The Elusive Goal of Maintaining Population Cancer Screening:
It Is Time for a New Paradigm

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Screening mammography is credited, in part, for the success in reducing the mortality from breast cancer in the United States (1). However, screening uptake has not been universal nor has it been adopted for regular use by all eligible women. In this issue of the Journal, Vernon et al. conducted a methodologically rigorous review of the literature on controlled behavioral interventions to increase repeat mammography screening among women at average risk for the disease (2).

Their results are sobering: Behavioral interventions only increase rates by a small to moderate amount, and there is insufficient evidence to know which approaches are the most effective (2). These results are all the more discouraging because the reviewed studies focused on getting women to undergo only one to two repeat screening examinations and not the 12–13 biennial screenings presently recommended for average risk women aged 50–74 years (3). Even intensive counseling approaches, which included patient navigation (patient education and assistance), showed only a modest return for their high resource intensity. The most effective approaches reported by studies in this analysis appear to be reminder systems, but those studies were too heterogeneous to provide definitive evidence of superiority.

From a public health perspective, there are several different potential actions in response to these results: 1) invest in more research to test additional interventions to improve repeat mammography rates, 2) use risk status to match interventions and technology and target communications rather than a “one size fits all” approach, 3) invest in research to understand how to change the structure of care to promote repeat screening, 4) devote more resources to developing better screening tests, and/or 5) use modeling to evaluate which combinations of approaches would have the greatest potential impact on reducing breast cancer mortality and use these data to guide future directions.

A critical question raised by the meta-analysis by Vernon et al. is whether we will ever know which types of behavioral interventions are “the best” for improving regular mammography use. The research reviewed included well-designed studies from the past two decades. The costs of applying screening interventions like those included in the review are considerable. For instance, the cost of reminders is $124,217 per year of life saved vs status quo care (in year 2000 dollars) (4). Reminders are only cost-effective if targeted to virtually unscreened women or women with a twofold increase in risk. These results suggest that investments in more interventions to increase regular screening in average risk groups may not be the optimal deployment of resources.

The review by Vernon et al. does not address whether interventions would be any more or less effective if targeted to women at higher than average risk based on genetic, lifestyle, or other risk factors. Some studies showed that having extremely high risk such as conferred by $BRCA1$ or $BRCA2$ mutations increases adherence to routine screening (5,6). Even women with mildly or moderately increased risk are more likely to obtain regular mammography screening than those without risk factors (7). Thus, it is logical to posit that women at high risk might be more motivated to seek regular screening than those at average risk and that existing interventions might be more effective in high-risk subgroups. However, this has not been shown empirically. If this idea is confirmed, it will be important to generate clear, consistent communication of any new risk-based recommendations to women and their providers. The recent US Preventive Services Task Force guidelines (3) created a lot of confusion and mixed media messages because of the recommendation that women aged 40–49 years consider both the benefits and the harms of screening (8–10). Therefore, future intervention research should be closely linked to communication and dissemination efforts to be maximally effective in changing behavior in population subgroups.

Interventions at the health-care level represent an alternative, or complementary, approach to targeting individual behavior changes. For instance, the coverage of screening mammography by Medicare in 1991 (11) and the elimination of patient copayments in 1998 (12) are excellent examples of how reimbursement structural changes removed barriers to screening use. Another structural approach to improving screening is congressional funding of the National Breast and Cervical Cancer Early Detection Program of the Centers for Disease Control (13). Passage of health-care reform and provision of insurance to broader populations may also facilitate maintenance of early detection behaviors, although it is far too early to evaluate outcomes associated with this system change. As Vernon et al. concluded, integration of individual behavioral interventions with structural-level changes has the potential to create sustainable improvements in breast cancer screening adherence.

Another possible explanation for failing to define the most effective interventions for promoting regular mammography adherence may be that women are making an informed choice to not use an imperfect technology. There has been a fair amount of media attention to the fact that mammography misses many cancers while detecting other lesions that are never destined to become cancer (14–16). It could be reasonably argued that we should better spend our efforts in discovering better early detection tests rather than continuing to invest in getting a few more women to regularly
use a flawed technology. Proteomics and gene expression profiling methods are some of the evolving tools that are being used to identify potential biomarkers that could be used as screening tests (17,18).

Overall, there are multiple complex influences that affect our approach to optimizing screening, ranging from biological factors and individual behavior to health-care organizations and the broader policy environment. Connections and feedback among these levels are difficult to study with traditional methods. Computer simulation modeling integrates outcomes of interventions across multiple levels and estimates, which investments are likely to have the maximum impact on population mortality while balancing reach, effects, harms, and costs. The Cancer Intervention and Surveillance Modeling Network (CISNET) funded by the National Cancer Institute (http://cisnet.cancer.gov) is an excellent example of the application of modeling to determine the most profitable avenues for intervention (19).

The promise of breast cancer screening has fallen short of its goals because of its imprecision, failure to screen those at highest risk, lack of compliance with screening continuance over recommended periods of time, and gaps in access to or quality of diagnostic follow-up and treatment (20). It is no longer enough to simply conduct more interventions to understand which work best in motivating individuals to undergo repeat cancer screening. New paradigms, guided by evidence from modeling, novel trials, and new scientific discovery, will be needed to realize the promise of eliminating the burden of cancer.

References

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