Correlates of Screening Mammography in a Family Practice Setting

Claire C. Bourguet, PhD, Valerie J. Gilchrist, MD, and Manju Kandula
Canton, Ohio

The medical records of 243 asymptomatic women aged 50 years or older were reviewed at a community-based family practice center to determine the proportion who had been referred for a screening mammogram and to identify correlates of mammography referral. Patient demographic characteristics, breast cancer risk factors, and characteristics of past patient-physician encounters were considered. Between July 1, 1981, and July 1, 1987, 40 (16 percent) of the women had received a mammography referral from their currently assigned physician. All but two of the women had actually obtained the mammogram. The primary predictors of mammography referral were the known risk factors for breast cancer: a family history of breast cancer (prevalence rate ratio [PRR] = 9.3, P = .001) and a history of benign breast disease (PRR = 7.9, P = .002). Other predictors included having a Papanicolaou test performed by the current physician (PRR = 4.1, P = .03), having a test for stool occult blood returned by the patient (PRR = 10.2, P = .003), having been instructed in smoking cessation by the current physician (PRR = 10.0, P = .05), and, possibly, being a former smoker (PRR = 4.6, P = .09). Patient demographic characteristics, other known breast cancer risk factors (age, obesity, alcohol use, and pregnancy history), and the sex of the physician were not predictive.

Primary care physicians are reluctant to refer women for screening mammography.[1-5] In contrast, the guidelines of the American Cancer Society and the Canadian Task Force on the Periodic Health Examination recommend annual mammography for women over 50 years of age.[6,7]

Only a small proportion of physicians report that they follow these guidelines,[1,2,5] while about one half report "sometimes" ordering mammograms for asymptomatic women.[2] Data from review of medical records indicate additional discrepancies between physicians' reported and actual practices.[3,4]

The retrospective study reported here examines the extent to which resident and attending physicians at a family practice center refer asymptomatic women aged 50 years and over for mammography and the extent to which women actually obtain those mammograms. The study identifies characteristics of the patient and the physician-patient encounter that make a referral for mammography more likely.

METHODS

Data were collected at the family practice center of a university-affiliated community-based hospital in a small midwestern city. This center serves a low to middle income, predominantly white population.

Any woman who was aged 50 years or older on July 1, 1986, and who had been seen at the Family Practice Center during the subsequent year was eligible for the study. Study members were identified by a computerized patient appointment roster at the center, and data were then abstracted from medical records.

Data were collected describing the demographic characteristics of the study members, their risk factors for breast cancer, and characteristics of patient encounters with currently assigned family physicians. A characteristic was considered present if it was indicated anywhere in

Submitted, revised, January 27, 1988.

From the Northeastern Ohio Universities College of Medicine, Rootstown, and the Family Practice Center of Aultman Hospital, Canton, Ohio. Requests for reprints should be addressed to Dr. Claire C. Bourguet, Division of Community Health Sciences, Northeastern Ohio Universities College of Medicine, PO Box 95, Rootstown, OH 44272.

TABLE 1. DEMOGRAPHIC CHARACTERISTICS OF STUDY MEMBERS (n = 243): DISTRIBUTION OF CHARACTERISTICS AND CRUDE AND ADJUSTED PREVALENCE RATE RATIOS (PRRs) FOR MAMMOGRAPHY REFERRAL

Characteristics	No. (%)	Percent Referred	Crude PRR	Adjusted PRR*	P Value
Race					
White	211 (87)	18	∞		
Nonwhite	15 (6)	0	1.0**		
Not recorded	17 (7)	12			
Age (years)					
50–59	68 (28)	15	1.4	0.5	.48
60–69	79 (33)	24	2.2	1.5	.48
70+	96 (40)	11	1.0	1.0	
Marital status					
Single	9 (4)	33	2.4	2.1	.47
Married	106 (44)	14	1.0	1.0	
Widowed	91 (37)	15	1.1		
Divorced	27 (11)	22	1.6	2.8	.16
Not recorded	10 (4)	20			
Payment status					
Private insurance	85 (35)	20	2.0	2.5	.33
Medicare	127 (52)	16	1.6	2.9	.31
Other	31 (13)	10	1.0	1.0	

** Adjusted for age, marital status, payment status, breast cancer in first-degree relative, personal history of benign breast disease, smoking, sex of physician, dietary instruction, smoking instruction, cholesterol and stool occult blood test performed, and Papanicolaou test since July 1, 1981*
*** PRR = 1.0 denotes referent category*

the medical record. All other information was considered "no" or "not recorded."

Mammography was recorded if the procedure had been ordered after July 1, 1981. The American Cancer Society guidelines for mammography were published in the 1980 July-August issue of *CA: A Cancer Journal for Clinicians* and from July 1, 1981, six years of observation were allowed during which the guidelines were known. A radiology report was taken as evidence that a woman had actually obtained the mammogram. Only mammograms ordered by the currently assigned family physician were included.

Mammograms were classified as diagnostic, follow-up, or screening based on complete review of each chart including progress notes. A mammogram was considered diagnostic if an abnormality was noted either by the physician or the patient. A prior abnormal or equivocal mammogram defined a follow-up mammogram. Only mammograms ordered for asymptomatic women were categorized as screening mammograms. A mammogram was considered a screening mammogram in the presence of benign breast disease only if the diagnosis of benign breast disease had been established prior to the mammogram and the woman was currently asymptomatic. Similarly, benign breast disease diagnosed as a result of the screening mammogram was not included. This analysis included only screening mammograms ordered for women with no prior history of breast cancer.

The data were analyzed to determine which characteristics of the patients and the physicians were associated with an increased probability of a mammography referral. The ratio of the prevalence (probability) of mammography in women with a risk factor compared with the prevalence of mammography in women without the risk factor (prevalence rate ratio or PRR) was calculated.

The data analyses were carried out in two phases: first, the individual (crude) association of each risk factor with mammography was calculated; second, for those factors that showed a preliminary association, a linear logistic model was used to estimate the adjusted PRRs for mammography referral controlling for possible confounding by other risk factors. Confounding by a third variable occurs when the apparent relationship between two variables is actually due to a common relationship with a third variable.

RESULTS

Two hundred ninety-one eligible women were identified by the appointment roster, and 290 charts were located for review. Eighty-one women (28 percent) had had a mammogram ordered during the six-year study interval. Forty-seven women were excluded from the study, 12 who had a prior history of breast cancer, 12 who had had mammograms for diagnostic or follow-up purposes, and

TABLE 2. BREAST CANCER RISK FACTORS: DISTRIBUTION OF CHARACTERISTICS AND CRUDE AND ADJUSTED PREVALENCE RATE RATIOS (PRRs) FOR MAMMOGRAPHY REFERRAL (n = 243 patients)

	No. (%)	Percent Referred	Crude PRR	Adjusted PRR*	P Value
Breast cancer in first-degree relative					
Yes	17 (7)	53	3.8	9.3	.001
No or not recorded	226 (93)	14	1.0	1.0	
Personal history of benign breast disease					
Yes	15 (6)	47	3.4	7.9	.002
No or not recorded	228 (94)	14	1.0	1.0	
Overweight**					
Yes	173 (71)	17	1.2		
No or not recorded	70 (29)	14	1.0		
Age at first term pregnancy					
Nulliparous	28 (12)	18	1.0		
>30 years	4 (2)	25	1.4		
≤30 years	59 (24)	22	1.2		
Not recorded	152 (63)	14			
Smoking					
Current	49 (20)	16	1.0	1.0	
Past	25 (10)	32	2.0	4.6	.09
Never	97 (40)	19	1.2	3.4	.17
Not recorded	72 (30)	8			
Alcohol					
None or rare	107 (44)	19	1.4		
Social or moderate	44 (18)	20	1.4		
Excess (ever)	7 (3)	14	1.0		
Not recorded	85 (35)	12			

** Adjusted for age, marital status, payment status, breast cancer in first-degree relative, personal history of benign breast disease, smoking, sex of physician, dietary instruction, smoking instruction, cholesterol and stool occult blood test performed, and Papanicolaou test since July 1, 1981*
*** Overweight if Quetelet score [(weight in kg)/(height in m)^2] > 22*

23 who had mammograms ordered only by physicians other than their currently assigned primary physicians. Among the remaining 243 asymptomatic women, 40 women (16 percent) had had a mammogram ordered by their assigned primary physicians. For two of these women, review of the charts showed no indication that the mammogram had actually been obtained.

The first column of data in Table 1 shows the distribution of demographic characteristics of the study members. The women were predominantly white, either married or widowed, and insured by Medicare. Forty percent of the women were aged 70 years or older. The corresponding column in Table 2 shows the distribution of breast cancer risk factors. Seven percent of the study members had a history of breast cancer in a first-degree relative, and 6 percent reported a history of benign breast disease. Twelve percent were nulliparous, and only 2 percent had borne their first child at the age of 30 years or older. Using a Quetelet score of 22 as a cutoff, more than 70 percent were overweight. Twenty percent were smokers and 10 percent had smoked in the past. About 20 percent admitted to social or greater use of alcohol.

In Table 3 the first column of data describes characteristics of past encounters of the patient with her currently assigned family physician. The current family physicians were predominantly male. While the majority of women had a cholesterol measurement, a Papanicolaou test, and a test for stool occult blood recorded in their charts, very few had health promotion and disease prevention instructions recorded.

The second column of data in each of the tables shows the proportion of women in each category who were referred for mammography. The third column in each table shows the crude prevalence ratio associated with each potentially predictive factor. The fourth and fifth columns show the adjusted prevalence ratios and their associated significance levels. The adjusted PRRs shown in the fourth data column are the ratios of the mammography probability for women with and without each specific risk factor when all other risk factors in the predictive model are set to the average values of the women in the study. The last two columns show only the PRRs for variables that were included in the logistic model.

In the initial analysis, all patient demographic characteristics (Table 1) showed some association with referrals for mammography. Race in particular was associated with

TABLE 3. PATIENT ENCOUNTERS (n = 243 patients) WITH CURRENT PRIMARY PHYSICIANS: DISTRIBUTION OF CHARACTERISTICS AND CRUDE AND ADJUSTED PREVALENCE RATE RATIOS FOR MAMMOGRAPHY REFERRAL

	No. (%)	Percent Referred	Crude PRR	Adjusted PRR*	P Value
Sex of physician					
Male	209 (86)	14	1.0	1.0	
Female	34 (14)	29	2.1	1.2	.73
Dietary instruction					
Yes	76 (31)	22	1.6	2.0	.15
No or not recorded	167 (69)	14	1.0	1.0	
Exercise instruction					
Yes	28 (12)	18	1.1		
No or not recorded	215 (88)	16	1.0		
Weight loss instruction					
Yes	26 (11)	19	1.2		
No or not recorded	217 (89)	16	1.0		
Smoking instruction					
Yes	12 (5)	33	3.0	10.0	.05
No or not recorded	37 (15)	11	1.0	1.0	
Nonsmokers	194 (80)				
Cholesterol measured by					
Current physician	124 (51)	16	1.3	0.7	.71
Prior physician	41 (17)	12	1.0	1.0	
No or not recorded	78 (32)	19	1.6	3.6	.10
Stool occult blood by					
Current physician	67 (28)	24	8.0	3.2	.14
Prior physician	46 (19)	13	4.3	3.8	.13
Patient	42 (17)	36	12.0	10.2	.003
No or not recorded	88 (36)	3	1.0	1.0	
Papanicolaou testing since July 1, 1981					
Current physician	97 (40)	33	8.3	4.1	.03
Prior physician	55 (23)	7	1.8	0.7	.63
No or not recorded	91 (37)	4	1.0	1.0	

** Adjusted for age, marital status, payment status, breast cancer in first-degree relative, personal history of benign breast disease, smoking, sex of physician, dietary instruction, smoking instruction, cholesterol and stool occult blood test performed, and Papanicolaou test since July 1, 1981*

mammography referral in that no nonwhite woman had been referred. Because of this extreme distribution, it was impossible to include race in the logistic model. After adjusting for other factors, no demographic characteristic was significantly associated with mammography.

A history of a first-degree relative with breast cancer, a history of benign breast disease, age at first pregnancy, smoking and alcohol use were initially associated with mammography (Table 2). In the final logistic model, a family history of breast cancer (PRR = 9.3, P = .001) and a history of benign breast disease (PRR = 7.9, P = .002) were strongly associated with referral for mammography. Women who were former smokers were 4.6 times as likely (P = .09) to have been referred for mammography. Women who had never smoked were also more likely (PRR = 3.4) to have been referred, although this increase was not statistically significant.

The crude PRRs were elevated for the sex of the physician, dietary and smoking cessation instruction, cholesterol measurement, and Papanicolaou and stool occult blood testing (Table 3). After adjustment for other characteristics, smoking instruction among smokers (PRR = 10.0, P = .05), Papanicolaou testing by the current physician (PRR = 4.1, P = .03), and having had the patient return one or more slides for occult blood in the stools (PRR = 10.2, P = .003) continued to be predictive. The PRRs for stool occult blood testing by the current physician or a prior physician were elevated but not significantly.

Other variables examined in the initial analysis that showed no association with mammography included history of other cancer (ovarian, endometrial, or colorectal), number of children, age at menopause, use of estrogen therapy, and for resident physicians, their year in training. Too few women had regular breast self-examination recorded in their charts to examine that variable.

DISCUSSION

Although the proportion screened in this family practice sample does not approach the recommended level, it compares favorably with the proportions found by other studies. The Rand Health Insurance Experiment monitored insurance claims of a nationwide random sample of women to document a variety of disease prevention procedures. Over a three-year period, only 2 percent of women aged 45 to 65 years had received a mammogram.[8]

Surveys of physicians' attitudes toward mammography suggest that the low rates of referral reflect a widespread disagreement with the screening guidelines. The nationwide survey of primary care physicians by the American Cancer Society found that only 41 percent of physicians agreed entirely with the mammography guidelines. Twenty-seven percent agreed partially, and 32 percent did not agree. The commonly cited reasons for disagreement were related to cost, lack of symptoms or risk factors, the annual screening interval, radiation risk, and low yield of the procedure.[2] In a postal survey of Los Angeles physicians, only 11 percent of respondents reported following the mammography guidelines for women aged 50 years and older. Fifty-five percent of those who did not follow the guidelines gave high cost and low yield as the reason.[5] Similarly, among family physicians in New York State, only 8 percent reported that they ordered annual mammography for women aged 50 years and over.[1]

Furthermore, physicians may overestimate their rate of mammography referral. When physician opinions were contrasted with review of medical records in two internal medicine residency programs, the physicians had actually referred women for mammography less than one half as often as estimated.[3,4]

Physicians are most inclined to refer women for mammography when powerful risk factors are present. McPhee and colleagues[4] found that 25 percent of high-risk patients but only 2 percent of low-risk patients had received mammograms. In the present study among asymptomatic women with either a family history of breast cancer or a history of benign breast disease, there was a 50 percent probability of having a mammogram ordered. Among women with neither of those risk factors, the probability was 12 percent. Several other known breast cancer risk factors, obesity, nulliparity, and prior ovarian or endometrial cancer, were not associated with mammography referrals.

In this study mammography referral was associated with stool occult blood testing, smoking cessation instruction, Papanicolaou testing, and being a former smoker. These factors (with the exception of smoking status) appear to be markers for a complete physical examination. Mandel and colleagues,[9] in their study of provider compliance with screening guidelines in a family medicine program, report that the strongest predictor of screening in general was the frequency of complete physical examination.

There was no difference in the probability of referral for mammography based on the sex of the physician. Similarly, Bassett and colleagues,[5] in their postal survey of Los Angeles physicians, found no differences between the reported behavior of male and female physicians.

Only two of the referred women had failed to obtain a mammogram. This finding concurs with the American Cancer Society survey data in which only 5 percent of physicians cited lack of patient cooperation to justify disagreement with the mammography guidelines.[2] Studies based on patient self-report indicate similarly high compliance. In the Los Angeles Health Survey, 97 percent of women who had been advised to obtain a mammogram reported doing so.[10] Woo et al[3] found that 40 percent of eligible patients desired yearly mammography. These data, which are based on patient self-report, may be unreliable. In contrast, Cummings and colleagues[1] report that among physicians who use mammography, 63 percent say that patients "often" or "sometimes" refuse mammography.

In this study there was no increase in the probability of mammography with increasing age of the patient. Data from the Surveillance, Epidemiology and End Results network of the National Cancer Institute demonstrate that increasing age is a powerful risk factor for breast cancer. One in every 500 American women aged 50 to 54 years develops breast cancer each year. The risk increases to one in 400 each year at age 60 to 64 years, and one in 333 each year at age 70 to 74 years.[11]

The above-mentioned studies, in conjunction with findings reported here, suggest several conclusions. First, there may be a compliant subgroup of patients whose interactions with their physician encourage a variety of health maintenance procedures including screening for breast, colorectal, and cervical cancer. These patients may be exemplified by women who are willing to take home and return stool guaiac slides or by the group of former smokers who may be likely to be more health conscious. The remaining less-compliant group of women should be targeted for intervention. Second, there is increasing evidence that women will comply with mammography recommendations. Interventions to increase the rate of mammography could be profitably directed to physicians. Third, in this study the mammography rate did not increase in the presence of accepted breast cancer risk factors, such as age and obesity. A possible avenue of intervention, therefore, may be to acquaint physicians more thoroughly with the magnitude of risk associated with these factors.

The associations reported in this paper are cross-sectional in nature, meaning that data on risk factors and on mammography were collected at the same point in time, and causality cannot be assumed. For some factors,

for example, age or race, the temporal order of the relationship is clear. For other factors, for example, family history or smoking status, the study member's risk category may have changed if the information was recorded at intake examination several years prior. Fortunately, as such changes would occur both among the women who did and did not obtain a mammogram, any bias introduced by such errors in the data would be conservative.

Acknowledgment

This study was supported by a grant from the Cancer Control Consortium of Ohio.

References

1. Cummings KM, Funch DP, Mettlin C, Jennings E: Family physicians' beliefs about breast cancer screening by mammography. J Fam Pract 1983; 17:1029–1034
2. American Cancer Society: Survey of physicians' attitudes and practices in early cancer detection. CA 1985; 35:197–213
3. Woo B, Woo B, Cook EF, et al: Screening procedures in the asymptomatic adult. JAMA 1985; 254:1480–1484
4. McPhee SJ, Richard RJ, Solkowitz SN: Performance of cancer screening in a university general internal medicine practice. J Gen Intern Med 1986; 1:275–281
5. Bassett LW, Bunnell DH, Cerny JA, Gold RH: Screening mammography: Referral practices of Los Angeles physicians. AJR 1986; 147:689–692
6. Eddy D: Guidelines for the cancer-related checkup. Recommendations and rationale. CA 1980; 30:193–240
7. Canadian Task Force on the Periodic Health Examination: The periodic health examination: 2. 1985 update. Can Med Assoc J 1986; 134:724–727
8. Lurie N, Manning WG, Peterson C, et al: Preventive care: Do we practice what we preach? Am J Public Health 1987; 77:801–804
9. Mandel IG, Franks P, Dickinson JC: Screening guidelines in a family medicine program: A five-year experience. J Fam Pract 1982; 14:901–907
10. Reeder S, Berkanovic E, Marcus AC: Breast cancer detection behavior among urban women. Public Health Rep 1980; 95:276–281
11. Young JL, Percy CL, Asire AJ (eds): Surveillance, Epidemiology and End Results: Incidence and Mortality Data, 1973–77. National Institutes of Health (Bethesda, Md): National Cancer Institute Monograph 57. DHHS publication No. (NIH) 81-2330. Government Printing Office, 1981