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Factors Influencing Time to Diagnosis After Abnormal Mammography in Diverse Women

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Abstract

Background: Abnormal mammograms are common, and the risk of false positives is high. We surveyed women in order to understand the factors influencing the efficiency of the evaluation of an abnormal mammogram.
Methods: Women aged 40–80 years, identified from lists with Breast Imaging Reporting and Data System (BIRADS) classifications of 0, 3, 4, or 5, were surveyed. Telephone surveys asked about the process of evaluation, and medical records were reviewed for tests and timing of evaluation.
Results: In this study, 970 women were surveyed, and 951 had chart reviews. Overall, 36% were college graduates, 68% were members of a group model health plan, 18% were Latinas, 25% were African Americans, 15% were Asian, and 43% were white. Of the 352 women who underwent biopsies, 151 were diagnosed with cancer (93 invasive). Median time to diagnosis was 183 days for BIRADS 3 compared to 29 days for BIRADS 4/5 and 27 days for BIRADS 0. At 60 days, 84% of BIRADS 4/5 women had a diagnosis. Being African American (hazard ratio [HR] 0.69, 95% confidence interval [CI] 0.49-0.97, $p = 0.03$), income < $10,000 (HR 0.55, 95% CI 0.31-0.98, $p < 0.04$), perceived discrimination (HR 0.22, 95% CI 0.09-0.52, $p < 0.001$), not fully understanding the results of the index mammogram (HR 0.49, 95% CI 0.32-0.75, $p = 0.001$), and being notified by letter (HR 0.66, 95% CI 0.48-0.90, $p = 0.01$) or telephone (HR 0.62, 95% CI 0.42-0.92, $p = 0.02$) rather than in person were all associated with significant delays in diagnosis.
Conclusions: Evaluation of BIRADS 0, 4, or 5 abnormal mammograms was completed in most women within the recommended 60 days. Even within effective systems, correctible communication factors may adversely affect time to diagnosis.

Introduction

Screening mammography is a routine part of health maintenance for most women in the United States.[1] National data show that about 80% of women aged 50–74 years reported undergoing screening mammography in the previous 2 years, with minimal differences in rates by race/ethnicity.[2] At least one abnormal result was reported by 21.6% of screened women,[3] and the cumulative risk of false positives was 49.1% over 10 years with biennial screening.[4] A recent study of 169,456 screened women showed that the false positive recall was 61.3% with annual screening and 41.6% with biennial screening, and up to 7% of the women had false positive biopsy recommendation over a 10-year period.[5]

Increased attention has been focused on documenting the extent of follow-up tests and the factors that influence time to resolution of abnormal mammogram results.[3] Delays of 3–6 months between the onset of symptoms and breast cancer treatment may decrease survival,[6] and data from Canada show that delays of 1 year or longer in diagnosis of invasive breast cancer led to significantly higher odds of larger tumors and lymph node metastases.[7] Thus, delays of this magnitude in evaluating abnormal screening mammograms may be clinically significant. Before beginning their program, the National Breast and Cervical Cancer Early Detection Program (BCCEDP) selected 60 days as a quality standard by which at least 75% of women with abnormal mammograms should have a diagnosis.[8,9] Despite this, few other studies have

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evaluated adherence to this quality standard in the past 10 years.

At least five studies have compared time to diagnosis by demographic and clinical factors and reported a median time of 23–98 days.[10–14] These studies used either review of medical records or analyses of large administrative datasets, but none combined these with patient surveys to ascertain communication factors or other system variables. Earlier studies found that timely diagnostic resolution was affected by communication factors, such as satisfaction with physician's explanation of breast abnormality,[15] information on where to obtain care to evaluate abnormal breast findings,[16] and the patient's understanding of the need for follow-up.[17] Furthermore, a recent analysis of mammography registry data showed that non-English speakers were more likely to have delay in follow-up of abnormal mammograms.[18]

Delay in evaluation of an abnormal screening mammogram may be a contributing factor to racial/ethnic disparities in breast cancer detection and clinical outcomes, but there is need for more studies. Although breast cancer mortality on the whole has declined, racial differences are only partially explained by hypothesized differences in tumor biology, quality of treatment, and follow-up care.[19–22] In studies that compared delay in diagnosis by race/ethnicity, African American and Latina women experienced longer delays in some but not all of these studies, and methods of communication of abnormal results and individual patient factors were not fully evaluated.[15–18,23]

In order to understand the factors influencing the timeliness of the evaluation of an abnormal mammogram result, we conducted telephone surveys at the time of the index study and 1 year later, accompanied by medical chart reviews. This combination allowed for examining the experiences of a diverse group of women with abnormal mammography results. We hypothesized that race or ethnicity, language, and communication factors as well as access variables would affect time to diagnosis.

Materials and Methods

Design and setting

This was a 1-year observational cohort of women with abnormal mammograms from four different clinical settings. Women were surveyed after an initial index mammogram as soon as the recruitment and human subjects approval process allowed. Clinical sites were an academic health center, a public hospital, a community hospital, and four sites from an integrated healthcare delivery system. The goal was to recruit a diverse sample with regard to race/ethnicity and socioeconomic status.

Eligibility

Women with an index abnormal mammogram from November 1999 to December 2001 were identified using electronic records or hard copy reports of screening mammograms. Eligibility was defined as having an abnormal mammogram categorized according to the Breast Imaging Reporting and Data System (BIRADS) score of 0 (indeterminate), 3 (probably benign), 4 (suspicious abnormality), or 5 (highly suggestive of cancer).[24] We combined women in the category of BIRADS 4 or 5 into one group for analyses. Eligible women were between 40 and 80 years of age, self-identified African American, Asian, Latina, or white, and spoke English, Spanish, Cantonese, or Mandarin. Women with BIRADS scores of 1 (normal) or 2 (benign) and women who did not speak one of the four languages listed were excluded. Women with a previous diagnosis of cancer ≥ 5 years before the index mammogram were eligible for this study. Institutional Review Boards at each clinical site approved the study.

Study procedures

Eligible women were mailed a letter in the appropriate language describing the study and invited to send back a postcard indicating willingness to participate or a desire to opt out. Women who did not send back the opt-out postcard were contacted by telephone 2 weeks after the mailing. In each participant's desired language, research assistants explained the study and obtained verbal consent, and telephone surveys were conducted from January 2000 to December 2001. The median time after the index mammogram to completion of the baseline survey was 190 days and, thus, took place after the initial evaluation was completed in most women. The follow-up survey took place 1 year after the index mammogram report independent of the date of the baseline survey. We requested permission to review the test reports from medical records regarding the evaluation of the abnormal mammogram, and these were obtained, entered into a chart abstraction form, and reviewed by a clinician after completion of the follow-up survey.

Measures

Variables assessed in the baseline survey included demographic information (age, race/ethnicity, language of survey, country of origin, household income, educational level, health insurance type), self-reported mammogram result and follow-up, method of notification, initial understanding of abnormal mammography result, perceived discrimination in getting healthcare in the previous year, and whether the respondent consulted with a primary care clinician about the abnormal mammogram. Limited English proficiency (LEP) was defined as responding to the survey in a language other than English and reporting not speaking English well. Variables assessed in the follow-up survey included report of follow-up procedures to evaluate the abnormal mammogram that supplemented the data derived from the medical record review. Analyses of the baseline survey on initial understanding of abnormal test results, risk factors for breast cancer, and role of depressive symptoms were published previously.[25–27]

Type and results of follow-up tests were abstracted from the medical record. Tests included additional magnification views or any mammography done before 12 months had passed, breast ultrasonography, and breast biopsies or aspiration. Test dates, radiology reports, pathology reports, diagnoses listed, and cancer-related treatments were abstracted.

Data analyses

Data were analyzed using SAS statistical package, version 9.2. Descriptive statistics and bivariate analysis of the sample compared results by BIRADS categories (3, 4/5, 0). Time to first follow-up diagnostic test and time to

resolution of abnormality or definitive diagnosis were calculated in mean and median number of days from index abnormality to documented test from the medical record using the Kaplan-Meier method. Categorical predictors were evaluated using the log-rank test. A p value < 0.05 was considered significant.

We modeled predictors of time to first diagnostic test and time to resolution or diagnosis of abnormality using Cox proportional hazard models. Hazard ratios (HR) different from 1 with a 95% confidence interval (CI) that did not cross 1 were considered significant. Race/ethnicity, age, level of education, annual household income, health insurance type, understanding explanation of abnormal results, perceived discrimination, consultation with primary physician, and method of notification were included as predictors in all models. We calculated the proportion of women with complete resolution by 60 days as a quality standard.[8] Descriptive statistics were performed on the women diagnosed with invasive cancer or ductal carcinoma *in situ* (DCIS).

Results

Patient characteristics

Of 970 eligible women who completed baseline surveys, chart review data were obtained for 951 (98%). Table 1 shows demographic characteristics by BIRADS classification. The majority (85%) responded to the survey in English, 62% had some college education, and 41% had annual household incomes of ≥ $50,000. Only 5% of women were uninsured, and most (68%) were members of the integrated healthcare delivery system. History of breast cancer in the contralateral breast was present in 5.5% of women, although all mammograms were categorized as screening.

Mammography factors and follow-up tests

Nearly one third (31%) of index mammograms yielded suspicious or highly suggestive for cancer results (BIRADS 4 or 5). Over half (54%) were probably benign (BIRADS 3), and 15% were categorized as indeterminate (BIRADS 0) (Table 2). Follow-up tests included magnification mammography views, breast ultrasonography, cyst aspiration, biopsy, and mammography at 6 months. Women with follow-up mammography at ≥ 1 year were counted as having had follow-up. There was no follow-up documented in the medical records of 51 women, although 38 reported tests elsewhere in the survey.

Biopsies were performed on 334 women (35%), of whom 253 were women with BIRADS 4/5 and 37 were women with BIRADS 0; 44 women with BIRADS 3 also underwent biopsy. Follow-up mammograms were done in 433 women; 285 had this as their only diagnostic procedure, and most had an initial BIRADS 3 (probably benign) interpretation.

Time to first diagnostic test and time to final diagnosis

Median times to the first diagnostic test and to final diagnosis or resolution of abnormality vary by BIRADS category (Table 2). Over 80% of women with a BIRADS 0, 4, or 5 completed their evaluation within 60 days. A majority had an initial diagnostic test in < 3 weeks and a final diagnosis at a median of 4 weeks. BIRADS 3 readings led to slower evaluations, with only 29% resolved within 60 days and 50% at 6 months.

Table 3 shows the median days to final diagnosis and percent resolved within 60 days by BIRADS category and each of the demographic and mammography factors analyzed. Significantly longer times to diagnosis were found for women with BIRADS 4/5 assessments with low income, public or no insurance, less than full understanding of abnormality, not consulting with primary care physician, and perceived discrimination. Public or no insurance and low income also were associated with longer time to diagnosis among those with BIRADS 3 or 0.

Table 4 shows the HR of median time to resolution adjusted for all other factors. There were no significant age or education trends for any of the BIRADS classifications (results not shown). Among women with BIRADS 4/5, longer time to resolution was observed among those with < $10,000 in annual income, perceived discrimination in getting healthcare in the previous year, African Americans, and women who somewhat understood the results of the abnormal mammogram compared to those who fully understood. Women informed by telephone or by letter compared to those who were informed in person had significant delay in resolution of abnormality.

Among women with a BIRADS result of 0, income of $10,000–$50,000, and not understanding the meaning of the index mammogram were associated with longer time to resolution. Among women with a BIRADS 3 category of abnormality, only Latinas had a significantly faster resolution of abnormal tests, and no factors were associated with delays. Public or no insurance tended to be associated with delays among women with BIRADS 3 or 0 results.

Cancer diagnoses

Of the 352 women who underwent biopsies, 93 (26.4% of biopsies) were diagnosed with invasive cancer and 58 (16.5% of biopsies) had DCIS. Thus, nearly 43% of biopsies revealed a cancer diagnosis. An additional 4 women had lobular carcinoma *in situ* (LCIS), and 6 were diagnosed with atypical hyperplasia, identifying very high-risk conditions. Median times to first diagnostic test and to final diagnosis or resolution of abnormality are shown in Table 5 by diagnostic category. Evaluation of patients who eventually had a cancer diagnosis was timely, and nearly 90% were diagnosed within the 60 days of the index mammography.

A previous breast cancer had been diagnosed in 52 of the study participants, of whom 8 (15%) were shown to have invasive breast cancer. Time to resolution of diagnosis of these 52 patients was similar by BIRADS category to that of the other participants, with median time to resolution of 193 days for probably benign, 41 days for indeterminate, and 27 days for suspicious index mammograms.

Discussion

Our results indicate that most women with abnormal mammography results at these clinical sites were evaluated in a timely way. Within different clinical settings in the San Francisco Bay Area, several factors were significantly associated with delays in achieving a final diagnosis in women with abnormal mammograms. Having a low household income and being African American were associated with diagnostic delays, and this emphasizes the need for clinicians to improve care for underserved patients, given that racial inequities in timeliness of evaluation of abnormal mammograms have

Table 1. Demographic Characteristics of 951 Women with Abnormal Mammography, San Francisco Bay Area, 1999–2001

		BIRADS classification					
		Probably benign (3) n=512		Suspicious (4) or probably malignant (5) n=298		Indeterminate (0) n=141	
Characteristic	Total % (n)	%[a]	n	%[b]	n	%[c]	n
Age							
40–49	32 (306)	36	186	24	72	34	48
50–64	45 (430)	43	219	50	148	45	63
65–80	23 (215)	21	107	26	78	21	30
Race/ethnicity							
Asian	15 (139)	14	72	13	39	20	28
African American	25 (233)	25	127	23	68	27	38
Latina	18 (175)	21	109	10	29	26	37
White	43 (404)	40	204	54	162	27	38
Language of interview							
English	85 (808)	85	433	91	272	73	103
Spanish	10 (97)	10	53	4	13	22	31
Chinese	5 (46)	5	26	4	13	5	7
Annual household income							
<$10,000	11 (95)	10	46	9	23	21	26
$10,000–$50,000	48 (413)	49	232	48	128	43	53
≥$50,000	41 (351)	41	192	43	116	35	43
Education							
Less than high school graduate	14 (132)	13	66	11	33	24	33
High school graduate	24 (226)	25	126	25	74	19	26
Any college	26 (250)	29	147	24	71	23	32
College graduate or more	36 (341)	34	172	40	120	35	49
Health insurance							
No insurance or Medicare/MediCal	12 (118)	8	43	7	20	40	55
Integrated health care delivery system or other private	88 (839)	92	468	93	278	60	83
Understanding explanation of results							
Fully understood	70 (662)	63	321	77	229	79	112
Somewhat understood	14 (129)	15	76	12	36	12	17
Did not understand/explain/don't know	17 (160)	22	115	11	33	9	12
Did you feel discriminated against by your doctor or the staff because of your race or ethnicity in the past 12 months?							
No	94 (897)	95	486	96	286	89	125
Yes	6 (54)	5	26	4	12	11	16
Method of notification							
Sent letter or card	41 (391)	55	283	18	53	38	53
Told in person	17 (162)	11	55	28	83	17	24
Telephone	39 (369)	31	161	49	146	44	62
Other/unclassified/don't know	3 (29)	3	13	5	14	1	2
Consulted with primary care physician							
No	45 (432)	55	280	37	107	30	42
Yes	55 (519)	45	231	63	189	70	99

[a]Percentage of characteristic found among 512 abnormal mammogram results classified as Breast Imaging Reporting and Data System (BIRADS) 3.
[b]Percentage of characteristic found among 298 abnormal mammogram results classified as BIRADS 4/5.
[c]Percentage of characteristic found among 141 abnormal mammogram results classified as BIRADS 0.

been reported.[20] However, the importance of communication factors in affecting the timely resolution of a significant mammogram abnormality in our study was noteworthy.

Our data showed three significant addressable factors contributing to delay in diagnosis among women with BIRADS 4/5 mammograms. Women who only partially understood the meaning of the abnormal mammogram or who were notified of their abnormality by letter or telephone compared to in person were significantly more likely to delay diagnostic evaluation. These findings imply that strengthening patient education about the meaning of an abnormal test to improve full understanding and personalizing the initial

Table 2. Diagnostic Procedures Completed in 951 Women with Abnormal Mammography Results, by Breast Imaging Reporting and Data System Category, San Francisco Bay Area, 1999–2001

		BIRADS classification		
	Total tests done (n)	*Probably benign (3)* % (n)	*Suspicious (4) /malignant (5)* % (n)	*Indeterminate (0)* % (n)
Sample size by BIRADS class		$n=512$	$n=298$	$n=141$
Procedures completed				
Magnification view	258	19.7 (101)	13.8 (41)	82.3 (116)
Ultrasound	284	22.3 (114)	33.6 (100)	49.7 (70)
Cyst aspiration	21	0.4 (2)	3.0 (9)	7.1 (10)
Biopsy	334	8.6 (44)	84.9 (253)	26.2 (37)
Follow-up mammography 6, months	433	73.8 (378)	9.1 (27)	19.9 (28)
No follow-up documented	51	5.3 (27)	5.7 (17)	5.0 (7)
Time to diagnosis				
Median time to first test (days)		182	15	17
Mean time to first test (days)		150.8 ± 5.1	29.5 ± 3.3	38.0 ± 7.1
Median time to resolution (days)		183	29	27
Mean time to resolution (days)		166.6 ± 5.6	49.2 ± 4.8	48.2 ± 7.1
Percent resolved by 60 days (*n*)		29 (145)	84 (237)	82 (113)

Table 3. Median Time to Resolution and Proportion Resolved at 60 Days by Category in 938 Women with Abnormal Mammograms, San Francisco Bay Area, 1999–2001

	Probably benign (3)		*Suspicious (4)/malignant (5)*		*Indeterminate (0)*	
Characteristic	*Median days*	*% ≤ 60 days*	*Median days*	*% ≤ 60 days*	*Median days*	*% ≤ 60 days*
Age (years)						
40–49	182	32	30	83	27	78
50–64	182	28	28	85	24	79
65–80	184	27	29	85	29	93
Race/ethnicity						
Asian	128	47	36	86	20	82
African American	182	28	34	81	37	76
Latina	179	37	26	85	30	78
White	184	19	27	85	23	92
Annual household income						
<$10,000	182	26	47	55	29	92
$10,000–$50,000	183	29	28	89	37	69
≥$50,000	183	29	27	85	20	86
Health insurance type						
No insurance/Medicare/MediCal	209	23	29	69	30	81
Integrated healthcare delivery system/ private insurance	182	30	29	85	22	84
Understanding explanation of results						
Fully understood	182	31	28	86	26	83
Somewhat understood	181	36	45	76	29	76
Did not understand/explain/DK	184	19	17	82	40	75
Discrimination getting healthcare in 12 months						
No	183	29	28	86	28	80
Yes	134	38	111	36	27	93
Method of notification						
Sent letter or card	184	21	40	86	27	80
Told in person	161	43	22	88	28	79
Telephone	175	39	29	81	27	87
Other/unclassified/unknown	210	33	21	93	67	0
Consulted with primary care physician						
No	184	27	32	83	30	73
Yes	181	32	28	85	25	86

Table 4. Adjusted Hazard Ratios and 95% Confidence Limits for Time to Resolution by Participant Characteristics, Pathfinders-San Francisco Bay Area, 1999–2001

	BIRADS 3: Probably benign			*BIRADS 4: Suspicious, or BIRADS 5: probably malignant*			*BIRADS 0: Indeterminate*[a]		
	n = *451*			n = *250*			n = *115*		
Variable (Reference)	*HR*	*95% HR CL*	p	*HR*	*95% HR CL*	p	*HR*	*95% HR CL*	p
Race/ethnicity (White)									
Asian	1.25	0.91-1.72	0.17	1.03	0.66-1.58	0.91	1.33	0.68-2.60	0.40
African American	1.17	0.90-1.53	0.23	0.69	0.49-0.97	0.03	0.55	0.28-1.09	0.09
Latino	1.46	1.09-1.96	0.01	1.03	0.64-1.67	0.90	0.78	0.39-1.55	0.47
Income (>$50,000)									
<$10,000	0.77	0.51-1.17	0.22	0.55	0.31-0.98	0.04	1.15	0.55-2.40	0.71
$10,000–$50,000	0.82	0.66-1.04	0.10	1.17	0.88-1.57	0.28	0.54	0.31-0.96	0.04
Insurance: Integrated health care system/private									
Medicare/MediCal/None	0.67	0.44-1.02	0.06	1.81	0.95-3.46	0.07	0.65	0.36-1.17	0.15
Understanding results (Fully understood)									
Did not understand/explain/did not know	1.12	0.85-1.46	0.42	0.96	0.60-1.53	0.85	0.42	0.17-1.06	0.07
Somewhat understood	1.19	0.90-1.57	0.22	0.49	0.32-0.75	0.001	0.63	0.33-1.23	0.17
Discrimination (No)									
Yes	1.24	0.76-2.02	0.38	0.22	0.09-0.52	<0.001	1.55	0.73-3.31	0.26
Method notified (Told in person)									
Sent letter or card	0.91	0.65-1.26	0.56	0.62	0.42-0.92	0.02	1.09	0.60-2.00	0.77
Told by telephone	1.03	0.72-1.46	0.88	0.66	0.48-0.90	0.01	1.04	0.56-1.94	0.89
Consulted with PCP									
Yes	1.18	0.96-1.46	0.13	1.32	0.99-1.76	0.06	0.94	0.54-1.64	0.82

[a]All hazard ratios (HR) are adjusted for age, education, race/ethnicity, household income, insurance type, understanding of results, perceived discrimination, method of communication, and consultation with primary care physician. For BIRADS 0 analysis, group model health maintenance organization (HMO) was combined as reference with private insurance.

CL, confidence limits; PCP, primary care physician.

communication of the results may be important components to enhancing quality of care after abnormal mammograms. Although only 6% of all women in our study perceived discrimination in their healthcare, there was a significant delay in time to diagnosis among the 12 women who reported discrimination and had BIRADS 4/5 mammogram results. In a study from Connecticut, African American women were significantly more likely to experience inadequate communication of screening mammogram results compared to white women.[28] Although we did not observe this difference by race, our findings of the importance of communication factors influencing time to resolution of a mammogram abnormality extend earlier work that identified information of where to get tests, satisfaction with physician explanations, and understanding the need for follow-up as significant associations with time to diagnosis.[15–17] These results should have practical implications for clinical care, such as emphasis on communication of abnormal results in a personal setting if

Table 5. Breast Imaging Reporting and Data System Assessment, Median Time to First Diagnostic Test and Resolution, and Previous Breast Cancer, by Biopsy Results, San Francisco Bay Area, 1999–2001

Characteristic	*Invasive cancer* % (n)	*DCIS* % (n)	*Benign* % (n)	*LCIS/atypical hyperplasia* % (n)
Sample size, *n*	93	58	790	10
Previous breast cancer	8.6 (8)	0	5.3 (42)	20 (2)
Breast assessment by BIRADS				
0 indeterminate	6.5 (6)	5.2 (3)	16.6 (131)	10 (1)
3 probably benign	4.3 (4)	15.5 (9)	62.9 (497)	20 (2)
4 suspicious	59.1 (55)	56.9 (33)	18.5 (146)	70 (7)
5 highly malignant	30.1 (28)	22.4 (13)	2 (16)	0
Median time to first test (days)	8	17	55	21.5
Mean time to first test (days)	18.3	21	112.1	29.4
Median time to resolution (days)	17	30	76	39
Mean time to resolution (days)	43.8	35.1	127.2	44.8
Percent resolved by 60 days	88.8	86	47.1	80

DCIS, ductal carcinoma *in situ*; LCIS lobular carcinoma *in situ*.

possible by a clinician familiar with the patient. Timeliness of evaluation and resolution of abnormal mammograms should be included as outcomes in quality improvement metrics and be considered a target for interventions within healthcare systems.

Even though these data were collected over a decade ago, the detailed information on diagnostic evaluation points to important differences in evaluation by categories of abnormal results. Although some patients with a BIRADS 3 mammography abnormality will be diagnosed with invasive cancer or DCIS (13 of 512, or 2.5% in this study), most will have a benign outcome. In fact, resolution of a BIRADS 3 abnormality is often dependent on the stability of the 6-month mammogram, and by definition, the time to diagnosis will be prolonged to at least 6 months. BIRADS 3 mammogram abnormalities constitute a majority of all potential false positive tests and should be considered in their own category.

For women with mammography results in categories of BIRADS 0, 4, or 5, there is urgency for more efficient diagnostic evaluation. Access to an initial diagnostic test at an average of < 5 weeks and an average of 7 weeks to diagnosis meant that > 80% of participants in this study met the Centers for Disease Control and Prevention (CDC) criterion of having a diagnosis within 60 days. This 60-day standard is somewhat arbitrary and was defined after these data were collected and before the CDC data were collected. In fact, other studies that included a San Francisco site showed that 92% of abnormal mammograms were resolved at 12 weeks.[29] Thus, outcomes 10 years ago were already excellent and may be even better at the current time. The San Francisco Mammography Registry experience from 1997 to 2008 found that for women with BIRADS 0, 4, and 5 screening tests, > 80% had completed follow-up at 60 days.[18] Among the women with BIRADS 0, 4, or 5 in our study, the rate of invasive cancer was 20.3%, with another 11.1% diagnosed with DCIS. This compares with an estimated rate of 7% of cancer diagnosis for all abnormal results included in 98,355 women in the BCCEDP from 1996 to 2005[14] and 11.3% in the 13,014 women in the San Francisco Mammography Registry analysis.[18] Evaluations of abnormal mammography results must consider these differences in expected rate of cancer and emphasize BIRADS 0, 4, and 5 without ignoring abnormalities in the BIRADS 3 category.

Defining a quality standard for the efficiency of evaluating BIRADS 0, 4, and 5 mammograms should facilitate comparisons across systems. The BCCEDP data showed that median time to diagnosis was 23–26 days, with 81%–82% diagnosed by 60 days from 1996 to 2000, which improved to 19–26 days, with 83%–84% diagnosed by 60 days from 2001 to 2005.[14] Studies from South Carolina (median time 28–34 days), Boston (36 days), and Jacksonville, Florida (38 days), showed similar time to diagnosis, with > 75% resolved at 60 days in each of these studies.[10–12] Another report from Chicago found diagnostic delays of > 60 days in 30%–40% of patients studied.[13] Our results showed a median time to resolution of 27–29 days, although > 80% were completed at 60 days.

Although system factors may be the most important in determining delays, individual demographic factors are also significant. African American women with BIRADS 4/5 had significant delay in time to resolution, but no delays were identified for Latina or Asian women compared to white women. Delay in diagnostic evaluation for African American women was reported in the national BCCEDP and in other studies from South Carolina.[10,14] Diagnostic delays for Latinas were reported in one study, with only 60% of 714 Latina women having timely diagnostic resolution.[15] In another study, Latinas with a breast abnormality were significantly less likely to receive adequate follow-up care.[16] Data on income, education, and type of health insurance were not always reported or available, which may explain some of these racial/ethnic differences. A study from Boston reported no difference in time to diagnosis by type of insurance, language of survey, or race/ethnicity.[11] The San Francisco Mammography Registry study, however, did identify significant odds of delay in women who did not speak English in the facility with the lowest proportion of LEP patients.[18]

There are limitations to our study, of which the most important is that these data are over 10 years old, and a question of relevance to current clinical reality may be raised. However, there are few studies that have evaluated what happens when women have an abnormal mammogram despite the fact that it is a common clinical event. Furthermore, understanding system and individual factors that contribute to meeting quality standards remain relevant today and, in fact, provide a comparison point for ongoing quality improvement. Because one of our sites is an academic health center, it is possible that some women were referred to that site having already had an abnormal screening examination or a breast symptom, which may explain the high rates of biopsy and cancer diagnoses compared to other studies.[14] We did not measure functional health literacy, which is a limitation given the findings that communication and understanding of the result are important factors in evaluating timeliness of follow-up. Our study was conducted in the San Francisco Bay Area, and the overall quality indicators were met at that time, but these results may not be applicable to other areas. Although most patients were recruited from a large integrated healthcare delivery system and an academic health center, the participation of a community hospital and public hospital strengthens the generalizability of the results.

In summary, we found that > 80% of women with BIRADS 0, 4, or 5 abnormal mammograms have a diagnosis within the CDC-defined quality metric of 60 days. Although African American women and those from the lowest income group had delays in diagnosis, other differences in diagnostic efficiency by race/ethnicity, income or education, and LEP status were not observed. Our study indicates that three potentially correctible communication factors may significantly influence determining delays in diagnosis, all of which can be addressed by possible interventions within healthcare systems. Ongoing surveillance of diagnostic evaluations of women with abnormal mammograms may be a sensitive clinical condition to evaluate quality metrics that blends system, individual, and clinical communication factors.

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Disclosure Statement

The authors have no conflicts of interest to report.

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