in patients who have never been screened and patients with delayed screening test, but who are mostly on schedule. The cost implications of different patient-directed interventions may vary based on the screening history in the patient population. Other interventions that address "fixed" patient barriers, such as lack of transportation, might require ongoing investments to maintain screening levels. In environments with limited resources, cost and cost-effectiveness information may be critical in guiding decisions about the implementation of interventions to improve cancer screening.

Areas for Additional Intervention Research in Improving Cancer Screening

The health services research perspective can also be used to identify key areas where additional research would inform the adoption of effective interventions.

Cost Effectiveness of Interventions to Improve Screening and Longer-Term Outcomes

Multiple studies have assessed the cost effectiveness of screening in reducing mortality,[18] but few have explicitly addressed the cost effectiveness of implementing interventions to improve screening, particularly in relationship to the longer-term outcomes, stage at diagnosis, or survival. Simulation models, such as those developed through the National Cancer Institute (NCI)–sponsored Cancer Intervention Surveillance Network (CISNET),[19] can simultaneously incorporate the impact of intervention strategies, screening histories, costs, the longer-term outcomes of survival following cancer diagnosis, and mortality. How does the cost effectiveness of different categories of interventions to improve screening vary based on assumptions about regular screening, completion of follow-up and treatment or the need for additional intervention throughout the cancer control continuum? Which categories of interventions or combinations of interventions are most cost effective in improving screening in never or rarely screened populations? How does the cost effectiveness of intervention categories vary from the perspective of a health plan compared to a local health department?

Interaction Between Patient-Directed Interventions with Provider- and System-Level Interventions to Increase Screening

Primary care and specialty care provider background, experience, and beliefs about screening, as well as the provider–provider interaction, influence the screening recommendation,[6] and this recommendation has consistently been reported to be one of the strongest predictors of whether patients receive cancer screening.[6] Does the simultaneous implementation of provider- and patient-directed interventions produce a larger effect on screening than either category of intervention alone? Similarly, does the simultaneous introduction of patient-directed intervention with healthcare system–level interventions, such as the introduction of electronic medical records, produce larger effects on screening than either category of intervention alone? The NCI- and Agency for Healthcare Research and Quality (AHRQ)–sponsored Cancer Research Network (CRN), an affiliation of 13 large managed care organizations with more than 11 million covered lives and hundreds of clinic sites and providers,[20] may be an ideal setting in which to conduct this research.

Intervention Effectiveness in Improving Regular, Ongoing Screening

The interventions identified in the systematic reviews[7,8] addressed a single screening event, yet preventive services recommendations are for ongoing, regular cancer screening.[1–3] The effectiveness of different categories of inter-

ventions in improving regular screening is largely unknown. Is a single exposure to an intervention sufficient to motivate long-term behavior change related to regular screening? How does this vary by intervention category (e.g., tailored education versus mammovan)?

Effectiveness of Interventions for Multiple Cancers and for Multiple Health Behaviors

Patient-level barriers to breast, cervical, and colorectal cancer screening are similar,[6] but for several categories of interventions, the evidence was not sufficient to separately recommend these interventions for all three cancers.[7,8] Does intervention effectiveness in promoting regular screening vary for breast and cervical screening, or across colorectal cancer screening modalities? Does exposure to an intervention to increase screening for one cancer "prime" or make patients more responsive to interventions to increase screening for the other cancers?

Similarly, health-risk behaviors, such as smoking, sedentary lifestyle, and low fruit and vegetable consumption, tend to cluster and have been reported to be associated with the receipt of cancer screening.[21] Are multi-component interventions effective and cost effective in improving screening and other risk reducing health behaviors, such as smoking cessation?

Finally, as illustrated in Figure 1, the adoption and effectiveness of interventions to improve screening will be influenced by the multiple levels of federal and state policies, community and social environments, the local healthcare delivery setting, and the patient–provider interaction, yet multilevel analytic techniques are rarely used in the evaluation of these interventions. Ongoing efforts to use multilevel analytic models are an important area for additional research to inform cancer control healthcare delivery and policy, and ultimately, improve cancer outcomes.

No financial disclosures were reported by the author of this paper.

References

1. Humphrey LL, Helfand M, Chan BK, Woolf SH. Breast cancer screening: a summary of evidence for the U.S. Preventive Services Task Force. Ann Intern Med 2002;137:347–60.
2. U.S. Preventive Services Task Force. Screening for colorectal cancer: recommendation and rationale. Ann Intern Med 2002;137:129–31.
3. U.S. Preventive Services Task Force. Screening for cervical cancer: recommendations and rationale. Am J Nurs 2003;103:101–9.
4. Breen N, Wagener DK, Brown ML, Davis WW, Ballard-Barbash R. Progress in cancer screening over a decade: results of cancer screening from the 1987, 1992, and 1998 national health interview surveys. J Natl Cancer Inst 2001;93:1704–13.
5. Meissner HI, Breen N, Klabunde CN, Vernon SW. Patterns of colorectal cancer screening uptake among men and women in the United States. Cancer Epidemiol Biomarkers Prev 2006;15:389–94.
6. Mandelblatt JS, Yabroff KR, Kerner JF. Equitable access to cancer services: a review of barriers to quality care. Cancer 1999;86:2378–90.
7. Baron RC, Rimer BK, Coates RJ, et al. Client-directed interventions to increase community access to breast, cervical, and colorectal cancer screening: a systematic review. Am J Prev Med 2008;35(1S):S56–S66.
8. Baron RC, Rimer BK, Breslow RA, et al. Client-directed interventions to increase community demand for breast, cervical, and colorectal cancer screening: a systematic review. Am J Prev Med 2008;35(1S): S34–S55.
9. Task Force on Community Preventive Services. Recommendations for client- and provider-directed interventions to increase breast, cervical, and colorectal cancer screening. Am J Prev Med 2008;35(1S): S21–S25.
10. Aday LA. Health care in the U.S.: equitable for whom? Beverly Hills, California: Sage Publications, 1980.
11. Andersen RM, Aday LA. Access to medical care in the U.S.: realized and potential. Med Care 1978;16:533–46.
12. Zapka JG, Taplin SH, Solberg LI, Manos MM. A framework for improving the quality of cancer care: the case of breast and cervical cancer screening. Cancer Epidemiol Biomarkers Prev 2003;12:4–13.
13. National Breast and Cervical Cancer Early Detection Program. www.cdc.gov/cancer/NBCCEDP/.
14. National Committee for Quality Assurance (NCQA). HEDIS–Health Plan Employer Data and Information Set. 2003. www.ncqa.org/tabid/59/Default.aspx.
15. Klabunde CN, Brown ML, Frame PS, Mandelson MT, Riley GS. Health plan policies and programs for colorectal cancer screening: a national profile. Am J Manag Care 2004;10:273–9.
16. Taplin SH, Ichikawa L, Yood MU, et al. Reason for late-stage breast cancer: absence of screening or detection, or breakdown in follow-up? J Natl Cancer Inst 2004;96:1518–27.
17. Leyden WA, Manos MM, Geiger AM, et al. Cervical cancer in women with comprehensive healthcare access: attributable factors in the screening process. J Natl Cancer Inst 2005;97:675–83.
18. Pignone M, Saha S, Hoerger T, Mandelblatt J. Cost-effectiveness analyses of colorectal cancer screening: a systematic review for the U.S. Preventive Services Task Force. Ann Intern Med 2002;137:96–104.
19. National Cancer Institute. Cancer Intervention and Surveillance Modeling Network (CISNET). cisnet.cancer.gov/.
20. Wagner EH, Greene SM, Hart G, et al. Building a research consortium of large health systems: the Cancer Research Network. J Natl Cancer Inst Monogr 2005;35:3–11.
21. Meissner HI, Yabroff KR, Dodd KW, Leader AE, Ballard-Barbash R, Berrigan D. Are patterns of health behavior associated with cancer screening? Am J Health Promot 2008. In press.