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Surveillance mammography for Medicaid/Medicare breast cancer patients

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Abstract

Background—Surveillance mammography for breast cancer survivors can detect recurrences early when treatment is most effective. We assessed the receipt of surveillance mammography for elderly breast cancer survivors considering their Medicaid and Medicare dual eligibility and minority status that may make them vulnerable to poor surveillance care.

Methods—We analyzed Michigan Medicare and Medicaid data for patients, age 66 years or older, diagnosed with early stage breast cancer between 1997 and 2000. Using logistic regression and proportional hazards models, we identified individual and area level factors associated with patients' receipt and timeliness of surveillance mammography for up to 3 years post treatment.

Results—In the first year post cancer treatment, patients who received breast conserving surgery (BCS) and radiation therapy were more likely to receive surveillance mammography than those treated with BCS alone (OR=1.82; 95% CI=1.48–2.24). Patients who received BCS and radiation treatment also had a greater probability of receiving surveillance mammography sooner than those treated with BCS alone (HR=1.72; 95% CI=1.56–1.89). Time from treatment to mammography was longer for older (80+ years) versus younger patients (HR=0.55; 95% CI=0.45–0.66) and for those with greater comorbidity burden (HR= 0.59; 95% CI=0.43–0.81).

Conclusions—Regardless of race and dual eligibility, there is a greater likelihood for breast cancer patients who received BCS with radiation to receive surveillance mammography and to receive it sooner than for patients who were treated with BCS alone.

Implications for Cancer Survivors—Dual eligible, black, and elderly patients are less likely to receive radiation following BCS, thus disparities across the treatment and surveillance continuum need to be further investigated.

Keywords

Breast cancer; Surveillance mammography; Medicare and Medicaid dual eligible

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Long-term survival for breast cancer patients varies by a myriad of factors including the age of patient [1], treatment received [2], and stage of diagnosis [3]. Survival can also be influenced by the incidence and quality of follow-up care after treatment. Breast cancer is more likely to re-occur in patients diagnosed with invasive early stage who have received breast-conserving treatment (BCS) without radiation therapy [4]. For patients with early stage breast cancer, post treatment surveillance includes annual mammography, which can provide early warning of breast cancer recurrence and spur life saving treatment [5].

A mix of socio-demographic and clinical factors is indicated as possible contributors to inadequate mammography use following cancer treatment. African Americans, the elderly, those with lower income [6–8], and patients who have not received radiation therapy following BCS [9,10] are at risk for poor surveillance mammography following breast cancer treatment. Variations in area level socioeconomic factors of income, education, and area racial composition are also associated with access and receipt of healthcare [11] and breast cancer survival among the elderly [12].

Medicare and Medicaid dual eligibility refers to individuals covered by Medicare (Part A hospital insurance and/or Part B supplementary medical insurance) but constrained by limited resources and income so that they are eligible to receive assistance for their out-of-pocket medical expenses from their state Medicaid program. The role of insurance has been evaluated in late stage diagnosis [13] and access to surveillance mammography [14]. However the role of dual Medicare and Medicaid eligibility status has not been assessed for the vulnerable elderly breast cancer patient. Post treatment surveillance in the Medicaid population is important as later stage diagnosis and poorer outcomes are prevalent in the elderly female population who do not receive mammography [13]. In addition, Medicaid insurance offers a means to improve access to care for low-income patients. The examination of dual eligibility lends insight into the ability of public insurance to close the care gap between low income and wealthier patients. The objective of this study was to assess the relationship between dual eligibility of elderly breast cancer survivors and the receipt of annual surveillance mammography for up to three years post cancer treatment.

Methods

Data

A sample of breast cancer patients diagnosed with a first primary breast tumor between January 1, 1996 and December 31, 2000 were extracted from statewide Michigan Medicaid and Medicare data that was merged with the Michigan Tumor registry. The merging and extraction process is more fully described in a previous publication [15]. Extracted data included all claims for inpatient, outpatient, hospice, and physician services that matched the Michigan state segment of the Medicare denominator file. To include relevant area level factors, patient data were linked with the 1990 Area Resource File (ARF) and US Census Tract data using patient address information from the Tumor registry.

Study sample

The study population included Michigan Medicare and Medicare Medicaid dually eligible women 66 years of age or older, diagnosed with stage I, or stage II breast cancer between January 1, 1997 and December 31, 2000 (*n*=8,963). Cancer stage was identified from the tumor registry and defined according to the Surveillance, Epidemiology, and End-Results (SEER) summary stage. Patients were considered dually eligible if they were eligible for Medicaid within 12 months of their breast cancer diagnosis. We included only those patients who had received treatment (surgical, chemotherapy, or radiation) for their breast cancer and had survived for at least 18 months after the end of their cancer treatment (*n*=8,143). We defined the end of treatment as the time that is followed by a period of 6 months without claims that indicate any surgical, adjuvant chemotherapy, or radiation treatment. We excluded men (*n*=118) and hospice patients (*n*=17) patients who would be less likely to receive surveillance mammography, and those whose surveillance may be differentially affected by their specific care arrangements as in long-term care and nursing home patients (*n*=312), and patients insured by health maintenance organizations (*n*=133) as we wanted to assess the impact of healthcare coverage specifically related to Medicare and dual eligibility, thus leaving our final analysis sample of (*n*=7,563).

Dependent variables

We assessed two outcomes for surveillance mammography. The first was the receipt of surveillance mammography within the first year post cancer treatment and the second outcome measure was the time from the end of patients' cancer treatment to their first mammography post treatment. The American Joint Committee on Cancer (AJCC), National Cancer Comprehensive Network (NCCN) guidelines suggests annual mammography for stage I and stage II breast cancer patients after initial treatment but not earlier than 6 months after completion of radiation therapy [16]. For this study, treatment included mastectomy, BCS surgery, radiation, and chemotherapy. Surveillance mammography in year one was noted as month 7–18 post treatment.

The outcome measures for surveillance mammography were identified from all medical claims prior to diagnosis by the following *International Classification of Diseases*, version 9 (ICD-9), *Healthcare Common Procedure Coding System* (HCPCS), and *Current Procedural Terminology*, version 4 (CPT-4) codes. The following are the codes selected for screening mammography; HCPCS/CPT G0202, G0203, 76092 (bilateral); ICD-9V76.10 unspecified screening, V76.11 high risk screening, V76.12 screening, and V76.19 other screening. The codes used for diagnostic mammography include; HCPCS/CPT G0204, G0205, G0206, G0207, 76090 unilateral, and 76091 bilateral. Prior to1998, screening mammography was not covered by Medicare or Medicaid insurance and was often coded as diagnostic to ensure reimbursement [17]. Therefore, we included mammography claims coded diagnostic within the previously designated post treatment period in our definition of surveillance.

To assess time from end of treatment to first surveillance mammography we created censored variables required for the proportional hazards model that accounted for those patients with cancer recurrence and death before the end of the study.

Independent variables

We controlled for Medicare, and Medicare Medicaid dual eligibility, age, race, stage of cancer, and patients' co-morbidity status at the time of diagnosis. Age groups were defined as: 66–69, 70–74, 75–79, 80–84, and 85+ years of age. Race was defined as Caucasian, African American, and other. When estimating comorbidity burden, we excluded the diagnosis of breast cancer [15] in utilizing an adaptation of the Charlson co-morbidity score [18]. Patients were categorized by their number of comorbid conditions such that (0) indicated no comorbidity beyond their cancer diagnosis, (1) referred to one comorbid condition, (2) indicated two conditions, and (3) indicated three or more comorbid conditions in addition to a patients cancer diagnosis.

Treatments were identified by ICD-9 and HCPCS/CPT-4 codes. Mastectomy was included if the patient had undergone any bilateral mastectomy treatment. BCS patients were identified as patients having undergone less than a total mastectomy, including lumpectomy. Treatment for breast cancer patients was thus categorized into three categories: mastectomy, BCS, and BCS with radiation therapy. The codes used to identify procedures for bilateral mastectomies were; ICD-9 85.42, 85.44, 85.46, 85.48; HCPCS 19180, 19182, 19200, 19220, 19240. Codes for breast-conserving surgery (lumpectomy and unilateral mastectomy) included; ICD-9 85.21, 85.3, 85.41, 85.43, 85.45, 85.47; HCPCS 19120, 19125, 19126, 19160, 19162, Codes for radiation therapy included; ICD-9 92.21, 92.22, 92.25, 92.26, 92.28, 92.32, 92.33, 92.40, 92.41, V58.0, V66.1, V67.1, (V diagnosis codes indicate an encounter for radiation therapy); HCPCS 77261–77431, 77499, 77750–77799; CPT C9714–15, C9726.

Area level variables

Residential socioeconomic factors of income, education and area racial composition have been associated with reduced access and receipt of healthcare [11]. Specifically, Kirby and Kaneda (2006) indicate associations between individual race/ethnicity and preventive care use may be moderated by the racial or ethnic composition of the area in which a person resides. Small area geographic variation in poverty and census tract racial distribution has also been shown to have an impact on breast cancer survival among the elderly [12]. We used the 1990 US census data to include socioeconomic measures of median household income and area level of educational attainment for the census tract in which study patients resided. Median household income was categorized as: <$25,000, $25,001–$35,000, $35,001–$45,000, and >$45,000. The census tract percentage of adults with less than a high school education was included as a continuous variable. We also included a variable from the Area Resource File (ARF) that measured the percent Black population in counties in which patients resided, as well as the 2003 Urban Influence Codes to control for urban and rural residency [19]. We dichotomized the Urban Influence Codes as Metro (0) for Metropolitan or urban areas (metropolitan areas with at least 250,000 residents) and Rural (1) for non-metropolitan and rural areas (all other rural or small metropolitan areas with at least 2,500 residents but less than 250,000 residents).

Physician availability [20] may impact access to and receipt of healthcare; additionally physician type has been associated with variation in the receipt of surveillance mammography for breast cancer survivors [21]. Therefore to account for physician availability and type we included the ARF county level variables for the number of radiation oncologists per 100,000 residents, and the number of primary care physicians per 100,000 residents in our analysis.

Analysis

We used descriptive and bivariate analyses to examine socio-demographic, treatment, and surveillance mammography differences between Medicare and dual eligible patients in the three years' post treatment. Logistic regression with robust standard errors was used to assess the association of demographic and treatment factors with the likelihood of receipt of surveillance mammography in the first year following treatment. Cox regression proportional hazards model was used to determine differences in time to first mammography after BCS treatment between patients with and without radiation therapy. The analysis included individual and area socioeconomic factors, while controlling for different patient entry and exit times during the study period. Patients were censored if they had cancer recurrence, died, or reached the end of study without surveillance mammography so that the time to event for those who did not receive surveillance is the time till recurrence, death, or end of study. Hazard ratios and 95% confidence intervals are reported.

Results

Table 1 reports descriptive statistics for dual eligible and Medicare patients. A greater proportion of the dual eligible population were African American, had more than two comorbid conditions, and resided in areas of low education and income than Medicare patients. A greater percentage of dual eligible (45%) versus Medicare patients (37%) received mastectomy for their breast cancer treatment. Conversely, dual eligible patients (53%) received BCS with radiation less often than their Medicare counterparts (66%).

Table 2 reports the unadjusted bivariate analysis for the first, second, and third year following treatment. Accounting for patients' time in the study or death in calculating the rates for year two and three, we found nearly 53% of the study population received surveillance mammography. In the second surveillance year, the incidence of mammography receipt fell to 34% and by year three, only 19.1% of the study sample had received surveillance mammography. There were differences in the receipt of surveillance mammography in year one by race (57% of Caucasians patients had mammography versus 50% of the African American patients), dual status (57% Medicare patients versus 49% of dual eligible patients received surveillance mammography), and by breast cancer treatments where 63% of patients who received BCS and radiation therapy also received surveillance mammography in the year following treatment in contrast to only 49% of those receiving BCS alone.

Table 3 provides results from the adjusted logistic regression analysis to assess the factors associated with the receipt of surveillance mammography in the 12 months post cancer treatment. Initially two models were analyzed (one with and one without the variable for breast conserving surgery with radiation). In the first model (data not shown), dual eligibility in the absence of the treatment variable was a strong predictor of lack of surveillance mammography (OR=0.72; 95% CI=0.56–0.91). However the addition of treatment (breast conserving surgery with radiation) to the model indicated dual eligibility was not a statistically significant predictor of surveillance mammography suggesting a mediating effect of treatment on dual eligibility. Patients regardless of race or dual eligibility, who receive BCS accompanied by radiation versus those receiving BCS alone were significantly more likely to receive mammography in their first surveillance year (OR= 1.82; 95% CI=1.48–2.24). Furthermore greater comorbidity burden and advanced age were both significantly and negatively associated with the likelihood of receiving surveillance mammography. Whether a patient had seen a physician (oncologist or primary care) within the first year post treatment was also significantly and positively associated with receiving surveillance mammography, (OR=4.44; 95% CI=2.89–6.83).

Breast cancer treatments were analyzed in separate models and in combination. Mastectomy was not significantly associated with receipt of surveillance mammography when analyzed alone. Further, because a third of the study sample that received BCS also received mastectomy, when included in the model with BCS, the mastectomy variable was dropped from the combined model due to co-linearity (results not shown). Subsequent analysis using BCS patients excluded those who also had mastectomy.

Table 4 provides hazard ratios from the proportional hazards analysis of time to first surveillance mammography for patients who received surgical breast cancer treatment. Patients who received BCS and radiation treatment had a greater probability of receiving surveillance mammography sooner than those treated with BCS alone (HR=1.72; 95% CI=1.56–1.89). However, older patients (80+ years) had less probability of receiving mammography sooner after treatment (HR=0.55; 95% CI=0.45–0.66) than younger patients, as did those with stage II versus stage I diagnosis (HR=0.84; 95% CI=0.77–0.92), and for and those with greater comorbidity burden than for healthier patients (HR= 0.59; 95% CI=0.43–0.81).

Discussion

Surveillance mammography for all groups of elderly breast cancer survivors' declined with each successive year post cancer treatment. Competing mortality causes and poor initial treatment were associated with inadequate follow-up care. In particular, receiving BCS with radiation versus BCS alone emerged as a significant factor in the receipt of surveillance mammography for elderly breast cancer patients, regardless of their dual eligibility, race, or age.

Patients who had BCS with radiation had more than 80% greater likelihood of receiving surveillance mammography than patients receiving BCS alone. Possible reasons for the disparity in breast cancer treatment are likely similar to those for the disparity in the receipt of surveillance mammography. These reasons may include patient provider communication concerning a patient's choice of treatment and follow up as well as the possible lack of physician recommendation for cancer care choices. Socioeconomic and access issues may have played a role in treatment disparities and lack of follow up surveillance. Inadequate and unaffordable transportation or limited reimbursement rates may have made out of pocket expenses associated with the adjuvant radiation therapy and follow up surveillance too high. As surveillance mammography was also more likely to have occurred sooner for BCS patients who received radiation than for those who did not, further investigation into the reasons for disparities in cancer treatment and surveillance are merited.

Adjusted logistic regression analyses excluding cancer treatment indicated surveillance was particularly low for African Americans and dually eligible patients and was additionally driven by advanced age and poor health status. Patients of advanced age (older than 80 years), as well as those with increased comorbidity, were more likely to have lower rates of surveillance mammography indicating that perhaps these patients and their providers were more concerned with other health care issues.

Area level factors of income, rural/urban status, and physician availability and specialty did not play a significant role in the likelihood of receiving surveillance mammography. However, the inclusion of patient's census tract education level and breast cancer treatment reduced the significance of race and dual eligibility as factors for surveillance mammography indicating possible mediating socioeconomic factors. Residential area education may act as proxy for other related SES determinants such as inadequate transportation or reduced health literacy that may contribute to the observed disparity.

The lack of association of other area socio-demographics and physician availability with surveillance mammography might indicate that patients who are introduced into the healthcare system as a result of their illness, in this case breast cancer, have already successfully navigated barriers to care inherent to their residential environments.

The ability to identify Medicaid insured patients is limited to the state level, as the Medicare denominator file does not adequately identify Medicaid patients. Therefore, this investigation was limited to a single state. We acknowledge that this study cannot address the clinical, provider, or patient reasons for the differences in the use of BCS with and without radiation between patient groups. We do suggest however, that those patients who receive BCS without radiation are generally at greater risk for recurrence and yet still are less likely to receive surveillance mammography than those who receive BCS with radiation.

Policy implications

There are low rates as well as disparities in the receipt of surveillance mammography in elderly breast cancer patients. Disparities in breast cancer treatment figure prominently in the receipt of surveillance mammography, yet as other studies have documented a significant association of breast cancer treatment disparities with race and socioeconomic status; we cannot dismiss their role in surveillance care for the elderly population. There is likely a mediated presence of socioeconomic vulnerability that contributes to disparity in the continuum of cancer care, precedent to treatment and persisting through cancer surveillance. Greater effort is needed to provide mammography surveillance to elderly breast cancer patients, particularly those who have received BCS without radiation.

References

1. Yancik R, Wesley MN, Ries LA, Havlik RJ, Edwards BK, Yates JW. Effect of age and comorbidity in postmenopausal breast cancer patients aged 55 years and older. JAMA 2001;285:885–892. [PubMed: 11180731]
2. Yood MU, Owusu C, Buist DS, Geiger AM, Field TS, Thwin SS, et al. Mortality impact of less-than-standard therapy in older breast cancer patients. J Am Coll Surg 2008;206:66–75. [PubMed: 18155570]
3. McCarthy EP, Burns RB, Freund KM, Ash AS, Shwartz M, Marwill SL, et al. Mammography use, breast cancer stage at diagnosis, and survival among older women. J Am Geriatr Soc 2000;48:1226–1233. [PubMed: 11037009]
4. Geiger AM, Thwin SS, Lash TL, Buist DS, Prout MN, Wei F, et al. Recurrences and second primary breast cancers in older women with initial early-stage disease. Cancer 2007;109:966–974. [PubMed: 17243096]
5. Lash TL, Fox MP, Buist DS, Wei F, Field TS, Frost FJ, et al. Mammography surveillance and mortality in older breast cancer survivors. J Clin Oncol 2007;25:3001–3006. [PubMed: 17548838]
6. Keating NL, Landrum MB, Guadagnoli E, Winer EP, Ayanian JZ. Factors related to underuse of surveillance mammography among breast cancer survivors. J Clin Oncol 2006;24:85–94. [PubMed: 16382117]
7. Schapira MM, McAuliffe TL, Nattinger AB. Underutilization of mammography in older breast cancer survivors. Med Care 2000;38:281–289. [PubMed: 10718353]
8. Schootman M, Jeffe DB, Lian M, Aft R, Gillanders WE. Surveillance mammography and the risk of death among elderly breast cancer patients. Breast Cancer Res Treat. 2007
9. Field TS, Doubeni C, Fox MP, Buist DS, Wei F, Geiger AM, et al. Under utilization of surveillance mammography among older breast cancer survivors. J Gen Intern Med 2008;23:158–163. [PubMed: 18060463]
10. Doubeni CA, Field TS, Ulcickas YM, Rolnick SJ, Quessenberry CP, Fouayzi H, et al. Patterns and predictors of mammography utilization among breast cancer survivors. Cancer 2006;106:2482–2488. [PubMed: 16634097]
11. Kirby JB, Kaneda T. Access to health care: does neighborhood residential instability matter? J Health Soc Behav 2006;47:142–155. [PubMed: 16821508]
12. Schootman M, Jeffe DB, Lian M, Gillanders WE, Aft R. The role of poverty rate and racial distribution in the geographic clustering of breast cancer survival among older women: a geographic and multilevel analysis. Am J Epidemiol 2009;169:554–561. [PubMed: 19103608]
13. Halpern MT, Bian J, Ward EM, Schrag NM, Chen AY. Insurance status and stage of cancer at diagnosis among women with breast cancer. Cancer 2007;110:403–411. [PubMed: 17562557]
14. Katz ML, Donohue KA, Alfano CM, Day JM, Herndon JE, Paskett ED. Cancer surveillance behaviors and psychosocial factors among long-term survivors of breast cancer: cancer and Leukemia Group B 79804. Cancer 2009;115:480–488. [PubMed: 19133656]
15. Bradley CJ, Given CW, Dahman B, Luo Z, Virnig BA. Diagnosis of advanced cancer among elderly Medicare and Medicaid patients. Med Care 2007;45:410–419. [PubMed: 17446827]
16. Khatcheressian JL, Wolff AC, Smith TJ, Grunfeld E, Muss HB, Vogel VG, et al. American Society of Clinical Oncology 2006 update of the breast cancer follow-up and management guidelines in the adjuvant setting. J Clin Oncol 2006;24:5091–5097. [PubMed: 17033037]
17. Randolph WM, Mahnken JD, Goodwin JS, Freeman JL. Using Medicare data to estimate the prevalence of breast cancer screening in older women: comparison of different methods to identify screening mammograms. Health Serv Res 2002;37:1643–1657. [PubMed: 12546290]
18. Charlson ME, Pompei P, Ales KL, et al. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis 1987;40(5):373–383. [PubMed: 3558716]

19. Area Resource File 2003 Urban Influence Codes from the U.S. Department of Agriculture's Economic Research Service (ERS) website. [[Accessed December 2008]]. Available from URL: http://www.ers.usda.gov/Data/UrbanInfluenceCodes/

20. Davidson PL, Bastani R, Nakazono TT, Carreon DC. Role of community risk factors and resources on breast carcinoma stage at diagnosis. Cancer 2005;103:922–930. [PubMed: 15651072]

21. Lewis BG, Halm EA, Marcus SM, Korenstein D, Federman AD. Preventive services use among women seen by gynecologists, general medical physicians, or both. Obst Gynecol 2008;111(4):945–952. [PubMed: 18378755]

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Table 1

Socioeconomic characteristics for Medicaid and Medicare Stage I and II breast cancer patients (*N*=7,563)

	Medicare (%) (*n*=7,030)	**Dual eligible (%) (*n*=533)**	**P***
Patient Characteristics			
Race			<0.001
Caucasian	91.8	71.7	
African American	6.4	25.1	
Other	1.8	3.2	
Comorbidity			<0.001
0	77.8	58.2	
1	16.1	26.1	
2	4.3	11.3	
3+	1.9	4.4	
Age			<0.001
66–69	23.4	22.3	
70–74	30.6	26.1	
75–79	24.2	24.6	
80–84	14.6	14.8	
85+	7.3	12.2	
Stage of Cancer			0.098
I	21.8	18.8	
II	78.2	81.2	
Area Level Variables			0.096
Metro	77.2	71.7	
Rural	19.2	24.0	
Missing	3.6	4.3	
Low Education Area ø	17.9	41.5	<0.001
Medium House Hold Income (*n*=8,613)			<0.001
<=$25,000	23.8	52.1	
$25,001–35 K	32.7	30.6	
35,001–45 K	25.7	12.2	
45 K+	17.6	5.1	
Treatment			<0.001
BCS with Radiation ϕ (2,996)	66.3	53.9	
Mastectomy	37.5	44.6	

*Statistical significance assessed by χ^2 likelihood ratio tests

øResides in area in which greater than 30% of the population has less than a high school education

ϕExcludes those with mastectomy

Table 2

Patient factors and receipt of surveillance mammography N(%)

Patient characteristics	Mammography year 1 (7,563)	Mammography year 2 (7,243)	Mammography year 3 (6,947)
Surgical treatment			
Mastectomy	1,588 (55.2)	989 (35.9)	518 (19.5)
BCS with radiation$^{\phi}$	1,895 (63.2)	1,136 (39.0)	578 (20.6)
BCS alone$^{\phi}$	787 (49.8)	517 (35.1)	319 (22.9)
Medicaid/Medicare (%)			
Dual	265 (49.7)	143 (29.4)	62 (13.8)
Non dual	4,060 (57.8)	2,542 (37.6)	1,38 (21.3)
Race (%)			
Caucasian	3,952 (57.8)	2,449 (37.4)	1,335 (21.3)
African American	293 (50.4)	182 (32.5)	85 (14.8)
Other	80 (55.2)	54 (38.6)	28 (20.7)

$^{\phi}$Excludes those with mastectomy

Table 3

Adjusted logistic regression results for mammography surveillance in year one post treatment in elderly Medicaid and Medicare breast cancer patients who received BCS, OR (95% CI)

Independent variables (referent)	Surveillance mammography *N*=2,998
Eligibility (Medicare)	1.00
Dual (Medicaid and Medicare)	0.80 (0.57–1.11)
Age (66–69 years)	1.00
70–74	1.02 (0.78–1.33)
75–79	0.90 (0.69–1.19)
80–84	0.68 (0.50–0.92)*
85+	0.34 (0.24–0.48)**
Race (Caucasian)	1.00
African American	0.73 (0.50–1.05)
Other	1.39 (0.60–3.23)
Stage at diagnosis (I)	1.00
II	0.73 (0.62–0.85)**
Comorbidity (0)	1.00
1	0.72 (0.56–0.92)**
2	0.59 (0.40–0.86)**
3 or more	0.37 (0.21–0.64)**
Education	1.00
<12th Grade Education	0.29 (0.11–1.09)
BCS without Radiation ϕ	1.00
BCS with radiation	1.82 (1.48–2.24)**
No Physician visit within 1 year post treatment α	1.00
Physician visit within 1 year post treatment	4.44 (2.89–6.83)**

The regression model also includes annual household income, number of radiation oncologists and number of general Practitioners/100,000 persons, percent minority composition of community, and rural/urban status

* $p<0.01$ χ^2 likelihood ratio test

** $p<0.001$ χ^2 likelihood ratio test

ϕ Excludes those with mastectomy

α Post treatment refers to the 12 months after last treatment received

Table 4

Proportional hazards analysis for time to surveillance mammography (*n*=4,363)

Independent variables (referent)	Surveillance mammography HR (95%CI)	P value
Eligibility (Medicare)	1.00	
Dual (Medicaid and Medicare)	0.89 (0.75–1.06)	0.208
Treatment (BCS no radiation) $^{\phi}$	1.00	
BCS with radiation	1.72 (1.59–1.89)	<0.001
Age (66–69 years)	1.00	
70–74	0.99 (0.89–1.10)	0.931
75–79	0.98 (0.87–1.10)	0.780
80–84	0.91 (0.79–1.05)	0.209
85+	0.55 (0.45–0.66)	<0.001
Race (White)	1.00	
African American	1.00 (0.84–1.19)	0.920
Other	1.34 (0.99–1.83)	0.056
Stage at diagnosis (I)	1.00	
II	0.84 (0.77–0.92)	<0.001
Comorbidity (0)	1.00	
1	0.94 (0.84–1.05)	0.333
2	0.80 (0.66–0.98)	0.031
3 or more	0.59 (0.43–0.81)	0.001

The analytic model also includes annual household income, number of radiation oncologists and number of general practitioners/100,000 persons, percent minority composition of community, and rural/urban status

$^{\phi}$Excludes those with mastectomy