

Competing Demands in the Office Visit: What Influences Mammography Recommendations?

Paul A. Nutting, MD, MSPH, Monika Baier, MS, James J. Werner, MS, Gary Cutter, PhD, Colleen Conry, MD, and Linda Stewart, MD

Background: The multiple competing demands of the busy office visit have been shown to interfere with delivery of preventive services. In this study we used physician recommendations for screening mammography to examine the relative importance of physician, patient, and visit characteristics in determining on which patient visits this preventive service will be provided.

Methods: Physicians in the Ambulatory Sentinel Practice Network (ASPN) completed a questionnaire describing their knowledge, attitudes, and beliefs about screening mammography. They also described the content of a series of nonacute care visits with women aged 40 to 75 years with regard to making a recommendation when the patient was due for screening mammography. The data were linked, and univariate and multivariate logistic regression methods were used to examine the relative importance of physician, patient, and visit characteristics on making a recommendation for mammography.

Results: Ninety-three physicians reported making a recommendation for screening mammography on 53.1% of nonacute visits. When modeling physician, patient, and visit characteristics separately, 70% of the variability in the model is explained by physician characteristics only, 63% by patient characteristics only, and 73% by visit characteristics only. A combined model using all characteristics explained 85% of the variability.

Conclusions: Although characteristics of physicians and patients can predict frequency of recommendations for mammography, the specific characteristics of the visit are equally important. Efforts to improve delivery of preventive services in primary care that emphasize physician education and performance feedback are unlikely to increase rates of mammography recommendation. Effective strategies must consider the multiple competing demands faced by patients and physicians during each office visit and seek ways for assisting them in setting rational priorities for services. (J Am Board Fam Pract 2001; 14:352–61.)

In providing comprehensive care the family physician is faced with the challenge of balancing a wide variety of health services patients need across a spectrum of preventive, acute care, chronic care, and mental health services. An important construct of competing demands has been proposed to explain how physicians and patients interact and address certain problems in primary care.^{1–7} The competing demands model suggests that patients and physicians bring an implicit agenda of issues to

the primary care visit. Their interaction, modified by visit and health system factors, results in attention to some problems with other problems left to subsequent visits, if addressed at all. Previous work has examined the competition among services with a focus on clinical preventive services^{2,3} and depression.^{4,7} A better understanding of how competing demands play out in an office visit would be helpful in guiding further research and improvement programs for enhancing clinical prevention.

Physician recommendations for screening mammography provides an excellent marker for examining the competing demands of primary care practice. Despite incontrovertible evidence for effectiveness of screening mammography in decreasing breast cancer mortality^{8–14} and strong evidence that a physician recommendation of mammography is effective in leading to successful screening,^{15–20} substantial numbers of women are not on schedule for screening mammography.²¹ Even when physicians believe in the value of screening

Submitted, revised, 31 January 2001.

From the Department of Family Medicine (PAN, CC), and the Program in Health and Behavioral Science (JJW), University of Colorado Health Sciences Center; the Center for Research Strategies (PAN), and the AMC Cancer Center (PAN, MB, GC), Denver; and the Family Medicine Center of Baton Rouge (LS), Baton Rouge, La. Address reprint requests to Paul A. Nutting, MD, MSPH, Center for Research Strategies, Suite 1150, 225 E 16th Avenue, Denver, CO 80203.

This work was supported through funding from the Centers For Disease Control and Prevention (Cooperative Agreement #0009272279).

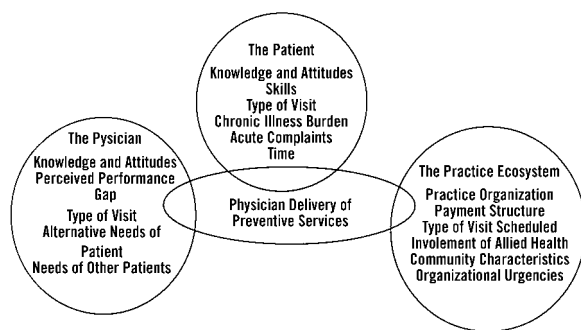


Figure 1. The competing demands model: patient, physician, and practice characteristics interact to affect delivery of preventive services. (Adapted with permission from Jaen CR, Stange KC, Nutting PA. Competing demands of primary care: a model for the delivery of clinical preventive services. *J Fam Pract* 1994;38:166–71.)

mammography, they are often unable to seize opportunities to recommend mammography during routine patient visits.¹⁵

To better understand the determinants of physician recommendations for screening mammography in primary care, we report a further analysis of a study originally conducted in collaboration with the Centers for Disease Control and Prevention (CDC) to describe primary care physician knowledge and practices for screening mammography.²² We report the results of linking two components of the study (data on physician characteristics and data on recommendations for mammography reported from a series of office visits) to examine the relative importance of physician, patient, and visit characteristics on physician recommendations for screening mammography. We hypothesize that characteristics of the specific visit will be at least as predictive of mammography recommendations as characteristics of the patient and the physician.

Methods

Conceptual Model and Measures

The competing demands model is depicted in Figure 1 and emphasizes the interaction of physician and patient characteristics and the practice ecosystem in determining patterns of preventive service delivery during a primary care visit. Although primary care should be delivered during a coordinated sequence of visits, the model emphasizes the importance of the characteristics of a given visit in determining which issues will be addressed and

which will be deferred to a subsequent visit. In this study, we examined several physician characteristics, including training, and previous experience with breast cancer, acceptability of mammography to patients, and knowledge and beliefs about the appropriate use of screening mammography. We also examined such patient characteristics as patient age and risk, history of mammography, and potential barriers to receiving a mammogram. Because the immediate circumstances of the visit are believed to be an important determinant, we examined three visit characteristics separately. We were unable to include in this analysis a number of potentially important characteristics of the practice¹ or health care policy and reimbursement environment.⁵

Data Collection

From 21 October 1991 to 19 January 1992, volunteer physicians in 50 community-based practices of the Ambulatory Sentinel Practice Network (ASPN) enrolled consecutive women 40 to 74 years of age who were scheduled for either a health maintenance (routine annual examination) or routine chronic care visit. Visits for intercurrent illness, emergent conditions, and injuries were not included in the study.

Visit data were reported by the physician using the standard ASPN weekly return card,^{23,24} which captured patient age, patient reason(s) for visit, breast cancer history in the patient and first-degree relatives, year of last mammogram, whether the patient requested a mammogram, the result of a breast examination done on that visit, and whether a mammogram was ordered on that visit. The physicians also reported their perceptions of (1) the likelihood that the patient would comply with a suggestion for obtaining a mammogram, (2) the patient's attitude regarding compliance, (3) whether cost was a barrier for the patient, and (4) whether, in their opinion, a more urgent issue was dealt with during the visit. Detailed instructions were provided to ensure reliable completion of the cards. All cards and questionnaires were checked for completeness by the practice coordinator and transferred to the ASPN central office. Data were edited and double entered.

Before collecting data on specific patient visits, physicians in the practices also completed a 20-item questionnaire capturing demographic characteristics, information on training and experience, and

knowledge, attitudes, and beliefs about screening mammography. Before the analysis, 8 items were selected from the questionnaire to represent physician knowledge of and attitudes toward screening mammography recommendations.

Linking Data Sets

The original data were collected only at the practice (rather than the individual physician) level. To link the physician questionnaire with visit data for that physician, practices were asked to review medical records to determine who participated in and reported on each visit in the data set. Forty-three of the practices (86%) agreed to review medical records and attempt data linkage. This process produced a total of 3,322 visits for women between 40 and 75 years of age that were successfully linked to one of 93 physicians who saw them on that visit. To analyze visits in which a screening mammogram was clearly indicated, we excluded visits by patients who had a mammogram within the current or previous year (1,048 visits), visits by patients for whom mammogram status could not be determined (476 visits), visits by patients for whom the reason for the visit was related to a breast problem (187 visits), and visits by patients with a history of breast cancer (273 visits). We also excluded 200 visits for patients seen by a variety of nonphysician providers. These exclusions resulted in a linked data set of 1,138 visits to 93 physicians by women due for screening mammography.

Methods of Analysis

The analysis was directed toward examining the relative importance of physician characteristics (including knowledge and attitudes about screening mammography), patient characteristics, and the characteristics of specific visits on whether a screening mammogram was recommended.

Univariate chi-square statistics were computed for the relation between each of the physician, patient, and visit characteristics and whether a mammogram was recommended on the visit. Variables that were significantly associated with a recommendation for mammography (at the $P < .05$ level) were further analyzed by logistic regression. To examine the independent effects of physician, patient, and visit characteristics, separate logistic regression models were fitted for variables in each category that was significantly associated with ordering a mammogram from the univariate analyses.

A final regression model was developed to examine the relative contribution of variables in each category to the recommendation for screening mammography.

Receiver operating characteristic (ROC) curves were obtained from each logistic regression to determine the closeness of fit of the sample logistic regression equation to the observed values of whether a mammogram was ordered. The ROC curve is similar to the coefficient of determination (R^2) obtained from simple linear regression in representing the amount of variability explained by the model.

All univariate analyses were performed using SAS-PC (SAS Institute, Cary, NC). The logistic regression analyses were performed using Egret (Cytel Software Corp, Cambridge, Mass), to account for nesting of patient visits within physician.

Results

Six-hundred two (53.1%) of the patients making a visit to one of the 93 physicians received a recommendation for a screening mammogram. A recommendation for screening mammography was associated with visits scheduled for an annual examination significantly more frequently than with visits for routine chronic care (80.7% vs 38.7%; $P < .01$) Women who received a mammography recommendation were significantly younger (mean age 56.1 vs 58.2 years; $P < .001$). In general, compared with male physicians, female physicians recommended mammography significantly more frequently (63.7% vs 49.8%; $P < .01$).

Table 1 shows the univariate associations between physician characteristics and a recommendation for screening mammography. Of the demographic characteristics, physician race and ethnicity showed no significant association, but female physicians and physicians reporting completion of residency training were more likely to recommend mammography. There are strong associations between physician knowledge attitudes and beliefs and mammography recommendation. For physicians, having reported more frequent intervals for ordering mammography, a belief that breast cancer mortality can be reduced with mammography, experience with breast cancer detected by mammography, a belief that mammography does not produce psychological stress for the patient, and familiarity with the literature on breast cancer

Table 1. Univariate Associations of Physician Characteristics and Physician Recommendation for Screening Mammography.

Physician Characteristic	Number	Visits in Which Physician Characteristic Was Associated With Recommendation for Mammography (%)	P Value
<i>Demographic Characteristics</i>			
Sex			
Male	6	49.8	
Female	6	63.7	.001
Race			
White (not of Hispanic origin)	81	53.0	
African American (not of Hispanic origin)	3	44.4	
White (of Hispanic origin)	3	46.2	
Asian	6	68.6	.198
Completed residency training			
Yes	64	62.1	
No	28	36.1	.001
<i>Knowledge and Attitudes</i>			
Interval at which screening mammography is ordered for age 40–49 years			
Every 3–5 years or less	32	38.0	
Every 2 years	53	62.2	
Annually	8	85.4	.001
Interval at which screening mammography is ordered for age 50 years and older			
Every 3–5 years or less	6	19.8	
Every 2 years	23	39.5	
Annually	64	61.8	.001
Degree to which physician believes breast cancer mortality is reduced with screening mammography			
1 (not at all)	0	—	
2	13	35.6	
3 (moderately reduced)	33	51.8	
4	20	69.4	
5 (significantly reduced)	26	51.5	.001
How much physical discomfort physician believes is experienced by patient during mammogram			
1 (no discomfort or a little)	27	50.2	
2 (moderate discomfort)	52	55.9	
3 (great discomfort)	13	48.4	.101
How much psychological distress physician believes is experienced by patient having a mammogram			
1 (no distress)	5	73.1	
2 (moderate distress)	60	57.1	
3 (significant distress)	28	42.0	.001
Have any of your patients had breast cancer detected by mammography when you did not suspect cancer?			
Yes	69	55.6	
No	23	42.1	.001
Have you or a family member been diagnosed with breast cancer?			
Yes	15	34.6	
No	78	58.6	.001
How familiar are you with scientific and professional literature on breast cancer screening?			
1 (not at all familiar)	0	—	
2	9	48.7	
3 (moderately familiar)	33	53.6	
4	38	61.5	
5 (very familiar)	13	35.2	.001

Table 2. Univariate Associations of Patient Characteristics and Physician Recommendation for Screening Mammography.

Patient Characteristic	Number (n = 1,138)*	Visits in Which Patient Characteristic Was Associated With Recommendation for Mammography (%)	P Value
Patient age			
Mean for patients receiving recommendation = 56.1 years	602		
Mean for patients not receiving recommendation = 58.2 years	531		.0007
Patient has relative with diagnosed breast cancer			
Yes	99	64.7	
No	1,032	52.0	.016
Physician believes patient will comply with recommendation			
Yes	892	59.6	
No	235	29.4	.001
Physician believes cost is a barrier			
Yes	192	42.7	
No	879	55.9	.001
Patient had a previous mammogram			
Yes	503	60.0	
No	630	47.6	.001

*Number of visits for some patient characteristics is less than 1,138 because of missing data.

screening were all significantly associated with recommendations for mammography. Having a personal or family experience with breast cancer was also significantly associated with recommendations, but surprisingly a positive history was associated with a lower frequency of recommendation.

Table 2 shows the univariate relations between patient characteristics and a recommendation for

screening mammography. Younger women, those with a previous mammogram, and those with a relative with breast cancer were significantly more likely to receive a mammography recommendation, whereas those for whom the physician believed cost was a barrier or would not comply were significantly less likely to receive a recommendation.

Table 3 shows the univariate relations between

Table 3. Univariate Associations of Visit Characteristics and Physician Recommendation for Screening Mammography.

Visit Characteristic	Number (n = 1138)*	Visits in Which Visit Characteristic Was Associated With Recommendation for Mammography (%)	P Value
Scheduled reason for visit			
Annual examination	389	80.7	
Chronic disease follow-up	741	38.7	.001
More urgent issue dealt with during visit			
Yes	753	42.1	
No	360	74.4	.001
Patient requested a mammogram			
Yes	97	92.8	
No	1,036	49.4	.001

*Number of visits for some visit characteristics will be less than 1138, due to missing data.

Table 4. Predictors of a Recommendation for Screening Mammography. Separate Logistic Regression Models Were Fitted for Physician, Patient, and Visit Characteristics.

Predictor	Odds Ratio	95% Confidence Interval
<i>Modeling only physician characteristics</i>		
Interval at which screening mammography is ordered for age 40–49 years		
Every 3–5 years or less	1.0	
Every 2 years	2.2	1.5, 3.1
Annually	8.9	2.5, 31.3
Interval at which screening mammography is ordered for age 50 years and older		
Every 3–5 years or less	1.0	
Every 2 years	2.2	1.1, 4.4
Annually	3.9	1.8, 8.4
How familiar are you with scientific and professional literature on breast cancer screening?		
1 (not at all familiar)	—	
2	1.0	
3 (moderately familiar)	1.7	0.8, 3.2
4	2.2	1.1, 4.3
5 (very familiar)	0.7	0.3, 1.4
Completed residency training		
Yes	1.0	
No	0.6	0.4, 0.8
<i>Modeling only patient characteristics</i>		
Patient age	0.98	0.972, 0.996
Patient has relative with diagnosed breast cancer		
No	1.0	
Yes	1.7	1.1, 2.7
Physician believes patient will comply with recommendation		
No	1.0	
Yes	3.0	2.1, 4.2
<i>Modeling only visit characteristics</i>		
Scheduled reason for visit		
Chronic disease follow-up	1.0	
Annual examination	4.5	3.2, 6.3
More urgent issue dealt with during visit		
No	1.0	
Yes	0.5	0.4, 0.7
Patient requested a mammogram		
No	1.0	
Yes	7.9	3.5, 17.9

characteristics of the visit and mammography recommendations. A visit scheduled for an annual examination and one in which the patient specifically requests a mammogram were significantly more likely to result in a mammography recommendation. On the other hand, visits in which the physician reported dealing with a more urgent issue are significantly less likely to result in mammography recommendations.

Table 4 shows the results of logistic regression in which separate models were fitted for physician, patient, and visit characteristics. For physicians, completing a residency, reporting familiarity with the literature on breast cancer screening, and reporting annual recommendations for women 40 to 49 and 50 to 74 years were associated with mammography recommendations, with an area under the ROC curve of 0.71. For patient characteristics

Table 5. Predictors of a Recommendation for Screening Mammography. A Single Logistic Regression Model Combined Physician, Patient, and Visit Characteristics.

Predictor	Odds Ratio	95% Confidence Interval
<i>Physician characteristics</i>		
Interval at which screening mammography is ordered for age 40–49 years		
Every 3–5 years or less	1.0	
Every 2 years	2.4	1.7, 3.5
Annually	9.2	2.2, 38.4
Interval at which screening mammography is ordered for age 50 years and older		
Every 3–5 years or less	1.0	
Every 2 years	3.0	1.4, 6.5
Annually	8.1	3.8, 17.4
How familiar are you with scientific and professional literature on breast cancer screening?		
1 (not at all familiar)	—	
2	1.0	
3 (moderately familiar)	1.7	0.8, 3.2
4	2.2	1.1, 4.3
5 (very familiar)	0.7	0.3, 1.4
Completed residency training		
Yes	1.0	
No	0.5	0.3, 0.7
<i>Patient characteristics</i>		
Patient has relative with diagnosed breast cancer		
No	1.0	
Yes	2.2	1.2, 4.0
Physician believes patient will comply with recommendation		
No	1.0	
Yes	3.6	2.4, 5.3
<i>Visit characteristics</i>		
Scheduled reason for visit		
Chronic disease follow-up	1.0	
Annual examination	8.1	3.3, 20.1
More urgent issue dealt with during visit		
No	1.0	
Yes	0.5	0.4, 0.8
Patient requested a mammogram		
No	1.0	
Yes	8.1	3.3, 20.1

age, having a relative with breast cancer diagnosed, and the physician's judgment that the patient would comply were associated with a mammography recommendation, with an area under the ROC curve of 0.63. Among visit characteristics an annual examination, specific patient request for a mammogram, and physician's judgment of more urgent issues to be addressed were associated with mammography recommendations, with an area under the ROC curve of 0.73.

Table 5 shows the results of logistic regression in which physician, patient, and visit characteristics were put into a single model. All characteristics remained from the individual models except for patient age, which did not enter the final regression equation. The area under the ROC curve for the combined model was 0.85.

The analysis was repeated considering only the 640 visits by women between the ages of 50 and 74 years, representing the age-group for which all pro-

fessional bodies recommended annual screening at the time of data collection. The results were similar in that three visit characteristics (patient requested mammogram [OR = 6.0], more urgent issue dealt with during visit [OR = 0.5], and annual examination [OR = 9.3]) remained in the regression model. Two patient characteristics (physician's judgment that patient would comply with recommendation [OR = 6.6] and belief that cost is a barrier [OR = 0.5]) remained. Only three physician characteristics entered the regression model, however, including physician or family member diagnosed with breast cancer (OR = 0.3) and physician's belief that mammograms should be recommended every 2 years (OR = 9.8) or annually (OR = 27.1).

Discussion

The family physician is nearly inundated with recommendations for clinical prevention, screening, and early detection of the wide variety of conditions common in primary care. The health services literature regularly reports studies that allege underperformance by primary care physicians and proposes interventions to change clinical behavior in a desired direction. Most such studies examine a single health issue out of context and interpret the results as although the single focus of the study were the only issue with which primary care physicians and their patients were concerned. The challenge of providing comprehensive care brings before the primary care physician an array of patient complaints, psychosocial problems, medical morbidity, the need for screening for a vast number of treatable conditions, and the omnipresent need to explain and clarify patient fears and misunderstandings. For example, comprehensive care for an average adult patient will involve issues as wide-ranging as cancer screening, family planning, stress associated with occupation (or unemployment), seatbelt use, firearms in the home, child and spouse abuse, smoking cessation, and substance abuse. If the patient also has diabetes, there will be issues of diet, exercise, blood pressure, lipid profiles, and screening for treatable sequelae of diabetes. Add to these issues the issues that must be explored if the visit begins with a chief complaint of fatigue, and the enormity of responding to the patient's need for service is staggering. It is clear that primary care physicians and their patients must set rational priorities among a great number of competing service needs.

The results further emphasize the limitations in explaining the provision of clinical preventive services based only on physician knowledge and attitudes without taking into account characteristics of the patient and the visit itself. When modeling physician, patient, and visit characteristics separately, 70% of the variability in the model could be explained by physician characteristics only, 63% by patient characteristics only, and 73% by visit characteristics only. The relative importance of characteristics specific to the visit lend further support for the competing demands phenomenon. For example, a more urgent issue to be addressed in a visit reduced by 50% the odds of receiving a mammography recommendation. Patient and physician expectations for the visit are clearly critical as well. The odds of a mammography recommendation was eight times greater for a routine annual examination than for chronic problem visits and eight times greater when the patient requests a mammogram.

Some policy implications of the competing demands model are obvious. Although physician knowledge and attitudes about screening mammography are important, they are not necessarily the most critical ingredients in increasing mammography recommendations, and efforts to increase rates by focusing on physician education are not likely to be fruitful. Although our physician sample was not drawn randomly from the universe of primary care physicians, 93.5% reported a belief in the value of screening mammography in the age-group of women older than 50 years, yet their visit-specific rate of mammography recommendations in nonacute care visits was only 53.1%. It is highly unlikely that further emphasis on physician education would be very effective.

Family physicians respond to the needs and expectations of their patients and set priorities among a great number of demands competing for their time and attention. Further improvements in clinical preventive services must be based on strategies that enable the physician and patient to systematically address a potentially long list of shared health concerns in a system that rewards meeting patient needs across of spectrum of health issues. The current health policy and reimbursement environment that coerces the primary care physician to attend to specific Health Plan Employee Data and Information Set measures in the face of an increasing requirement to see more patients per hour will simply fail to produce high-quality health care.

This analysis provides a foundation for further study of the competing demands model in primary care. Careful descriptive studies are needed to examine more carefully both the physician's and the patient's agenda coming into the visit, as well as the mechanisms by which their interaction brings some issues to their joint attention. Intervention studies that examine a mechanism by which physician and patients can make their agendas more explicit and prioritize issues for the current and future planned visits are also needed. Both types of study should also examine the mediating effects of the practice ecosystem, including time pressures and both obvious and occult incentives on both patient and physician.

Several limitations of the study deserve mention. We report a post-hoc analysis of 8-year-old data from a study not specifically designed to examine the relative importance of physician, patient, and visit characteristics on physician recommendations for mammography. The analysis was limited by the data collected in the original study, including use of physician estimates of patient perceptions of cost and patient likelihood of complying with a recommendation as proxy measures of patient characteristics. The data set included only three visit-specific characteristics; however, all three were shown to have a substantial effect on mammography ordering in the combined model.

The data were collected from 93 physicians in 43 ASPN primary care practices who volunteered to conduct the study. Although other studies have shown similarity in characteristics of physicians and their patients^{25,26} and physicians' practice patterns²⁷ from practice-based research networks, the possibility that the physicians participating in this study were atypical in important ways cannot be completely eliminated. Finally, we examined mammography recommendations by the physician, rather than actual receipt of a mammogram by the patient. Although we realize that not all recommendations lead to a completed mammogram, we were interested in the activities during the visit that enhance or compete with a recommendation. A related but separate set of competing demands at the patient level probably govern whether the recommendation is acted on.

Conclusions

Despite its limitations, the study provides convincing evidence of competing demands that affect the

likelihood that a given preventive service will be addressed on a given visit. It also shows that physician knowledge and attitudes are not the only important determinants of clinical behavior. It follows that interventions aimed at merely encouraging physicians to do more will not be effective. Primary care involves balancing a great many competing demands for the physician's and patient's time and attention, and further work will be necessary to understand adequately how physicians and patients set the agenda for their care.

References

1. Jaen CR, Stange KC, Nutting PA. Competing demands of primary care: a model for the delivery of clinical preventive services. *J Fam Pract* 1994;38:166-71.
2. Jaen CR, Stange KC, Tumieli LM, Nutting PA. Missed opportunities for prevention: smoking cessation counseling and the competing demands of practice. *J Fam Pract* 1997;45:348-54.
3. Stange KC, Fedirko T, Zyzanski SJ, Jaen CR. How do family physicians prioritize delivery of multiple preventive services? *J Fam Pract* 1994;38:231-7.
4. Rost K, Nutting P, Smith J, Coyne JC, Cooper-Patrick L, Rubenstein L. The role of competing demands in the treatment provided primary care patients with major depression. *Arch Fam Med* 2000;9:150-4.
5. Klinkman MS. Competing demands in psychosocial care. A model for the identification and treatment of depressive disorders in primary care. *Gen Hosp Psychiatry* 1997;19(2):98-111.
6. Williams JW. Competing demands: does care for depression fit in primary care? *J Gen Intern Med* 1998;13:137-9.
7. Nutting PA, Rost K, Smith J, Werner JJ, Elliot C. Competing demands from physical problems: effect on initiating and completing depression care over 6 months. *Arch Fam Med* 2000;9:1059-64.
8. Baker LH. Breast Cancer Detection Demonstration Project: five-year summary report. *CA Cancer J Clin* 1982;32:194-225.
9. Morrison AS, Brisson J, Khalid N. Breast cancer incidence and mortality in the Breast Cancer Detection Demonstration Project. *J Natl Cancer Inst* 1988;80:1540-7.
10. Shapiro S, Venet W, Strax P, Venet L, Roeser R. Ten- to fourteen-year effect of screening on breast cancer mortality. *J Natl Cancer Inst* 1982;69:349-55.
11. Verbeek AL, Hendriks JH, Holland R, Mravunac M, Sturmans F, Day NE. Reduction of breast cancer mortality through mass screening with modern mammography. First results of the Nijmegen project, 1975-1981. *Lancet* 1984;1:1222-4.

12. Tabar L, Fagerberg CJ, Gad A, et al. Reduction in mortality from breast cancer after mass screening with mammography. Randomised trial from the Breast Cancer Screening Working Group of the Swedish National Board of Health and Welfare. *Lancet* 1985;1:829–32.
13. DeKoning HJ, Fracheboud J, Boer R, et al. Nationwide breast cancer screening in The Netherlands: support for breast cancer mortality reduction. National Evaluation Team for Breast Cancer Screening (NETB). *Int J Cancer* 1995;60:777–80.
14. Smart CR, Hendrick RE, Rutledge JH, Smith RA. Benefit of mammography screening in women ages 40 to 49 years. Current evidence from randomized controlled trials. *Cancer* 1995;75:1619–26.
15. Love RR, Brown RL, Davis JE, Baumann LJ, Fontana SA, Sanner LA. Frequency and determinants of screening for breast cancer in primary care group practice. *Arch Intern Med* 1993;153:2113–7.
16. Fox SA, Stein JA. The effect of physician-patient communication on mammography utilization by different ethnic groups. *Med Care* 1991;29:1065–82.
17. Friedman LC, Woodruff A, Lane M, Weinberg AD, Cooper HP, Webb JA. Breast cancer screening behaviors and intentions among asymptomatic women 50 years of age and older. *Am J Prev Med* 1995;11:218–23.
18. Coll PP, O'Connor PJ, Crabtree BF, Besdine RW. Effects of age, education, and physician advice on utilization of screening mammography. *J Am Geriatr Soc* 1989;37:957–62.
19. Fox SA, Murata PJ, Stein JA. The impact of physician compliance on screening mammography for older women. *Arch Intern Med* 1991;151:50–6.
20. Skinner CS, Strecher VJ, Hospers H. Physicians' recommendations for mammography: do tailored messages make a difference? *Am J Public Health* 1994;84:43–9.
21. Self-reported use of mammography and insurance status among women aged ≥ 40 years—United States, 1991–1992 and 1996–1997. *MMWR - Morb Mortal Wkly Rep* 1998;47:825–30.
22. Miller RS, Main DS, Conry CM, Iverson DC, Nutting PA. Breast cancer screening in primary care: a report for the Centers for Disease Control and Prevention. Cooperative agreement #0009272279. August 1993.
23. Green LA. The weekly return as a practical instrument for data collection in office based research. *Fam Med* 1988;20:182–4.
24. Green LA, Reed FM, Miller RS, Iverson DC. Verification of data reported by practices for a study of spontaneous abortion. *Fam Med* 1988;20:189–91.
25. Green LA, Miller RS, Reed FM, Iverson DC, Barley GE. How representative of typical practice are practice-based research networks? A report from the Ambulatory Sentinel Practice Network, Inc (ASPN). *Arch Fam Med* 1993;2:939–49.
26. Gilchrist V, Miller RS, Gillanders WR, et al. Does family practice at residency teaching sites reflect community practice? *J Fam Pract* 1993;37:555–63.
27. Nutting PA, Baier M, Werner JJ, Cutter G, Reed FM, Orzano AJ. Practice patterns of family physicians in practice-based research networks. A report from the Ambulatory Sentinel Practice Network. *J Am Board Fam Pract* 1999;12:278–84.