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EPIDEMIOLOGY

Racial disparities in surveillance mammography among older breast cancer survivors

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Abstract

Background Despite lower incidence rates among black women and a national decline in breast cancer (BC) deaths, there is a widening gap in BC mortality rates between black and white women in the United States. A previous study evaluating data from 1992 to 1999 found a racial disparity in the receipt of surveillance mammography. We sought to evaluate whether this disparity persists between black and white women diagnosed with BC between 2000 and 2011.

Methods Using the SEER-Medicare registry, we conducted an analysis of women ≥ 66 years diagnosed with early-stage (0–III) BC between 2000 and 2011 who underwent BC surgery. The primary outcome was receipt of surveillance mammography within 12 months of surgery. Chi square analyses were used to compare characteristics between black and white women. Multivariate logistic regression was used to assess receipt of surveillance mammography after controlling for potential confounders.

Results There were 3353 black and 40,564 white women in the final cohort. After adjusting for confounders, black women were still 24% less likely than white women to receive surveillance mammography (Odds ratio 0.76, 95% CI 0.70–0.0.82). Those who were married, younger, in the highest income quartile, diagnosed at earlier stages, had a lower comorbidity score, or who resided in metropolitan areas were more likely to receive surveillance mammography ($p < 0.05$).

Conclusion(s) We found that older black BC survivors continue to experience lower rates of surveillance mammography, even after adjusting for multiple potential confounders. There remains a need to investigate which individual and systemic factors affect disparities in breast cancer care.

Keywords Breast cancer · Surveillance mammography · Racial disparity

Introduction

Breast cancer (BC) is the most common cancer among women in the United States (US), with over 250,000 new cases expected to be diagnosed in 2018 [1, 2]. The number of older BC survivors in the US has also increased, due in part to improvements in early detection and treatment [3, 4]. Among 3.5 million US women with a history of BC, more than half are now 65 years of age or older [3, 5].

Current guidelines recommend surveillance mammography in all BC survivors to detect recurrence early and to improve long-term outcomes [6–10]. Multiple studies suggest that surveillance mammograms significantly reduce mortality rates among older patients with early-stage BC [11–13]. Although debate is ongoing regarding the recommended frequency and duration of surveillance screening in older BC survivors [14, 15], there is strong consensus about

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the need for at least a baseline mammogram 6–12 months following primary surgical treatment [15, 16].

However, multiple studies have found racial disparities in receipt of appropriate BC treatment and care. Concurrently, the gap in BC mortality rates between white and black women has widened over the past 30 years [1, 17], despite lower incidence among black women [4, 18] and an overall national decline in BC deaths [1, 19]. It is possible that differences in receipt of surveillance mammography are contributing to the growing racial disparities in mortality rates.

Keating et al. found a significant racial disparity in the receipt of surveillance mammography among older breast cancer survivors diagnosed between 1992 and 1999 [20]. Since this study, significant outreach efforts have been undertaken to reduce disparities in mammography utilization, including community-based participatory research interventions and mobile mammography. In the context of these efforts, we aimed to assess whether racial disparity in receipt of surveillance mammography continued to persist in a more recent 2000–2011 cohort of older BC survivors.

Materials and methods

Data sources

Study participants were selected from the Surveillance, Epidemiology and End Results (SEER) registry linked to Medicare claims records. We excluded individuals in healthcare maintenance organizations and those without Medicare Parts A and B insurance, due to incomplete claims needed to assess comorbidities and cancer treatment (surgery, chemotherapy, radiation therapy).

Study population

We identified 59,648 women ≥ 66 years of age who were diagnosed with primary early-stage (0–III) breast cancer between January 1, 2000, and December 31, 2011 in the SEER-Medicare database. We excluded 3047 patients who did not identify as black or white, 5388 who were not initially diagnosed with stage 0–III cancer, 7 patients who had missing residence data, 2573 patients who passed away within 18 months of diagnosis, and 4716 patients who did not undergo primary surgical treatment (see Fig. 1). This yielded our main cohort of 43,917 patients.

Sociodemographic variables were extracted from linked Medicare claims and included age at diagnosis, self-reported race/ethnicity, income quartile, marital status, comorbidities and county residence type. Comorbidities were assessed using the Deyo adaptation of the Charlson comorbidity index [21, 22]. Breast cancer treatment (surgery, chemotherapy, radiotherapy) was also extracted from Medicare claims using International Classification of Diseases, Ninth Revision (ICD-9) and Health Care Procedure Coding System (HCPCS) procedure codes (see Online Appendix).

Study outcome

The primary outcome measured was receipt of surveillance mammography within 12 months of primary surgical treatment, including breast conserving surgery (BCS) and mastectomy. To account for other forms of surveillance screening within this timeframe, we assessed receipt of MRI and ultrasound as secondary endpoints (see appendix for procedure codes).

Statistical analyses

Chi square tests were used to compare baseline characteristics between black and white women. Variables assessed included age at diagnosis, income quartile, marital status (married, single, separated or widowed, unknown), metropolitan vs nonmetropolitan residence, Charlson comorbidity index, BC stage and receipt of cancer treatment (surgery, radiation and chemotherapy). Multivariate logistic regression was used to assess receipt of surveillance mammography within 12 months of surgery by race/ethnicity after adjustment for the variables above. All statistical analyses were performed using SAS (version 9.3; SAS Institute Inc.), with the two-sided significance level set at $p < 0.05$. This study was deemed exempt by the Mount Sinai Institutional Review Board.

Results

Patient characteristics

In the final cohort of women who received surgery, there were 3353 black women and 40,564 white women. Mean age at diagnosis was 73.7 years in black women, and 74.7 years in white women ($p < 0.001$, Table 1). There were more black women represented in the three lowest income quartiles and substantially more white women in the highest income bracket (26.0% vs. 16.2%, $p < 0.0001$). The majority of women lived in metropolitan counties, though this percentage was higher for black women (92.3% vs. 89.3%, $p < 0.0001$). Comorbidities were also higher among black women, with nearly three times more black women having a comorbidity score of 2 + compared to white women (12.3% vs. 4.4%, $p < 0.0001$). More black women were diagnosed at later stage breast cancer with 29.9% diagnosed at stage 2 (vs. 26.4% white women) and 9.3% diagnosed at stage 3 (vs. 7.0% white women, $p < 0.0001$ for all comparisons). However, more black women were also diagnosed at

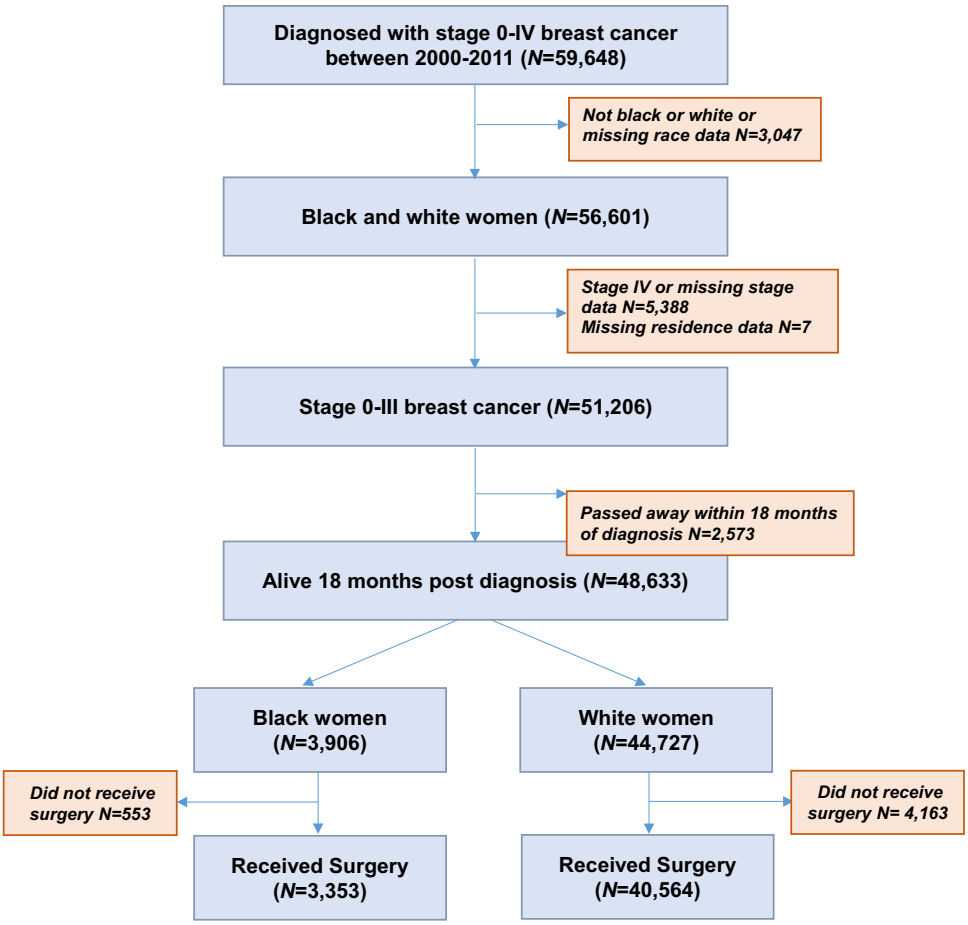

Fig. 1 Flowchart for selection of study participants

stage 0 (20.3% vs. 17.9%, $p < 0.0001$). Fewer black women received radiotherapy (56.8% vs. 59.9%, $p < 0.001$), but more black women received chemotherapy (25.5% vs 19.3%, $p < 0.0001$).

Univariate analysis

Compared to white women, black women were less likely to receive a surveillance mammogram (58.0% vs. 66.9%, $p < 0.0001$) within 12 months of surgery. On average, black women also received a surveillance mammogram 3 weeks later compared to white women (252 vs. 230 days, $p = 0.04$). More white women also received breast MRI screening within the same timeframe (6.4% vs. 4.7%, $p < 0.0001$).

Multivariate analysis

In multivariate analysis, black women remained less likely to receive a surveillance mammogram within 12 months of surgery (Odds Ratio: 0.76, 95% Confidence Interval 0.70–0.82). There was no observed effect modification of income quartile on differences in surveillance mammography receipt by race. Other factors that were independently associated with decreased odds of receiving surveillance mammography were older age, being unmarried, diagnosis at stage > 0, nonmetropolitan residence, higher comorbidity score and receiving chemotherapy (see Table 2).

Discussion

We found that racial disparity in the receipt of surveillance mammography among older BC survivors continued to persist between 2000 and 2011. Black women were nearly a quarter less likely than white women to receive a first surveillance mammogram within 12 months of primary surgical treatment. Further, these differences were not accounted for by compensatory MRI or ultrasound screening among black women. These findings echo Keating et al.'s study from a decade ago in which black women were over 30% less likely to receive surveillance mammography compared to white women.

Our findings are notable in the context of recent efforts to reduce disparities in mammography receipt through community-based participatory research models (CBPR) [23]. Shirazi et al. outline three such programs funded by

Table 1 Baseline characteristics of stage 0–III breast cancer patients≥ 66 in the SEER-medicare database (2000–2011) who received surgery

	Black ($N=3353$)	White ($N=40564$)	p value
Age, median (interquartile range)	73.7 (70–79)	74.7 (70–80)	< 0.0001
Income quartiles, *N* (%)			< 0.0001
First quartile	870 (29.0)	9527(24.6)	
Second quartile	848 (28.2)	9617 (24.8)	
Third quartile	800 (26.6)	9505 (24.6)	
Fourth quartile	487 (16.2)	10,071 (26.0)	
Marital Status, *N* (%)			< 0.0001
Married	924 (27.6)	19,439 (47.9)	
Single	507 (15.1)	2789 (6.9)	
Separated or widowed	1733 (51.7)	16,624 (41.0)	
Unknown	189 (5.6)	1712 (4.2)	
County residence, *N* (%)			< 0.0001
Nonmetropolitan	258 (7.7)	4346 (10.7)	
Metropolitan	3095 (92.3)	36,218 (89.3)	
Comorbidity score, *N* (%)			< 0.0001
< 1	1563 (46.6)	26,792 (66.1)	
1–2	1379 (41.1)	11986 (30.0)	
2 +	411 (12.3)	1786 (4.4)	
Breast cancer stage, *N* (%)			< 0.0001
0	680 (20.3)	7268 (17.9)	
1	1358 (40.5)	19,730 (48.6)	
2	1004 (29.9)	10,713 (26.4)	
3	311 (9.3)	2853 (7.0)	
Cancer treatment, *N* (%)			
Chemotherapy	856 (25.5)	7816 (19.3)	< 0.0001
Radiotherapy	1906 (56.8)	24,294 (59.9)	0.0005
Surveillance screening, *N* (%)			
Mammogram	1943 (58.0)	27,141 (66.9)	< 0.0001
MRI	157 (4.7)	2605 (6.4)	< 0.0001
Ultrasound	614 (18.3)	7844 (19.3)	0.15
Days to first surveillance screening, median (interquartile range)			
Mammogram	252 (182–316)	230 (172–317)	0.04
MRI	55 (22–227)	116 (21–238)	0.22
Ultrasound	176 (57–268)	176 (53–274)	0.50

the National Cancer Institute, including an effort by the Johns Hopkins Center to Reduce Cancer Disparities to educate black women about breast cancer screening via a "train-the-trainer" approach [24]. Similarly, a South Dallas research coalition created an educational curriculum where participants reported higher breast cancer knowledge and were more likely to undergo screening mammography and breast self-examination [25]. Another CBPR study in Texas provided breast cancer education for 114,000 black women and was able to screen over 8000 women between 1998 and 2003 [26]. The promising results of these studies point to CBPR being a viable model to improve breast cancer outcomes at the community-level.

Mobile mammography services have also been identified as a successful and cost-effective means to promote screening in communities that experience underuse [27]. A retrospective analysis assessing data from 2008 to 2010 found that mobile outreach efforts were particularly effective at engaging women who were uninsured, had not received a recent mammogram, and were of Hispanic ethnicity [28]. Another case–controlled study demonstrated that mobile units were effective in garnering repeat visits among women who were aged 50–65 compared to 40–50, uninsured and African-American [29]. However, these studies also did not describe interventions explicitly aimed at increasing surveillance screening among women

Table 2 Adjusted odds ratio (OR) of surveillance mammography in patients who received surgery

	Adjusted odds ratio	95% CI	*p*-value
Race			< 0.0001
White	Ref		
Black	0.76	0.70–0.82	
Age	0.99	0.98–0.99	< 0.0001
Income quartiles, *N* (%)			
First quartile	Ref		
Second quartile	1.03	0.97–1.10	0.4134
Third quartile	1.03	0.97–1.10	0.3433
Fourth quartile	1.10	1.03–1.17	0.0045
Marital status, *N* (%)			
Married	Ref		
Single	0.87	0.80–0.94	0.0010
Separated or widowed	0.87	0.83–0.92	< 0.0001
Unknown	0.95	0.85–1.05	0.3087
County residence, *N* (%)			< 0.0001
Nonmetropolitan	Ref		
Metropolitan	1.45	1.35–1.56	
Comorbidity score, *N* (%)	0.95	0.93–0.97	< 0.0001
Breast cancer stage, *N* (%)			
0	Ref		
1	0.78	0.73–0.83	< 0.0001
2	0.51	0.47–0.55	< 0.0001
3	0.28	0.25–0.31	< 0.0001
Cancer treatment, *N* (%)			
Chemotherapy	0.73	0.69–0.78	< 0.0001
Radiotherapy	2.86	2.73–3.0	< 0.0001

who were already diagnosed and/or treated for breast cancer. Our findings thus highlight the specific role mobile mammography units could play reducing these known disparities.

Barriers contributing to racial disparities in breast cancer treatment and outcomes have been well-documented in the literature [30]. Both systemic and individual factors may drive disparities in surveillance mammography receipt. Systemic factors that have been identified in BC mortality include fragmented care, decreased access to care, lack of a primary care provider, clinic size, and lack of insurance [30, 31]. Bickell et al. found that ineffective organizational structures contribute to underuse of cancer therapies among BC survivors [32]. Hospitals that implement integrated electronic medical records and a system to track no-shows, among other measures, yield higher use of cancer therapies. Similarly, patient navigators have been highly successful in augmenting mammography screening in the community [33] and in improving cancer outcomes [34–36]. These examples point to viable systems approaches that may be adapted to increase surveillance mammography in populations of BC survivors who may experience underuse.

At the provider level, physician recommendation has been identified as a strong predictor of screening [37, 38] and surveillance mammography [20]. Provider biases or blatant discrimination may therefore potentially lead to disparities in surveillance mammography [31]. Of note, one study surveying 258 BC survivors found that physician communication about postsurgical adjuvant treatment was not correlated with patient understanding of treatment benefits [39]. This presents the possibility that provider-patient miscommunication may contribute to differences in receipt of surveillance mammography or follow-up.

Finally, several patient-level factors have been associated with disparities in BC treatment and outcomes. Reyes et al. found that low emotional/social support and poor body image were each associated with not completing adjuvant chemotherapy [40], findings that have been echoed in other studies [39]. Medical mistrust and cultural attitudes/beliefs among non-white racial groups may contribute to differences in follow-up care [30]. Multiple studies also report that black BC survivors have more comorbidities, which have been associated with delayed cancer treatment [41, 42], possibly because survivors with comorbidities are either more likely to die from those illnesses or that comorbidities may pose a risk during cancer treatment. [41–43] Finally, similar to other studies we found that BC survivors who did not receive radiation therapy were less likely to receive a surveillance mammogram within 12 months of BCS [44–46]. As lack of radiation therapy after surgery is a risk factor for recurrence [45], those who did not receive radiation would benefit most from increased surveillance [44].

There were several limitations in our study. First, while the SEER-Medicare database represents over 30% of cancer cases in the US, this database is comprised of older BC survivors and our results may not be generalizable to younger BC survivors or to those with different insurances. Furthermore, we were unable to control for provider(s) seen during the study period, and since provider recommendation is critical for undergoing mammography [47], we are unable to account for individual provider-level influences on disparities in surveillance mammography.

In summary, we have found that racial disparity persists in receipt of surveillance mammography among older BC survivors diagnosed between 2000 and 2011. Women who were older, unmarried and lived in rural areas were also less likely to receive a surveillance mammogram. Our study further illustrates the need to address the individual and systemic factors that contribute to disparities in follow-up care for older BC survivors. Finally, we highlight the potential for targeted CBPR and mobile mammography interventions to increase surveillance screening in this population.

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Data availability This analysis used data from the Surveillance, Epidemiology and End Results registry linked to Medicare claims (SEER-Medicare). Given concern for patient and provider confidentiality, this dataset is not publicly available, but may be obtained by request and with permission from NCI SEER-Medicare.

Compliance with ethical standards

Conflicts of interest Dr. Wisnivesky is a member of the research board of EHE International, has received consulting honorarium from Merck Pharmaceuticals and IMS Health, and a research grant from Aventis. All other authors are without any conflicts of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent This study used de-identified data from the Surveillance, Epidemiology and End Results registry linked to Medicare claims (SEER-Medicare) and did not require informed consent to be obtained from this database.

References

1. DeSantis CE, Fedewa SA, Goding Sauer A et al (2016) Breast cancer statistics, 2015: convergence of incidence rates between black and white women. CA Cancer J Clin 66(1):31–42
2. Siegel RL, Miller KD, Jemal A (2018) Cancer Statistics, 2018. CA Cancer J Clin 68(1):7–30
3. Miller KD, Siegel RL, Lin CC et al (2016) Cancer treatment and survivorship statistics, 2016. CA Cancer J Clin 66(4):271–289
4. DeSantis C, Siegel R, Bandi P et al (2011) Breast cancer statistics, 2011. CA Cancer J Clin 61(6):409–418
5. Homan SG, Kayani N, Yun S (2016) Risk factors, preventive practices, and health care among breast cancer survivors, United States, 2010. Prev Chronic Dis 13:E09
6. Runowicz CD, Leach CR, Henry NL et al (2016) American Cancer Society/American Society of Clinical Oncology Breast Cancer Survivorship Care Guideline. J Clin Oncol 34(6):611–635
7. Lam DL, Houssami N, Lee JM (2017) Imaging surveillance after primary breast cancer treatment. AJR Am J Roentgenol 208(3):676–686
8. Gradishar WJ, Anderson BO, Balassanian R et al (2017) NCCN guidelines insights: breast cancer, version 1.2017. J Natl Compr Cancer Netw 15(4):433–451
9. Schneble EJ, Graham LJ, Shupe MP et al (2014) Current approaches and challenges in early detection of breast cancer recurrence. J Cancer 5(4):281–290
10. Lash TL, Fox MP, Silliman RA (2006) Reduced mortality rate associated with annual mammograms after breast cancer therapy. Breast J 12(1):2–6
11. Lash TL, Fox MP, Buist DS et al (2007) Mammography surveillance and mortality in older breast cancer survivors. J Clin Oncol 25(21):3001–3006
12. Buist DS, Bosco JL, Silliman RA et al (2013) Long-term surveillance mammography and mortality in older women with a history of early stage invasive breast cancer. Breast Cancer Res Treat 142(1):153–163
13. Schootman M, Jeffe DB, Lian M et al (2008) Surveillance mammography and the risk of death among elderly breast cancer patients. Breast Cancer Res Treat 111(3):489–496
14. Freedman RA, Keating NL, Pace LE, et al (2017) Use of surveillance mammography among older breast cancer survivors by Life expectancy. J Clin Oncol
15. Freedman RA, Keating NL, Partridge AH et al (2017) Surveillance mammography in older patients with breast cancer-can we ever stop?: a review. JAMA Oncol 3(3):402–409
16. VanderWalde N, Jagsi R, Dotan E et al (2016) NCCN guidelines insights: older adult oncology, version 2.2016. J Natl Compr Canc Netw 14(11):1357–1370
17. Newman LA (2017) Breast cancer disparities: socioeconomic factors versus biology. Ann Surg Oncol. https://doi.org/10.1245/s10434-017-5977-1
18. Noone AM, Cronin KA, Altekruse SF et al (2017) Cancer incidence and survival trends by subtype using data from the surveillance epidemiology and end results program, 1992–2013. Cancer Epidemiol Biomark Prev 26(4):632–641
19. Jatoi I, Miller AB (2003) Why is breast-cancer mortality declining? Lancet Oncol 4(4):251–254
20. Keating NL, Landrum MB, Guadagnoli E et al (2006) Factors related to underuse of surveillance mammography among breast cancer survivors. J Clin Oncol 24(1):85–94
21. Deyo RA, Cherkin DC, Ciol MA (1992) Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. J Clin Epidemiol 45(6):613–619
22. Klabunde CN, Potosky AL, Legler JM et al (2000) Development of a comorbidity index using physician claims data. J Clin Epidemiol 53(12):1258–1267
23. Israel BA, Schulz AJ, Parker EA et al (1998) Review of community-based research: assessing partnership approaches to improve public health. Annu Rev Public Health 19:173–202
24. Shirazi M, Engelman KK, Mbah O et al (2015) Targeting and tailoring health communications in breast screening interventions. Prog Community Health Partnersh-Res Educ Action 9:83–89
25. Cardarelli K, Jackson R, Martin M et al (2011) Community-based participatory approach to reduce breast cancer disparities in South Dallas. Prog Community Health Partnersh-Res Educ Action 5(4):375–385
26. Adams ML (2007) The African American breast cancer outreach project: partnering with communities. Fam Community Health 30(1 Suppl):S85–S94
27. Massin-Short SB, Grullon MA, Judge CM et al (2010) A mobile mammography pilot project to increase screening among Latina women of low socioeconomic status. Public Health Rep 125(5):765–771
28. Brooks SE, Hembree TM, Shelton BJ et al (2013) Mobile mammography in underserved populations: analysis of outcomes of 3,923 women. J Community Health 38(5):900–906
29. Drake BF, Abadin SS, Lyons S et al (2015) Mammograms on-the-go-predictors of repeat visits to mobile mammography vans in St Louis, Missouri, USA: a case-control study. BMJ Open 5(3):e006960
30. Blackman DJ, Masi CM (2006) Racial and ethnic disparities in breast cancer mortality: are we doing enough to address the root causes? J Clin Oncol 24(14):2170–2178
31. Gerend MA, Pai M (2008) Social determinants of Black-White disparities in breast cancer mortality: a review. Cancer Epidemiol Biomark Prev 17(11):2913–2923
32. Bickell NA, Moss AD, Castaldi M et al (2016) Organizational factors affect safety-net hospitals' breast cancer treatment rates. Health Serv Res. https://doi.org/10.1111/1475-6773.12605
33. Peek ME, Han JH (2004) Disparities in screening mammography. Current status, interventions and implications. J Gen Intern Med 19(2):184–194

34. Charlot M, Santana MC, Chen CA et al (2015) Impact of patient and navigator race and language concordance on care after cancer screening abnormalities. Cancer 121(9):1477–1483
35. Braun KL, Kagawa-Singer M, Holden AE et al (2012) Cancer patient navigator tasks across the cancer care continuum. J Health Care Poor Underserved 23(1):398–413
36. Ferrante JM, Wu J, Dicicco-Bloom B (2011) Strategies used and challenges faced by a breast cancer patient navigator in an urban underserved community. J Natl Med Assoc 103(8):729–734
37. May DS, Kiefe CI, Funkhouser E et al (1999) Compliance with mammography guidelines: physician recommendation and patient adherence. Prev Med 28(4):386–394
38. Hawley ST, Earp JA, O'Malley M et al (2000) The role of physician recommendation in women's mammography use: is it a 2-stage process? Med Care 38(4):392–403
39. Bickell NA, Weidmann J, Fei K et al (2009) Underuse of breast cancer adjuvant treatment: patient knowledge, beliefs, and medical mistrust. J Clin Oncol 27(31):5160–5167
40. Reyes SA, King TA, Fei K et al (2016) Factors affecting the completion of adjuvant chemotherapy in early-stage breast cancer. Ann Surg Oncol 23(5):1537–1542
41. Sarfati D, Koczwara B, Jackson C (2016) The impact of comorbidity on cancer and its treatment. CA Cancer J Clin 66(4):337–350
42. Ashing K, Rosales M, Lai L et al (2014) Occurrence of comorbidities among African-American and Latina breast cancer survivors. J Cancer Surviv 8(2):312–318
43. Land LH, Dalton SO, Jorgensen TL et al (2012) Comorbidity and survival after early breast cancer. A review. Crit Rev Oncol Hematol 81(2):196–205
44. Field TS, Doubeni C, Fox MP et al (2008) Under utilization of surveillance mammography among older breast cancer survivors. J Gen Intern Med 23(2):158–163
45. Schapira MM, McAuliffe TL, Nattinger AB (2000) Underutilization of mammography in older breast cancer survivors. Med Care 38(3):281–289
46. Carcaise-Edinboro P, Bradley CJ, Dahman B (2010) Surveillance mammography for medicaid/medicare breast cancer patients. J Cancer Surviv 4(1):59–66
47. Snyder CF, Frick KD, Kantsiper ME et al (2009) Prevention, screening, and surveillance care for breast cancer survivors compared with controls: changes from 1998 to 2002. J Clin Oncol 27(7):1054–1061