

ORIGINAL RESEARCH

Factors Influencing Patient Confidence in Screening Mammography

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Background: We aimed to assess factors associated with patients' confidence in the ability of screening mammography to detect breast cancer.

Methods: Data were analyzed from a cross-sectional, prospective survey conducted in 2017 of women without a breast cancer history who were undergoing screening mammography at our institution.

Results: In total, 390 women completed the survey questions relevant to this study. Most respondents were 46 years or older (89.7%), White (87.6%), and college-educated (66.1%). Approximately 80% of respondents reported having confidence in the ability of screening mammography to detect breast cancer. Factors significantly associated with lower confidence in screening mammography were higher education ($P = .01$) and dense breast tissue ($P < .001$). Age ($P = .12$), race ($P = .64$), family history of breast cancer ($P = .17$), prior abnormal mammogram ($P = .07$), and mammogram frequency ($P = .42$) were nonsignificant. Women with a college education or higher were less likely to report confidence in routine mammography than women with less education (odds ratio [OR] = 0.43; 95% CI, 0.20–0.84; $P = .02$). Compared with women who reported their breast tissue as not dense, women who were aware they had increased breast density (OR = 0.16; 95% CI, 0.04–0.49; $P = .004$) or were unaware whether they had increased breast density (OR = 0.17; 95% CI, 0.04–0.51; $P = .005$) reported less confidence in screening mammography.

Discussion: Most respondents were confident in the ability of screening mammography to detect breast cancer. Confidence was inversely associated with education level and self-reported increased breast density.

Conclusions: These findings highlight the importance of continued patient education about the effectiveness of screening mammography for patients with dense breast tissue. (J Am Board Fam Med 2023;36:000–000.)

Keywords: Breast Cancer, Breast Density, Cancer Screening, Cross-Sectional Studies, Mammography, Patient Confidence, Prospective Studies, Surveys and Questionnaires

Introduction

Breast cancer is the most frequently diagnosed cancer in US women and is second only to lung cancer in cancer-related deaths among women.¹ Methods of radiographic screening to detect breast cancer

have greatly evolved from direct-exposure film mammography beginning in the early 20th century to digital mammography widely used today.² Although screening mammography is considered the criterion standard for breast cancer detection, a review of the Cochrane Library in 2000 brought controversy to the field after the authors reported little effect of screening mammography on improving breast cancer-related mortality rates.³ The debate about the effectiveness, benefits, and harms of mammography has continued.⁴ In 2016, the

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US Preventive Services Task Force changed its recommendation about the starting age and frequency of screening mammography, recommending against routine screening mammography of women aged 40 to 49 years (grade C recommendation) and recommending biennial screening for average-risk women aged 50 to 74 years (grade B recommendation).⁵ These recommendations differ from recommendations by the American Cancer Society and the National Comprehensive Cancer Network.⁴ The American Cancer Society⁶ recommends that screening mammograms be optional for women 40 to 44 years old, be performed annually for women 45 to 54 years, and be performed every 2 years for women 55 and older. The National Comprehensive Cancer Network⁷ recommends annual screening mammography starting at age 40 years. This lack of consensus regarding screening recommendations, in addition to the frequent presentation of screening mammography as all benefit and no harm, has likely further eroded public confidence in screening mammograms.

This debate has come to the attention of women in the US, with 95% of women in one survey saying they were aware of the controversy, and 50% reporting being upset by public disagreement on screening mammography recommendations.⁸ Mixed messages about the effectiveness and usefulness of screening mammography could influence confidence in mammography, a factor known to affect use of this screening tool.^{9,10} Compared with women who did not believe in the effectiveness of mammograms in detecting breast cancer, women who believed in the effectiveness of screening mammography were more likely to have a mammogram.¹⁰ The converse is also true; belief that mammography is ineffective or inaccurate is associated with decreased use.⁹

Mammography has a specificity of 88% to 98% for women without dense breast tissue and a sensitivity of 80% to 95%.^{11–13} Mammographic breast density is defined as the relative proportion of fibroglandular parenchyma compared with fatty elements of breast tissue.¹⁴ Approximately 50% of US women—a large proportion of the US population—have breast tissue that is considered dense by the Breast Imaging Reporting and Data System (BI-RADS) classification.^{15,16} Dense breast tissue has a masking effect on mammography that contributes to decreased sensitivity

and is an independent risk factor for breast cancer development.^{14,17}

Little prior research has been done with women undergoing screening mammography to assess factors that influence their confidence in the effectiveness of this screening method, still the best imaging study known to decrease deaths due to breast cancer.^{18,19} We describe survey findings about confidence in screening mammography reported by a cohort of women before they underwent screening mammography.

Methods

Survey

Asymptomatic women arriving for screening mammography at an academic breast imaging center were offered a cross-sectional survey to complete as part of a prospective survey study²⁰ about the importance of a baseline mammogram. The anonymous survey was administered between March and April 2017 and was compliant with the privacy rules of the Health Insurance Portability and Accountability Act (HIPAA) (See Appendix). The institutional review board exempted the survey study from review. The survey was developed by using an iterative process with multispecialty practitioner feedback and was pretested by the study team. No remuneration was provided to survey participants. Informed consent was obtained from all participants included in the study.

The current study focused on replies to questions in the survey about participants' confidence in the ability of a routine mammogram to screen for breast cancer, with choices ranging from very confident to not at all confident (Supplement, questions 12 to 18). Participants were also asked for demographic information: age, race, and highest level of education. No patient identifiers were collected; completed surveys were sequentially numbered for data entry purposes. Before survey distribution, the authors determined a sample size of 401 was required for a margin of error of 5% and a confidence level of 95%.²⁰ All data collected were transferred from the article survey to an electronic data collection system (REDCap [Research Electronic Data Capture], Vanderbilt University).^{21,22}

Statistical Analyses

Descriptive statistics were summarized as count (percentage) for categorical variables, with a χ^2 test

used for comparisons. To investigate the association of confidence in routine screening mammography (outcome) with education and patient knowledge of dense breast tissue, logistic regression was used. Regression analyses were adjusted for patient age categories, race and ethnicity, family history of breast cancer, and history of an abnormal mammogram. All statistical tests were 2-tailed with a significance level of .05. The analysis was conducted with R software version 3.6.2 (The R Foundation for Statistical Computing).

Results

Study Participants

In total, 401 women completed the survey, and the relevant survey questions were completed by 390 women without a history of breast cancer who came to the imaging center for screening mammography from March through April 2017. Most study participants were 46 years or older (89.7%), White (87.6%), and college-educated (66.1%) (Table 1).

Of 370 study participants who answered the question about confidence in screening mammography, 301 (81.4%) reported being confident in the ability of screening mammography to detect breast cancer. Factors not significantly associated with confidence in screening mammography were age ($P=.12$), race ($P=.64$), family history of breast cancer ($P=.17$), history of abnormal mammogram ($P=.07$), and mammogram frequency ($P=.42$).

Two significant inverse associations were observed. Confidence in screening mammography was inversely associated with higher education. Of

respondents reporting lack of confidence in screening mammography, 79.4% had at least some college education and 20.6% did not ($P=.01$) (Table 2). In addition, known presence of dense breast tissue on a prior mammogram was inversely associated with confidence in screening mammography. Of those who reported lack of confidence in screening, 53.6% of women reported dense tissue vs 42.0% of women who reported being unaware of their breast density and 4.3% of women without dense tissue ($P<.001$) (Table 2). The associations of education and breast density with confidence in screening mammography were further adjusted for patient age, race and ethnicity, family history of breast cancer, and history of an abnormal mammogram. Women with a college education or higher were less likely to report confidence in routine mammography than women with less education (OR [odds ratio] = 0.43; 95% CI, 0.2–0.84; $P=.02$). Both women with awareness of their dense breast tissue (OR = 0.16; 95% CI, 0.04–0.49; $P=.004$) and unawareness of their breast density (OR = 0.17; 95% CI, 0.04–0.51; $P=.005$) were less likely to report confidence in screening mammography than women without dense tissue (Table 3).

Discussion

Women's reported confidence in the ability of screening mammography to detect breast cancer was inversely associated with higher education level and self-reported dense breasts. The inverse association with education level was somewhat surprising given that previous research findings showed that women with an education level beyond high school have higher rates of mammography use than women with less education.^{23–25} This relationship could be explained by increased access to mammography due to the higher socioeconomic status that education often affords. Greater health literacy with higher education levels may also be a contributing factor. Consumer articles about mammography written at a higher education level contain more material describing benefits of mammography as controversial.²⁶ Women with a higher level of education may consume more educational content that is critical of mammography than women with less education, thereby decreasing their confidence in the method. We do not recommend shielding women from information about limitations of screening mammography for women with dense breasts. However, acknowledging the relatively

Table 1. Demographic Characteristics of Patients (n = 390)

	Patients, No. (%)
Age, y	(n = 386)
≤45	40 (10.4)
46 to 65	208 (53.9)
≥66	138 (35.8)
Race and ethnicity	(n = 370)
White (non-Hispanic)	324 (87.6)
Non-White ^a	46 (12.4)
Highest education	(n = 372)
College or higher	246 (66.1)
High school	126 (33.9)

Notes. ^aSurvey choices for non-White were Hispanic or Latino, Black or African American, Native American or American Indian, Asian/Pacific Islander, and other (eg, multiracial and multiethnic).

Table 2. Descriptive Analysis of Characteristics of Patients With and Without Confidence in Screening Mammography^a

	Confidence in Screening Mammography			<i>P</i> value ^b
	Yes (n = 301)	No (n = 69)	Total (n = 370)	
Age, y	(n = 299)	(n = 68)	(n = 367)	
≤45	28 (9.4)	10 (14.7)	38 (10.4)	0.12
46 to 65	161 (53.8)	41 (60.3)	202 (55.0)	
≥66	110 (36.8)	17 (25.0)	127 (34.6)	
Race and ethnicity	(n = 284)	(n = 68)	(n = 352)	
White (non-Hispanic)	249 (87.7)	61 (89.7)	310 (88.1)	0.64
Non-White ^c	35 (12.3)	7 (10.3)	42 (11.9)	
Highest education	(n = 286)	(n = 68)	(n = 354)	
Some high school or diploma	104 (36.4)	14 (20.6)	118 (33.3)	0.01
College or higher	182 (63.6)	54 (79.4)	236 (66.7)	
Family member with breast cancer	(n = 293)	(n = 66)	(n = 359)	
Yes	77 (26.3)	12 (18.2)	89 (24.8)	0.17
No	216 (73.7)	54 (81.8)	270 (75.2)	
History of abnormal mammogram	(n = 278)	(n = 64)	(n = 342)	
Yes	89 (32.0)	28 (43.8)	117 (34.2)	0.07
No	189 (68.0)	36 (56.2)	225 (65.8)	
Presence of dense breast tissue				
Yes	110 (36.5)	37 (53.6)	147 (39.7)	<0.001
No	75 (24.9)	3 (4.3)	78 (21.1)	
Not sure	116 (38.5)	29 (42.0)	145 (39.2)	
Mammogram frequency				
Annual	240 (79.7)	52 (75.4)	292 (78.9)	0.42
Less often	61 (20.3)	17 (24.6)	78 (21.1)	

Notes. ^aDescriptive statistics comparing demographic characteristics of participants by their responses to the question, “How confident are you that a routine mammogram is adequate to screen for early-stage breast cancer in women without dense breast tissue?”.

^b χ^2 test (2-tailed).

^cHispanic or Latino, Black or African American, Native American or American Indian, Asian/Pacific Islander, and other.

decreased sensitivity and specificity of screening mammography in this population may serve to start further discussion between patients and their health care clinicians about other options for breast cancer screening.

The finding that women with increased breast density were less confident in screening mammography was expected. In prior surveys of women with dense breasts, between 2-thirds and 3-fourths of respondents were aware of the decreased sensitivity of mammography to detect breast cancer in women with dense breasts.^{27,28} Because most women seem aware of this effect, this knowledge may subsequently decrease confidence levels. Women may also be aware that women with dense breasts have a higher risk for false-positive results with time.²⁹ For women with dense breasts, supplemental screening modalities for breast cancer include

contrast-enhanced digital mammography, ultrasonography, molecular breast imaging, and magnetic resonance imaging of the breast. Interest in supplemental screening of this specific population is reportedly high, although the US Preventive Services Task Force does not currently endorse any guidelines for the use of supplemental screening modalities in any population.^{5,30,31}

Few prior studies have evaluated confidence in screening mammograms and the factors that influence this confidence for patients undergoing screening mammography. A 2022 study by Tosteson et al¹⁹ showed similar findings to ours. They studied women’s confidence in different breast cancer screening modalities, including digital mammography, and observed that lower confidence was expressed by women with dense breasts regardless of screening modality.

Table 3. Adjusted Odds Ratio of Confidence in Screening Mammography

	Comparison	Adjusted Odds Ratio (95% CI)	<i>P</i> value
Age, y	46 to 65 vs ≤45	1.61 (0.62–3.93)	0.31
	≥66 vs ≤45	2.01 (0.71–5.54)	0.18
Race and ethnicity	White vs non-White ^a	0.44 (0.14–1.19)	0.13
College education or higher	Yes vs no	0.43 (0.20–0.84)	0.02
Family history of breast cancer	Yes vs no	1.61 (0.77–3.60)	0.22
History of abnormal mammogram	Yes vs no	0.71 (0.38–1.33)	0.28
Dense breast tissue	Presence vs no	0.16 (0.04–0.49)	0.004
	Not sure vs no	0.17 (0.04–0.51)	0.005

Notes. ^aWhite (non-Hispanic) vs Hispanic or Latino, Black or African American, Native American or American Indian, Asian/Pacific Islander, and other.

Demographic factors that we did not show to be associated with patients' confidence in screening mammography were age and race and ethnicity. Increased age has been historically correlated with decreased use of mammography,^{25,32} so our finding that confidence in mammography remains high in older age groups (>45 years) is encouraging. Black and Hispanic women have been shown to undergo screening mammography less often than White women,²⁵ but some authors attribute this difference to socioeconomic factors influenced by race rather than race alone.³³ Participation in our survey by non-White women was limited, so further research in more diverse populations is necessary.

Limitations

This survey study had some limitations. First, selection bias is possible because our study participants were patients at a single institution who were scheduled for screening mammography. We cannot exclude the possibility that differences in opinion exist between our survey population and the population eligible for screening mammography. Second, the sample population was relatively homogenous, being largely White and educated and living in a state where practitioners are required to notify patients when they have dense breasts. These characteristics limit the generalizability of the data to more diverse populations and to populations without legislation requiring dense breast reporting. Third, the data regarding screening intervals, breast density categorization, and breast history were not abstracted from the health records but rather were reported by study participants, who may have recall bias. These data could not be confirmed by health record review because no personal identifiers were collected in the study to maintain HIPAA compliance. In

addition, we did not ask respondents to indicate the level of their increased breast density and therefore had no way of evaluating responses by the extent of participants' increased breast density. Fourth, we did not track the survey response rate, and women who were less confident in the effectiveness of screening mammography may have been more likely to decline to respond to the survey. Finally, the survey was developed at our institution for a study on knowledge about screening mammography²⁰ because we could not source a validated survey that would explore our objectives.

Conclusions

The results of our study suggest a lack of confidence in screening mammography's ability to help detect breast cancer as reported by some women, especially those with higher education or dense breast tissue. This finding is important because breast cancer continues to be a common cancer in women. Furthermore, dense breast tissue is considered an independent risk factor for breast cancer. Information gained from this study can make health care practitioners aware of these factors so that they can enhance patient-clinician communication and improve shared decision making about screening mammography use. Future studies should be performed to assess how patient confidence affects use and adherence rates for screening mammography.

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Appendix.

1- How often do you get mammograms (Select only 1)

- Yearly
- Every 2 years
- Irregularly
- This is my second 1/I have only had 1
- I have never had a mammogram (If yes skip number 2)

2- Have you ever had an abnormal mammogram? (Select only 1)

- Yes
- No
- Not sure

3- Do you have a blood related family member (sister, mother, daughter) with breast cancer? (Select only 1)

- Yes
- No
- Not sure

4- Have you heard and/or has someone discussed the term baseline mammogram with you? (Select only 1)

- Yes
- No

5- If you answered yes to number 4, what was the source? (Select all that apply)

- TV
- Radio
- Internet
- Primary care provider
- Oncologist (Cancer doctor)
- Radiologist
- Other specialty physician
- Other, please specify
- Not sure

7- A baseline (or previous) mammogram is important to have for comparison to accurately pick out a concerning area on a mammogram.

- True
- False

8- A baseline mammogram is important to decrease the chance a mammogram is incorrectly read as not normal.

- True
- False

9- A baseline mammogram will help reduce the pain or discomfort associated with your future mammograms.

- True
- False

10- A baseline mammogram is important for decreasing your associated cost, time, and discomfort due to the amount of mammograms incorrectly read as not normal.

- True
- False

11- Please rank the importance of the following 3 11-a, 11-b, 11-c reasons to have a baseline mammogram (1 = most important, 3 = least important)

11-a. For comparison to accurately pick out a concerning area on a mammogram

- 1
- 2
- 3

11-b. To decrease the chance a mammogram is incorrectly read as not normal

- 1
- 2
- 3

11-c For decreasing your associated cost, time, and discomfort due to the amount of mammograms incorrectly read as not normal

- 1
- 2
- 3

12- Has anyone discussed your breast density with you from your mammogram report?

- Yes
- No

13- If the answer is yes, who discussed this with you?

- Primary care provider
- Radiologist
- Other

14- Do you have dense breast tissue on your most recent mammogram?

- Yes
- No
- Not sure

15- Does knowing your breast density help in your decision to have additional screening tests for breast cancer?

- Yes
- No

16- How confident are you that a routine mammogram is adequate to screen for early-stage breast cancer in women who have dense breast tissue?

- Very confident
- Somewhat confident
- Neither confident nor not confident
- Somewhat not confident
- Not at all confident

17- How confident are you that a routine mammogram is adequate to screen for early-stage breast cancer in women without dense breast tissue?

- Very confident
- Somewhat confident
- Neither confident nor not confident
- Somewhat not confident
- Not at all confident

18- Dense breast tissue can mask underlying small breast lesions and also independently increase a women's risk for breast cancer. Supplemental imaging studies currently used to look for breast cancer can cause discomfort, additional time and expense. Given these risks and benefits, do you think supplemental studies are needed to look for breast cancer in women with dense breast tissue?

- Yes
- No

19- Your Age

35 or less
36 to 45
46 to 55
56 to 65
66 to 75
76 or more

20- Your Race

White
Hispanic or Latino
Black or African American
Native American or American Indian
Asian/Pacific Islander
Other

21- What is the highest degree or level of school that you have completed? (Select only 1.)

Some high school, no diploma
High school graduate or equivalent (example: GED)
Some college credit, no degree
Bachelor's degree
Graduate degree
GED indicates general education diploma.