

What Influences Diagnostic Delay in Low-Income Women with Breast Cancer?

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Abstract

Background: Delayed diagnosis of breast cancer (BC) may contribute to adverse outcomes, such as reduced survival. The purpose of this study was to identify correlates of elapsed time between recognition of breast abnormalities and receipt of definitive diagnosis of BC among low-income women.

Methods: Data were obtained from a cross-sectional study among a statewide sample of 921 low-income women with a new diagnosis of BC. Patients were grouped by whether their breast abnormalities were self-detected or healthcare system detected. Multivariate logistic regression analyses were used to examine associations between diagnostic delay and patient characteristics, patient communication, and system characteristics.

Results: The self-detected group experienced much greater delay than the system-detected group (median intervals 80.5 vs. 31.5 days). African Americans had the longest intervals between symptom detection and diagnostic resolution; median delays in the self-detected and system-detected subgroups were 115 and 70 days, respectively, compared to 64 and 22 days for Caucasians. In multivariate analyses, African Americans had considerably greater odds of >60-day delay than Caucasians in both the self-detected (odds ratio [OR] 3.51) and system-detected (OR 5.36) groups. Greater perceived self-efficacy in interacting with healthcare providers was significantly associated with shorter delay among the self-detected group (OR 0.86).

Conclusions: Disparities in timely BC diagnosis between African Americans and Caucasians were pronounced in this uniformly low-income population of women. Women with self-detected abnormalities had markedly greater delays than those with healthcare system-detected abnormalities. Among this vulnerable group, increasing self-efficacy in interacting with healthcare providers may reduce diagnostic delays.

Introduction

BREAST CANCER (BC) IS ONE OF THE MOST common cancers in the United States.¹ BC can be a particularly difficult diagnosis to receive under any circumstances, but it may be especially so for the uninsured, low-income population now comprising 15% of the U.S. population.² Studies have shown that these women are more likely to present with later stage BC, more likely to receive suboptimal treatment, and more likely to die within 5 years.^{3,4} Delayed diagnosis from the point an abnormality is detected, either by the patient or by a healthcare provider, to the point of definitive diagnosis may contribute to these negative outcomes, as well as to costlier treatment options and higher recurrence rates.⁵⁻¹¹ Although delayed care is more likely to occur in low-income and

medically indigent populations,¹²⁻¹⁸ few studies have addressed diagnostic delay in low-income BC patients with regard to both self-detected and system-detected breast abnormalities, the former of which is particularly salient in this vulnerable group.¹⁹

In research among general BC patient populations, patient characteristics associated with delay from the point an abnormality is detected to follow-up of tests or symptoms have included lower income level,²⁰ fewer screening mammograms before diagnosis,^{13,21} lack of a personal physician,¹⁷ and poorer health,^{21,22} as well as patient attitudes and beliefs, such as fear of bad news and concerns about medical procedures and survival,^{23,24} prior negative experiences with healthcare systems,^{20,25} and desire to avoid disruptions of normal activities, particularly work.¹⁸ Associated race/eth-

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nicity findings have been somewhat inconsistent. Some studies have documented greater delay in care seeking among ethnic minority women,^{26–29} whereas others have reported no racial/ethnic differences.^{30,31}

Aspects of patient communication, such as asking questions¹¹ and understanding the need for follow-up of a breast abnormality on mammogram,³² have been shown to be significantly associated with appropriate follow-up care. Further, although patient self-efficacy in communicating with physicians has not been investigated in the context of delayed care, it has been shown to predict receipt of BC knowledge,³³ receipt of breast reconstructive surgery,³⁴ decreased BC treatment-related symptoms,³⁵ and quality of life in low-income prostate cancer patients.³⁶ Ability to adequately interface with the healthcare system and healthcare providers, which could minimize diagnostic delay, may be particularly compromised in low-income, less-educated populations of women.

This study examines diagnostic delay in a large sample of low-income women with histologically confirmed BC. The two key research questions were (1) Are patient characteristics and patient communication associated with diagnostic delay in low-income women with BC? (2) Do predictors of diagnostic delay differ between women with self-detected vs. healthcare system-detected abnormalities? Identifying potentially malleable barriers to timely care could lead to interventions to reduce delay and prevent poorer outcomes prevalent in medically underserved BC patient populations.

Materials and Methods

Data were derived from a cross-sectional survey of low-income women living in California who were aged ≥ 18 years and newly diagnosed with BC. The study was approved by the UCLA Human Subjects Protection Committee.

Study sample

All 1869 women treated for BC through the California Breast and Cervical Cancer Treatment Program (BCCTP) between February 2003 and September 2005 were approached to be recruited. BCCTP is a Medicaid coverage option, legislated by the federal government as part of the Breast and Cervical Cancer Prevention and Treatment Act of 2000, to fund the treatment of breast and cervical cancer for uninsured and underinsured, low-income women ($\leq 200\%$ federal poverty level [FPL]).

Details about the study flow and research design have been published previously.³³ In brief, participants were interviewed by phone 6 months after enrollment in the BCCTP. Women who did not speak English or Spanish, had a previous history of BC, or were receiving treatment for another cancer were excluded from the study. Nine hundred twenty-one of 1508 eligible women agreed to participate (61%) and completed the survey. Compared with survey responders, non-responders were older (52 vs. 50 years, $p < 0.05$), more likely to be Asian (9% vs. 4%, $p < 0.05$), and less likely to be Latina (46% vs. 56%, $p < 0.05$).

Dependent variable

Diagnostic delay was defined as the number of days between recognition of a breast abnormality and the first biopsy or surgery to obtain a definitive diagnosis; the dates of these were by patient report. This interval was dichotomized at > 60

days vs. ≤ 60 days for analysis. There are no national consensus criteria for the definition of diagnostic delay. However, a 2-month delay from onset of symptoms to initiation of treatment is the lower limit of the interval found to affect survival in studies included in an analysis of pooled data from 38 studies relating breast cancer treatment to survival.⁸ As one would expect that treatment delay would necessarily be longer than diagnostic delay, survival would be particularly impacted by this long a diagnostic delay.

Independent variables

These variables included self-reported patient sociodemographic characteristics (age, ethnicity, education, marital status), comorbidity, patient-perceived self-efficacy in interacting with physicians, mode of detection (ie, how patients first became aware of their BC abnormalities), and having a regular source of care before their BC diagnosis. Education was initially assessed by an ordinal variable; it was subsequently dichotomized as high school graduate vs. non-graduate. Income was not included as, by definition, the entire sample was poor ($\leq 200\%$ FPL). Comorbidity was measured by a modification of the Charlson comorbidity index for patient self-report.³⁷ Comorbidity was truncated at 2, so that all participants had 0–2 comorbidities.

Patient self-efficacy in physician interactions was assessed by the 5-item Perceived Efficacy in Patient-Physician Interactions (PEPPI) questionnaire,³⁸ which contains 5 items about patients' confidence in their ability to obtain needed medical information and attention to their chief medical concern from physicians. Each item is rated on a 0–10-point scale, ranging from 0 (not at all confident) to 10 (extremely confident). Cronbach's alpha for the PEPPI scale in this sample was 0.96. Mode of detection (self vs. system) was used as a stratification variable. Patients were classified as self-detected if they discovered their breast abnormalities and as system-detected if their breast abnormalities were identified by physicians or mammography.

Other independent variables obtained from administrative records were type of facility where treatment was received and county of residence. Type of facility, whether treatment was provided in a cancer care setting, specifically a National Cancer Institute (NCI)-designated cancer center or an approved cancer center, was determined using the designation of the American College of Surgeons.^{39,40} In addition, information on stage of BC was abstracted from medical records for a subset of 609 women who had medical records available.

Data analysis

To assess potential disparities in accessing medical care, we examined unadjusted associations between patient and system characteristics and mode of breast abnormality detection. Associations between categorical variables and diagnostic delay were examined with chi-square tests. Additional chi-square tests were conducted to determine if there were any racial/ethnic group differences in mode of detection or tumor stage. Age was categorized for this preliminary analysis and for presentation in Table 2; however, it was used as a continuous variable in regression analyses. Because of its skewed distribution, self-efficacy was categorized by quartiles and analyzed as an ordinal variable. Logistic regression modeling was used to determine if unadjusted correlates of 60-day

delay persisted when potential confounders were controlled. Separate regression analyses were conducted for each subgroup (self-detected and system-detected) to address the second research question and to inform specific recommendations. The models were tested for multicollinearity and goodness of fit, which were not found to be problematic. Women from other race/ethnicities were excluded from bivariate analyses and regression models because of small sample size. The model for women with system-detected abnormalities contained two extra control variables: receipt of care at a cancer center, which should facilitate timely diagnosis after positive radiographic findings, and method of detection (clinical breast examination [CBE] vs. mammography), as patients with suspicious CBEs still had to undergo mammography and, thus, might experience greater delay. Regression models containing dummy variables for counties or groups of small counties (5 patients) with relatively high or low rates of delay were also fit to the data to control for variations in county services. As the resulting models did not differ substantively from those not controlling for county effects, we present the former, more parsimonious models.

Results

The mean age of the women was 51 years, over half were Latina, and close to a third were Caucasian (Table 1). Most had a high school education, half were married, and almost one-third reported at least one comorbid condition. Over half

TABLE 1. SAMPLE CHARACTERISTICS ($n=921$)

	50.8 (9.5) 38.2 (11.6)	25–85 0–50
Age, mean (SD) range	%	n
Self-efficacy, mean (SD) range		
Ethnicity		
Caucasian	31.6	292
African American	5.9	54
Latina	53.5	492
Asian/Pacific Islander	7.4	68
Other	1.6	15
Education		
<High school	40.8	375
Married/partner		
Yes	48.2	444
Regular source of care		
Yes	58.5	539
Any comorbidities		
0	70.1	646
1	18.9	174
2	11.0	101
Stage ($n=609$) ^a		
0	8.1	49
1	25.5	155
2	42.7	260
3	19.1	116
4	4.8	29
Self-detected		
Yes	66.9	615
>60-day delay		
Yes	51.4	472

^aStage information was collected for a subset of 609 subjects with medical records available.
SD, standard deviation.

reported a regular source of care at the time of diagnosis. Patients had an average self-efficacy score of 38 on a scale of 0–50. The majority presented at stage I or II at diagnosis. Two thirds of patients detected their breast abnormalities themselves, and somewhat more than a quarter were alerted by mammography (27%); relatively few patients had abnormalities detected by CBE (5%). Over half (51.4%) had a >60-day delay between detection of their breast abnormality and a definitive diagnosis. More extensive delays were also common: 39% had a 90-day diagnostic delay (48% for the self-detected group and 21% for the system-detected group). In the subset with positive mammograms, 30% had a >60-day delay, and 17% had a >90-day delay. African Americans had the longest intervals between symptom detection and diagnostic resolution; median delays in the total sample and in the self-detected and system-detected subsamples were 104, 115, and 70 days, respectively. Corresponding delays for Caucasians were 47, 65, and 22 days. Among African Americans who discovered their breast abnormalities, almost one fourth (24%) had not received a diagnosis within 1 year; for those with system-detected abnormalities, 44% had a >90-day diagnostic delay. No racial/ethnic group differences were found with respect to method of breast abnormality discovery or to stage of BC for the subset of 609 women with stage information.

In bivariate analyses, women with a self-detected abnormality were significantly more likely to experience a >60-day delay than those with a system-detected abnormality (59.7% vs. 34.5%, $p=0.001$), with median intervals of 80.5 vs. 31.5 days (data not shown). Table 2 depicts further bivariate associations between sample characteristics and overall 60-day diagnostic delay for each mode of detection, as well as overall median delay days for each sample characteristic. As shown, African Americans had the greatest proportions of 60-day delay for both self-detected and system-detected abnormalities compared to other race/ethnicities. Care in a designated cancer center was associated with less delay for the system-detected group. Regular source of care did not play a role in delays for either mode of detection. The participants' main sources of regular care were county, community, or hospital outpatient clinics (72.5%), with only 25.5% in a private physician's office or health maintenance organization (HMO) (data not shown).

Table 3 shows the results of multiple logistic regression analyses. Among self-detected patients, being African American rather than Caucasian was strongly associated with diagnostic delay (odds ratio [OR] 3.55). Other demographic characteristics were not associated with delay. Greater patient self-efficacy in dealing with physicians was inversely related to delay in the self-detected group. Among system-detected patients, being African American was again the only demographic factor associated with delayed diagnosis, with 5 times greater odds of diagnostic delay than Caucasians. Abnormality detection by CBE, rather than mammography, had a strong, positive association with delay, whereas receipt of care in a cancer center was inversely related to diagnostic delay. Having a regular source of care did not facilitate timely diagnosis for women whose breast abnormality was either self-detected or system-detected in multivariate analyses.

Discussion

This is the first study of which we are aware to examine diagnostic delay in a large sample of uniformly poor,

TABLE 2. ASSOCIATIONS WITH DIAGNOSTIC DELAY (*n* = 921)

	Median delay (days)	Self-detected		System-detected	
		%	<i>p</i> value ^a	%	<i>p</i> value ^a
Age category			0.805		0.443
≥ 50	59	60.3		33.5	
< 50	69	59.4		38.0	
Ethnicity			0.01		0.027
Caucasian	47	52.3		26.1	
African American	103.5	79.0		62.5	
Latina	63	61.7		36.4	
Asian/Pacific Islander	73	63.5		43.8	
Education			0.105		0.319
< High school	66	57.3		32.5	
≥ High school	59	64.0		38.1	
Comorbidities			0.604		0.107
0	63	59.7		38.7	
1	57	57.4		29.6	
2	59	65.1		22.2	
Regular source of care			0.124		0.561
Yes	56	57.0		34.0	
No	67.5	63.1		37.5	
Self-efficacy			0.122		0.977
Quartile 1	66	66.9		35.9	
Quartile 2	68	62.0		36.1	
Quartile 3	57	55.2		32.8	
Quartile 4	56	55.3		35.0	
Married			0.379		0.468
Yes	62.0	58.1		37.1	
No	61.5	61.6		33.1	
Cancer center			0.675		0.004
Yes	57	59.1		27.9	
No	67	60.8		44.5	

^aBased on chi-square tests for association with diagnostic delay.

multiethnic women with BC, as well as among the first to examine delays in women with both self-detected and system-detected abnormalities. A major strength of this study was the ability to hold income constant while examining ethnic differences in diagnostic delay, thereby overcoming the problem of ethnicity as a proxy measure of socioeconomic status (SES) in prior disparities research. Further, to our knowledge, no other studies have examined the effects of patient empowerment on diagnostic delay among women with BC, which may be particularly salient among a medically underserved population. Being African American was the overwhelmingly strongest predictor of diagnostic delay, for both patients who did and did not detect their own breast abnormalities. In addition, the only significant and malleable predictor of delay was patient self-efficacy in interacting with healthcare providers in the case of self-detected abnormalities.

As we previously reported,⁴¹ a majority (about 67%) of the women self-detected their breast abnormality. Women who did so were markedly more likely to experience diagnostic delays than those whose abnormalities were system-detected, potentially putting them at increased risk for mortality.^{8,42} This finding is attributable to some degree to the fact that women who discover their own abnormalities must subsequently access BC detection and treatment facilities in the healthcare system. However, the magnitude of the de-

TABLE 3. LOGISTIC REGRESSION MODELS FOR DIAGNOSTIC DELAY

Characteristic	Self-detected		System-detected	
	n = 607		n = 284	
	OR	95%CI	OR	95%CI
Age	1.00	0.99-1.02	1.00	0.97-1.04
Ethnicity				
Caucasian	1.00	–	1.00	–
African American	3.55	1.54-8.21**	5.00	1.50-16.42**
Latina	1.32	0.86-2.03	1.35	0.68-2.66
Asian/Pacific Islander	1.52	0.80-2.89	2.18	0.67-7.04
Education < 12 years	1.27	0.85-1.91	1.23	0.68-2.23
Married	0.88	0.62-1.25	1.22	0.70-2.14
Comorbidity	1.02	0.70-1.49	0.66	0.36-1.21
Self-efficacy ^a	0.86	0.73-0.997*	0.95	0.75-1.20
Regular source of care ^b	0.79	0.56-1.11	0.93	0.52-1.66
Cancer center			0.49	0.29-0.83**
Clinical breast examination			3.09	1.56-6.09***

^aQuartiles for the 0–50 point Perceived Efficacy in Patient-Physician Interactions (PEPPI) scale.

^bBefore diagnosis of breast cancer.

p* < 0.05; *p* < 0.01; ****p* < 0.001.

lay relative to system-detected abnormalities was remarkable (over 2.5 times greater). Research suggests that patient delays can be due to nonlump ambiguous symptoms,^{43,44} lack of BC knowledge,⁴⁵ absence of symptom distress,⁴⁶ perception of competing priorities,⁴⁷ and fear of BC or BC treatment.^{47,48}

As noted, African Americans whose abnormalities were self-detected were strikingly more likely to experience delay in diagnosis than Caucasians (adjusted OR 3.55). Reasons for such delay are likely multifactorial, including limited access to care and SES.⁴⁹ However, African Americans' disadvantage in timely diagnosis remained even after accounting for these two confounders. Although similar patient delay factors found in general populations may also be contributors to this disadvantage,^{20,50,51} certain cultural beliefs, fears, fatalistic views of BC, and mistrust of the healthcare system may particularly influence African American women's health-seeking behavior.^{52–55} Moreover, some studies have found that religion and spirituality are barriers for some African Americans to seeking care for BC,^{56,57} perhaps because of a belief in the power of prayer and religious intervention.⁵⁸

Similarly, African Americans were markedly more likely than Caucasians to experience delays in diagnosis in the case of system-detected abnormalities. The adjusted odds of 60-day diagnostic delay among our system-detected low-income African American patients compared to Caucasians were over 3 times greater than that in a sample of Medicare patients (OR 5.00 vs. 1.39, respectively).⁵⁹ As the two studies used similar definitions of diagnostic delay and age was not related to delay in our sample, it appears that documented racial/ethnic healthcare disparities in the general insured population are more pronounced in low-income, uninsured populations.⁴² Factors for system delay have not been well established among African Americans. One study showed that physicians are engaged in less patient-centered communication with African Americans than with Caucasian patients,⁶⁰ and poor

patient-provider communication has been identified as a barrier for abnormal mammography follow-up.^{11,61,62}

Perceived self-efficacy in patient-physician communication in the self-detected group was inversely associated with a >60-day diagnostic delay. Because this communication measure represents patients' confidence in their ability to get physicians to take their chief health concern seriously, to know what questions to ask, and to get doctors to answer their questions, higher scores should theoretically be associated with greater ability to expeditiously negotiate the healthcare system and avert diagnostic delays associated with patient-provider miscommunication.⁶³ The fact that self-efficacy was not associated with diagnostic delay in the system-detected group underscores the importance of provider and system characteristics in facilitating a definitive diagnosis once breast abnormalities are recognized by physicians; in fact, the system characteristic of care in a cancer center was significantly associated with less delay for system-detected patients. Improving patient-provider communication may be particularly important for African American women with BC,¹¹ and promoting self-efficacy is one avenue to achieve that goal.

Having a regular source of care for women for either mode of detection was not associated with diagnostic delay in either bivariate or multivariate analyses. Most women who had a regular source of care depended on public healthcare facilities, access to which may be more difficult than in private settings,⁶⁴⁻⁶⁶ thereby potentially obviating its facilitation of diagnosis. Increased comorbidity had an inverse relationship with delay among women with system-detected abnormalities, similar to the general population, and is likely due to increased exposure to the healthcare system.⁵⁹

Our findings suggest that more widespread public health interventions are needed to inform women about potential symptoms of BC and provide them with nonthreatening information about the importance and benefits of receiving prompt follow-up care for breast abnormalities. In particular, greater outreach efforts are needed to advise low-income populations about currently available resources, such as the Centers for Disease Control and Prevention (CDC)-funded Every Women Counts (EWC) free screening mammography program in California for women $\leq 200\%$ FPL and the BCCTP for treatment of BC. Of note is that the BCCTP was specifically designed to be a safety net for treatment for low-income women screened for BC through the EWC, yet only 27% of our BCCTP sample had their BC detected by mammography, lending support for the need for enhancing such outreach efforts. Finally, underserved women's efforts to assertively interface with the healthcare system and their healthcare providers to promote cognizance of and action on their needs should be facilitated in order to reduce delays in diagnosis and treatment of self-recognized breast abnormalities.

This study has several limitations. All patients were diagnosed in California, which may limit generalizability because of geographic variations. The sample of African Americans was relatively small, although proportionate to California's general population (6.7%),⁶⁷ a fact that also limits external generalizability. Moreover, as our responders were more likely to be Latina and younger overall and less likely to be Asian American than nonresponders, our findings may not be generalizable to older, non-Latina, and non-Asian American populations. A measurement limitation is recall bias, as virtually all data were obtained by patient report. It has been

noted, however, that people who have undergone a sudden and life-threatening health crisis manifest very clear recall of the details surrounding the event; BC patients, for example, can recall the precise time when they first noticed their symptoms.⁶⁸ We have also found that patient recall of BC treatment dates in our study sample was excellent compared to medical records.⁶⁹ Additionally, because of time constraints and logistical barriers in the parent study, we were not able to obtain information about patients' attitudes and beliefs about BC before diagnosis and their coping styles, which also could affect delays.

In summary, the disparities in diagnostic delay among African Americans that have been found in previous studies in general populations appear to be markedly more pronounced among low-income African American women in California and lengthy enough to possibly jeopardize survival.⁸ Further, women who self-detect their abnormalities experience far greater delays than those whose abnormalities are system detected. Among these women, improving patient self-efficacy in interacting with healthcare providers could result in less delay. Additional qualitative and quantitative studies are needed to understand the sources of the diagnostic delays described here and to determine if similar differential delays exist in other regions of the country.

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Disclosure Statement

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