RESEARCH

Mammography Utilization Trends at a Safety-Net Center

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ABSTRACT

Among uninsured and resource-poor populations, community safety net clinics are important providers of breast cancer screening services however there is little data on screening utilization patterns. Using data from a safety net screening center in Washington DC, we assessed trends in mammography utilization by selected sociodemographic factors. Prospectively collected demographic data were abstracted from the electronic medical records of the Capital Breast Care Center (CBCC) during 2010 – 2015. Time trends of mammography utilization over the 6 years were calculated and statistical significance of the differences between trends by the selected sociodemographic factors were analyzed using the Cochran-Armitage test. 8448 Black/ African-American and Hispanic women were screened at CBCC with 106 diagnoses of breast cancer. The proportion of women <50 years of age declined over the 6- year study period, decreased from 42% in 2010 to 35% in 2015 (P-value <0.0001). Trends in the racial/ethnic composition of the women screened shifted, with African-American women decreasing, while the proportion of Latina patients increased from 42% in 2010 to 51% in 2015 (P-value <0.0001). Our data suggest a declining trend in screening among women less than 50 years of age, which may reflect a change in referring providers following guideline concordant screening recommendations. Future studies are warranted to monitor and evaluate the changing effects of population and demographics and screening guidelines.

KEYWORDS: Mammography screening, safety-net, Blacks, Latinas, trends

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INTRODUCTION

Secondary prevention in the form of mammographic screening is recognized as an important strategy for reducing mortality from breast cancer (US Preventative Service Task Force, January 2016). Mammography has been shown to reduce breast cancer mortality in women aged 50-69 years by as much as 30% (Loberg et al., 2015; Mandelblatt et al., 2016; Myers et al., 2015; Oeffinger et al., 2015). Although controversial, younger women, ages 40-49, have also been shown to benefit from mammography with reduced breast cancer mortality (Moss et al., 2006; Nelson et al., 2009). A Healthy People 2010 goal set by the U.S. Departments of Health and Human Services was at least 70% of women 40 and over to have received a mammogram within the last two years while the 2020 goal seeks to increase this rate by a further 10% (Plescia and White, 2013; Sabatino et al., 2015). Although such goals have been established, many reports suggest that Black women undergo mammography less often, than White counterparts (Brooks et al., 2013; Komenaka et al., 2010; Mishra et al., 2012; Swan et al., 2003). A recent systematic review and meta-analysis of racial disparities in screening mammography shows that disparities in utilization of screening mammography are still evident in Black and Hispanic populations in the U.S.(Ahmed et al., 2017). Factors associated with decreased screening rates include low-socioeconomic status, non-Caucasian ethnicity, low education level, and recent immigration status (Brooks et al., 2013; Komenaka et al., 2010; Mishra et al., 2012; Swan et al., 2003). The diversity in prevalence and time trends of mammography screening with regards to socioeconomic status, education, reproductive history, within these minority groups have not been well described.

Access to mammography for low-resource communities is being addressed by community-based initiatives, including mobile mammogram vehicles and screening facilities participating in the National Breast and Cervical Cancer Early Detection Program (NBCCEDP)(Stanley et al., 2013). To meet this need in our nation's capital, which has some of the most disparate breast cancer outcomes in the country (Centers for Disease Control and Prevention (CDC), 2012; DeSantis et al., 2011), the Georgetown Lombardi Comprehensive Cancer Center established the Breast Care Center (CBCC) in 2004. CBCC serves as a critical safety net breast cancer screening facility for minority and medically under-insured women hailing from DC, Maryland and Virginia. CBCC traditionally serves a population that is majority Black and Hispanic, and on the younger spectrum of the recommended screening age (Oppong et al., 2016; Wallington et al., 2016).

Utilizing data from CBCC, we evaluated mammography screening patterns and time trends by sociodemographic characteristics in a population of primarily Black and Hispanic women who received breast cancer screening between 2010 and 2015.

MATERIALS AND METHODS

The study population is derived from CBCC, which serves as a safety net for under and un-insured, and medically underserved women residing in DC, Maryland and Virginia.

The data were abstracted from January 2010 to December 2015 with approval from the Institutional Review Board at Georgetown University.

Women presenting to the CBCC within screening age (40 or older) proceed to mammography.

Women who require additional workup are assigned a patient navigator, who facilitates the diagnostic evaluation with further imaging or biopsies. All women presenting for screening have their information prospectively collected and entered into the Electronic Medical Record system (EMR). The results of the screening test are entered into the EMR. Variables collected include demographic data (including, race, ethnicity, highest education attainment level and ward of residence), insurance status, family history of breast cancer, and menopausal status. The imaging results were recorded with standard Breast Imaging Reporting and Data System (BI-RADS) category values (Markossian et al., 2012). Out of a total of 20,959 screening and diagnostic exams, data on women undergoing screening mammograms were abstracted from January 2010 to December 2015 with approval from the Institutional Review Board at Georgetown University. Women who present to CBCC but did not receive a screening mammogram (i.e. they had an abnormal physical exam and required a diagnostic mammogram) were not included in the study.

Electronic Medical Record Data Abstraction (EMR)

We abstracted the density description recorded at the first screening mammogram for each woman.

Statistical Methods

Patient characteristics were presented as frequencies and corresponding proportions for variables including age (<50 years, ≥50 years), race (Black/African American, Hispanic), insurance (commercial, BCCP/Medicaid Program/Medicare), residence state (DC, MD/VA), education (did not complete HS, completed HS and above), family history of breast cancer (no/yes), menopausal status (no/yes). Cochran-Armitage test was used to examine the significance of trends in the proportions of screening across years (between 2010 and 2015) by categories of several characteristics including age, race, insurance, residence state, education, and family history of breast cancer. All tests were two-sided and significance was assessed at 0.05 level.

RESULTS

A total of 8,448 women underwent mammographic screening at CBCC from January 2010 to December 2015. The characteristics of the population are shown in Table 1. There were significant trends for age, race, and residence. The trend in screening mammography increased for older (58% to 65%) compared to younger women who decreased from 42% in 2010 to 35% in 2015 (P-value <0.0001). There was also a trend in the racial/ethnic composition of women screened with the proportion of Latinas increasing and African Americans decreasing (p-value <0.0001). The number of D.C. residents also decreased as more patients traveled from Maryland and Virginia to obtain breast cancer screening (p-value <0.0001). There was no significant change in the uninsured population, with 13-19% annually having private commercial insurance. This shows an unchanging reliance on the National Breast and Cervical Cancer Early Detection Program (NBCCEDP) for the remainder of women screened who have Medicaid and Medicare. Furthermore, over the 6-year period there were no differences in those screened having a family history of breast cancer and reported menopausal status. About 45% of the patients seen each year over this period were new patients who did not have a previously reported mammogram at CBCC. There was no significant trend in the proportion of new patients seen between 2010-2015.

Table 1. *Characteristics of women presenting for screening mammography at CBCC, 2010-2015.*

	2010	2011	2012	2013	2014	2015	P*
Total patients	1429	1584	1596	1364	1056	960	
Age (years)							
<50	578(42)	663(43)	641(41)	525(40)	362(36)	306(35)	<0.0001
>=50	814(58)	895(57)	915(59)	800(60)	650(64)	580(65)	
Race							
Black/African American	770(58)	765(54)	731(51)	595(48)	488(52)	424(49)	<0.0001
Hispanic	548(42)	646(46)	713(49)	640(52)	456(48)	441(51)	
Insurance							
Commercial	203(16)	216(17)	175(13)	185(15)	152(16)	162(19)	0.23
BCCP/Medicaid Program/Medicare	1058(84)	1080(83)	1178(87)	1064(85)	804(84)	681(81)	
Residence state							
DC	746(54)	768(49)	667(43)	516(39)	450(45)	392(44)	<0.0001
MD/VA	643(46)	788(51)	889(57)	809(61)	561(55)	494(56)	
Education							
Did not finish HS	385(30)	447(31)	456(31)	371(29)	296(31)	266(31)	0.52
Complete HS and above	919(70)	985(69)	1003(69)	894(71)	645(69)	579(69)	
Family history of breast cancer							
No	1167(84)	1272(84)	1314(85)	1135(84)	865(84)	794(83)	0.64
Yes	225(16)	234(16)	234(15)	220(16)	163(16)	159(17)	
Menopausal status							
No	642(46)	722(47)	767(49)	677(50)	487(47)	443(46)	0.47
Yes	767(54)	816(53)	793(51)	683(50)	548(53)	512(54)	

*P value from Cochran-Armitage test

The trends in proportion of women with benign screening mammography, BI-RADS 1 findings are presented in Table 2. Although the proportion of women with normal findings decreased from 2010 to 2015, trends were not statistically different by age, race/ethnicity, state of residence, insurance status, family history or menopausal status.

Table 2. *Trends in Proportions of Women with normal (BI-RADS 1) screening mammography findings at CBCC.*

	2010	2011	2012	2013	2014	2015
Total patients	848 (0.59)	904 (0.57)	931 (0.58)	843 (0.62)	530 (0.50)	478 (0.50)
Age						
<50 years	0.67 [0.63,0.71]	0.64 [0.6,0.67]	0.66 [0.62,0.69]	0.68[0.64,0.72]	0.58 [0.53,0.63]	0.57[0.52,0.63]
>=50 years	0.54	0.52	0.53	0.58	0.46[0.42,0.5]	0.43

	[0.51,0.58]	[0.49,0.56]	[0.5,0.56]	[0.54,0.61]		[0.39,0.47]
Race						
Black/African American	0.56 [0.53,0.6]	0.55 [0.52,0.59]	0.57 [0.54,0.61]	0.60 [0.56,0.64]	0.47 [0.42,0.51]	0.48 [0.43,0.52]
Hispanic	0.63 [0.59,0.67]	0.58 [0.54,0.62]	0.58 [0.54,0.62]	0.62 [0.59,0.66]	0.53[0.48,0.57]	0.50 [0.45,0.55]
Insurance						
Commercial	0.67 [0.61,0.74]	0.59[0.52,0.65]	0.66 [0.59,0.73]	0.63 [0.56,0.7]	0.50 [0.42,0.58]	0.49 [0.41,0.56]
BCCP/Medicaid Program/Medicare	0.57 [0.54,0.6]	0.57 [0.54,0.6]	0.57 [0.54,0.59]	0.62 [0.59,0.65]	0.51 [0.47,0.54]	0.48 [0.44,0.51]
Residence state						
DC	0.58 [0.54,0.62]	0.54[0.51,0.58]	0.58[0.54,0.6 2]	0.62 [0.58,0.66]	0.45 [0.41,0.5]	0.46[0.41,0.51]
MD/VA	0.61[0.58,0. 65]	0.60[0.56,0.63]	0.58 [0.55,0.61]	0.62 [0.58,0.65]	0.54 [0.5,0.58]	0.50 [0.46,0.55]
Education						
Did not finish HS	0.59 [0.54,0.64]	0.56 [0.51,0.6]	0.56 [0.51,0.6]	0.59 [0.54,0.64]	0.49 [0.44,0.55]	0.45[0.39,0.51]
Complete HS and above	0.60[0.57,0. 63]	0.57[0.54,0.6]	0.59[0.56,0.62]	0.63[0.6,0.66]	0.50[0.46,0.5 4]	0.51 [0.47,0.55]
Family history of breast cancer						
No	0.60[0.57,0. 62]	0.58[0.55,0.6]	0.58 [0.55,0.6]	0.62 [0.59,0.65]	0.50 [0.47,0.53]	0.51 [0.47,0.54]
Yes	0.59 [0.52,0.65]	0.55 [0.48,0.61]	0.59 [0.52,0.65]	0.59[0.53,0.66]	0.49 [0.41,0.57]	0.46 [0.38,0.54]
Menopausal status						
No	0.64[0.61,0. 68]	0.64[0.6,0.67]	0.63[0.6,0.67]	0.66 [0.62,0.69]	0.56 [0.51,0.6]	0.55 [0.5,0.59]
Yes	0.55 [0.51,0.58]	0.51 [0.48,0.54]	0.53 [0.49,0.56]	0.58 [0.54,0.62]	0.45 [0.41,0.49]	0.45 [0.41,0.49]

Of the 106 cancers diagnosed over 6 years, there were no statistically significant trends in age, race/ethnicity, insurance status, or family history of breast cancer (Table 3). Although a higher proportion of the cancer cases were in Black women over 50, there was no statistically significant time trend by age at diagnosis. The number of cancer cases diagnosed in women residing in Maryland and Virginia increased from 2010-2015, while those in DC residences declined (p-value 0.04)

Table 3. *Trends analysis of cancer patients diagnosed 2010-2015.*

	Year of screening						P*
	2010	2011	2012	2013	2014	2015	
Total patients	19	16	10	22	20	19	
Age							
<50 years	8 (42)	6 (38)	3 (30)	8 (36)	8 (40)	7 (37)	0.86
>=50 years	11 (58)	10 (63)	7 (70)	14 (64)	12 (60)	12 (63)	
Race							
Black/African American	13 (76)	11 (73)	6 (67)	7 (44)	11 (65)	10 (63)	0.24
Hispanic	4 (24)	4 (27)	3 (33)	9 (56)	6 (35)	6 (38)	
Insurance							
Commercial	5 (29)	1 (8)	1 (10)	5 (23)	3 (16)	6 (32)	0.68
BCCP/Medicaid Program/Medicare	12 (71)	11 (92)	9 (90)	17 (77)	16 (84)	13 (68)	
Residence state							
DC	11 (58)	8 (50)	4 (40)	9 (41)	6 (30)	6 (32)	0.043
MD/VA	8 (42)	8 (50)	6 (60)	13 (59)	14 (70)	13 (68)	
Family history of breast cancer							
No	15 (83)	10 (63)	9 (90)	17 (81)	17 (85)	14 (78)	0.69
Yes	3 (17)	6 (38)	1 (10)	4 (19)	3 (15)	4 (22)	

*P value from Cochran-Armitage test

DISCUSSION

Main finding of this study

Our results showed a significant trend in the decline in the screening of women less than 50 years of age over the study period. This may represent a change in the screening guidelines followed by the local referring physicians and partnering community organizations, especially with the varied recommendations from the US Preventative Task Force and other organizations such as the American Cancer Society (US Preventative Service Task Force, January 2016; Loberg et al., 2015; Oeffinger et al., 2015). During the study period, CBCC followed the screening recommendations consistent with the American Cancer Society and the National Breast and Cervical Cancer Early Detection Program (NBCCEDP) offering annual mammography starting at age 40.

Another demographic shift is an increase in Hispanic patients from 42% to 51% from 2010 to 2015, a trend that is statistically significant. A related observation is the increase in Maryland and Virginia residents among the women screened. In the Washington Metropolitan area, the largest immigrant groups are from Latin America (U.S. Census Bureau, Dec. 12, 2012), with many living outside DC proper. Over the past three years, CBCC outreach efforts have increased in the Latino community with the hiring of Spanish speaking health educators and patient navigators.

Extending our community reach is likely contributing to our observations.

In this climate of healthcare change, it is interesting that we did not see any trends representing changes in the proportion of women having commercial insurance coverage. The Affordable Care Act (ACA)(Meyer et al., 2017; Silva et al., 2017) was implemented in 2014 and this study does not show a decline in the uninsured population. Most of the CBCC population remains covered by Medicare, Medicaid and the NBCCEDP in conjunction with other state and local screening programs. Funding from these programs are integral in providing screening for the under and uninsured. As we collect more data under the ACA, shifts in the coverage landscape will undoubtedly impact the uninsured women.

What is already known

Results from our study underscore the importance of community based clinics in increasing cancer screening uptake among underserved communities. To provide access to mammography for low-resource populations, community-based initiatives utilize mobile mammogram vehicles and screening facilities that participate in the National Breast and Cervical Cancer Early Detection Program (NBCCEDP) (Stanley et al., 2013). In order to do this effectively, the community that is served has to be evaluated on a continuing basis to ensure adequate outreach. As minority communities evolve and demographics shift, such program evaluations can direct resource allocation and outreach targets.

Limitations

At the CBCC our database instituted in 2010 has enabled data analyses for program evaluation. This established EMR, however does have limited variables which in turn limits our analyses of trends to only the available collected factors [age, race, insurance, residence state, education, and family history of breast cancer]. To enhance our data, variables including, ethnicity or country of origin, having a primary care physician, primary spoken language, access to transportation or how a woman arrived at the facility would be desirable. Furthermore, the demographic data is based on patient report with accuracy unable to be confirmed. An example is, omitted or misrepresented information from some undocumented patients who may be uncomfortable giving some specific details such as place of residence. We also present the completed data over a 6-year period and for a trends analysis a longer period of time would make our observation more robust and increase accuracy.

What this study adds

The data reported here exemplify demographic changes in a dynamic screening population and the ongoing evaluation and assessments needed to identify such changes. In addition, our data also underscores the importance of changes in community outreach and support services within the organization to effectively provide cancer screening and prevention services to a changing population. Over the past few years there has been an increase in Hispanic women and Maryland and Virginia residents seeking CBCC's services in our catchment area. Monitoring these trends has guided our increased outreach efforts in the Latina community and in communities in Maryland and Virginia which are part of the Georgetown Lombardi cancer Center's catchment area. The enhanced outreach in the Latina community has been facilitated by increased access to Spanish language education materials and interpretation services; and new partnerships with community-based organizations that provide an array of services for Hispanic women. This ensures breast cancer screening services are

available to those in need and that the outreach is done in a culturally sensitive manner.

Our data suggest a declining trend in screening among women less than 50 years of age, which may reflect a change in referring providers following guideline concordant screening recommendations. Now that there are recent changes in mammography screening guidelines, we expect these trends to change in coming years. Future studies are warranted to monitor and evaluate the changing effects of population and demographics and screening guidelines.

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Conflict of interest

The authors declare that no competing or conflict of interests exists. The funders had no role in study design, writing of the manuscript, or decision to publish.

Authors' contributions

BAO, CD, HSG and LAC conceived of the presented idea. CD, KHM and XM developed the theory and performed the computations. CD and KHM verified the analytical methods. All authors discussed the results and contributed to the final manuscript.

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