Population-Based Analysis of Nonoperative Management and Treatment Patterns in Older Women with Estrogen Receptor-Positive Breast Cancer

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Research Article

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Abstract

Purpose: To examine the proportion of older women with ER+HER2- breast cancer receiving non-operative management versus surgery, and to evaluate the use of axillary staging and adjuvant radiation in this population.

Methods: We queried the SEER database to identify all women aged 70 years or older with stage I-III ER+HER2- invasive breast cancer diagnosed between 2010-2016. We evaluated trends in non-operative management, breast surgery, axillary staging, and adjuvant radiation according to age at diagnosis.

Results: We identified 57,351 older women with ER+HER2- disease. Overall, 3538 (6.2%) of the cohort underwent non-operative management, 38,452 (67.0%) underwent breast conserving surgery (BCS), and 15,361 (26.8%) underwent mastectomy. The proportion of patients undergoing non-operative management increased from 2.8% amongst 70-74 year old women to 30.1% in those [≥]90 years old ($p < 0.001$). In 53,813 women who underwent surgery, 36,850 (68.5%) underwent sentinel lymph node biopsy, while 10,861 (20.2%) underwent axillary lymph node dissection. Subgroup analysis of 29,032 older women undergoing BCS for stage I ER+HER2- breast cancer revealed a 14.2% rate of omission of axillary staging, increasing from 5.3% in those 70-74 years to 67.6% in those [≥]90 years old ($p < 0.001$). Receipt of adjuvant radiation occurred in 63.3% of older women following BCS and 18% post-mastectomy, with similar trends towards omission in older age groups.

Conclusion: Primary breast surgery remains the dominant management strategy for the majority of older women with ER+HER2- breast cancer. Omission of axillary staging and adjuvant radiation are used in a minority of eligible women undergoing breast conservation for early-stage disease.

Introduction

One third of women affected with breast cancer are over the age of 70 at the time of diagnosis. Relative to younger women, older women are significantly more likely to have estrogen-receptor positive, HER2/*neu* negative (ER + HER2-) breast cancers and to be diagnosed with stage II-III disease.[1] However, due to the presence of comorbidities, older women, particularly those over 80 years of age, are also more likely to be treated with non-operative management that includes primary endocrine therapy.[2, 3] In those who are eligible to undergo surgery, data from prospective clinical trials suggest that it is safe to omit axillary staging and adjuvant radiation without compromising overall survival.[4, 5]

Practice management strategies vary widely for older women with ER + HER2- breast cancer as this patient population is inherently heterogeneous.[6, 7] This can present a clinical challenge for health care providers, who must take into account chronologic and biological age, overall functional status, and residual life expectancy when making treatment decisions.[8, 9] Moreover, due to substantial gains in life expectancy over the last several decades, women living to 80 years of age can now expect a lifespan of 10 years, while women living to 90 years can expect 5.5 additional years of life.[10] As a result, care must

be taken not to over- or undertreat these patients, the latter of which can result in poorer breast-cancer specific survival.[11]

There is currently a paucity of data evaluating modern trends in local therapy for older women, particularly those older than 80 or 90 years of age. In this study, we sought to evaluate treatment patterns over the last decade in older patients with ER + HER2- breast cancer. Our goal was to examine the proportion of older patients with ER + HER2- breast cancer receiving non-operative management versus upfront surgery, and in those undergoing surgery, to evaluate the use of axillary staging and adjuvant radiation by age at diagnosis.

Methods

Data Source and Patient Selection

We evaluated a cohort of patients from the publicly available records of 18 population-based cancer registries in the *Surveillance, Epidemiology, and End Results* (SEER) Radiation/Chemotherapy Treatment database. SEER is an authoritative source for cancer statistics, collecting data on cancer diagnoses, primary treatment, and survival with a catchment area that covers approximately 28% of the United States population. The November 2018 submission was used for this study, with all patients censored on December 31, 2016. For cohort selection, women aged 70 years or older with a first diagnosis of histologically-confirmed breast cancer were abstracted from SEER. We retained all cases with stage I-III ER + HER2- breast cancer diagnosed between the years 2010 and 2016; prior to this period, data on HER2/*neu* status were not available. Women for whom histologic grade, nodal status, or staging information was not reported were then excluded from the analysis.

Outcome of Interest

Our primary outcome of interest was the proportion of patients receiving nonoperative management for ER + HER2- breast cancer. The reason for omitting surgery of the primary tumor was obtained from the 'Reason no cancer-directed surgery' variable in SEER. For those undergoing surgery, surgical management was categorized as breast conserving surgery (BCS) or mastectomy. Women who underwent the following surgical procedures were considered to have undergone BCS: partial mastectomy, partial mastectomy with nipple resection, lumpectomy, excisional biopsy, re-excision of biopsy site, and segmental mastectomy. Those undergoing total (simple) mastectomy, modified radical mastectomy, mastectomy NOS, or nipple-sparing ('subcutaneous') mastectomy were considered to have undergone mastectomy.

Our secondary outcome of interest was the use of axillary staging and radiation, particularly in women undergoing BCS. Axillary staging was determined using surrogate values with extent of disease codes for the number of regional lymph nodes examined; women with 1–5 lymph nodes removed were considered to have undergone sentinel lymph node biopsy (SLNB) whereas women with > 5 lymph nodes removed were placed within the axillary lymph node dissection (ALND) group, as has been done in previous

studies.[12] Adjuvant radiation therapy was defined as “received” versus “no radiation/unknown if received radiation” due to stated limitations and sensitivity of this variable reported by SEER.[13]

Independent Variables of Interest

Independent variables of interest included demographic variables such as age at diagnosis, marital status, race, and SEER region. Tumor histology, histologic grade, and pathologic characteristics such as tumor size and nodal status were also obtained. The American Joint Commission of Cancer (AJCC) 7th edition staging system was used to define patients with stage I-III disease.

Statistical Analysis

Statistical comparisons between groups were performed using Pearson’s Chi-squared or Fisher’s exact tests for categorical data and Wilcoxon Rank sum test for continuous data. According to age at diagnosis, the proportion of patients undergoing non-operative management, axillary surgery, and adjuvant radiation were compared using the Mantel-Haensel test for trend. To examine the implementation of clinical trial results,[4, 5] subgroup analysis was performed to examine axillary surgery and adjuvant radiation trends in older women with AJCC 7th edition Stage I (T1N0 or T1Nx) ER + HER2-breast cancer undergoing BCS. Multivariable logistic regression models were then constructed to calculate the adjusted odds ratio (OR) for receipt of non-operative management in all patients, as well as receipt of axillary surgery (defined as SLNB or ALND), and adjuvant radiation in those undergoing surgical management. In addition to the independent variables listed above, year of diagnosis was included as a variable in all adjusted analyses in order to account for temporal trends. Indicator variables were created for missing data and included in the model for analysis. All analyses were performed using SAS version 9.4 (SAS Institute, Cary, NC) with all p-values two-sided and a $p < 0.05$ used to indicate statistical significance.

Results

Cohort Characteristics

We identified 57,351 women aged 70 years or older with ER + HER2- disease who met inclusion and exclusion criteria and were eligible for study. The majority of patients were Caucasian (77.6%), with stage I (66.2%) disease and invasive ductal histology (70.9%). (Table 1) With respect to age, 38,595 (67.0%) patients were between 70–79 years old, 16,374 (28.6%) were between 80–89 years old, and 2382 (4.2%) were over the age of 90 years old at the time of diagnosis. Overall, 3538 (6.2%) of the cohort underwent non-operative management with omission of surgery, 38,452 (67.0%) underwent BCS, and 15,361 (26.8%) underwent mastectomy.

Factors associated with Non-operative Management in Older Women

The proportion of patients undergoing non-operative management for ER + HER2- breast cancer increased from 2.8% of women between 70–74 years to 30.1% of women over 90 years of age ($p < 0.001$, Fig. 1). Factors independently associated with patients receiving non-operative management included age, marital status, geographic region, and AJCC stage. (Table 2) In adjusted analyses, age remained the strongest predictor of non-operative management. Compared to women aged 70–74 years old, women aged 80–84 years old were 2.54-fold (95% CI 2.27–2.84), more likely to undergo nonoperative management, while women over the age of 90 were 13-fold more likely (OR 12.93, 95% CI 11.4–14.7). Relative to married women, women who were widowed (OR 1.38, 95% CI 1.26–1.51) or single (OR 1.58, 95% CI 1.42–1.76) were modestly more likely to undergo non-operative management. Finally, more advanced disease was also independently associated with a significantly higher odds of primary non-operative management (Stage III OR 3.68, 95% CI 3.24–4.17). (Table 2)

Overall, the majority of the cohort that underwent non-operative management did so because surgery was not recommended by their providers ($n = 2040$, 57.6%) or contraindicated due to co-morbid conditions ($n = 470$, 13.3%). In addition, 222 (6.3%) patients refused surgery, and an additional 28 (0.8%) died before recommended surgery could take place. In the remaining 632 patients (17.9%), the reason for non-operative management was not documented.

Axillary Staging in Older Women Undergoing Surgery

In the 53,813 women who underwent surgery for ER + HER2- breast cancer, 36,850 (68.5%) underwent axillary staging with SLNB, while 10,861 (20.2%) underwent ALND. In the group of 15,361 women undergoing mastectomy, 95.0% of patients underwent some form of surgical axillary staging with SLNB or ALND. In the minority of mastectomy patients (5.0%) who did not undergo axillary surgery, age remained a significant predictor for omission ($p < 0.001$). (Fig. 2A)

In the 38,452 women undergoing BCS, 28,628 (74.5%) patients underwent SLNB, 4493 (11.7%) patients underwent ALND, and 5331 (13.9%) patients underwent omission of axillary staging. There was also a trend towards omission of axillary staging in older age groups, increasing from 4.8% in 70–74 year old patients to 21% in the 80–84 year old age group, and to 65.9% of patients undergoing BCS at 90 years or older ($p < 0.001$). (Fig. 2B) In multivariable analysis adjusting for demographic and clinical variables, relative to women aged 70–74 years at diagnosis, women aged 80–84 years were 80% less likely to receive surgical axillary staging during breast conservation (OR 0.19, 95% CI 0.18–0.21) whereas women over 90 years old were 97% less likely to undergo axillary surgery (OR 0.03, 95% CI 0.02–0.03).

In subgroup analysis of 29,032 older patients with stage I ER + HER2- breast cancer undergoing BCS, the rates of omission of axillary surgery were similar (14.2%), with the majority of patients preferentially receiving SLNB for staging the axilla from ages 70–89 years old, after which omission of nodal staging became the dominant axillary management strategy. (Fig. 2C)

Adjuvant Radiation in Older Women

Overall, adjuvant radiation occurred in 24,336 (63.3%) older women following breast conservation, while post-mastectomy radiation occurred in 2765 (18%) older women. Age remained a significant factor for receipt of adjuvant radiation following BCS. Approximately 74.4% of patients in the 70–74 years old age group received adjuvant radiation therapy, decreasing steadily with age such that 52.7% of 80–84 year old patients and only 15% of women over 90 years received adjuvant whole breast radiation (Fig. 3A). In adjusted analysis, adjuvant radiation was more common in younger patients, as well as those with pathologic characteristics including invasive lobular carcinoma (OR 1.41, 95% CI 1.32–1.50), high grade histology (OR 1.28, 95% CI 1.19–1.36), large tumor size (pT3, OR 2.59, 95% 2.29–2.92) and node positive disease. In those that were node positive, increasing nodal burden resulted in an increased odds of receiving adjuvant radiation (pN1, OR 2.16, 95% CI 2.02–2.30; pN2, OR 5.74, 95% CI 5.08–6.50).

Discussion

In this large cohort of women aged 70 years or older with ER + HER2- breast cancer diagnosed between 2010 and 2016, we found that 6.2% of patients underwent non-operative management, while 26.8% underwent mastectomy and the remaining two-thirds of women underwent breast conservation. In those undergoing BCS, 86% received some form of axillary surgery, while 63% proceeded to adjuvant radiation therapy. Notably, we observed a de-escalation of local therapy with increasing age, with a tendency towards greater omission of SLNB and radiation following limited surgery in older age groups. This was most pronounced in patients aged 90 years or more, where non-operative management was selected in 30% of cases, and where omission of axillary surgery and adjuvant radiation was seen in the majority of women undergoing breast conservation, reported in 65% and 85%, respectively.

The use of non-operative management with primary endocrine therapy in older women with ER + HER2- breast cancer varies widely by geographic region and increases significantly with age. In the United Kingdom, Netherlands, and Ireland, surgery is omitted in 30%-40% of women aged 80 years or older and over half of women greater than 90 years of age.[14–16] In contrast, data from Germany, Belgium, and Switzerland suggest that primary surgery remains the dominant management strategy for the large majority of older women with breast cancer, including those above 90 years of age.[15] In North America, data from our study and other population-based registries suggest similar trends with primary surgery used preferentially in older women, although non-operative management has shown modest uptake in recent years.[17] Our study included 16,374 women 80 to 89 years, and in this population, 9.4% underwent non-operative management. In the 2,382 women aged 90 years and older, non-operative management was selected in 30.1% of cases. Interestingly, in two thirds of women managed non-operatively, the reasoning behind their decision to omit surgery was related to provider recommendation or medical contraindications, with relatively few older women refusing surgery outside of said circumstances.

While early meta-analyses demonstrated equivalent overall survival outcomes amongst women managed with primary endocrine therapy versus surgery,[18] newer data suggests improved breast-cancer specific survival in women with ER + HER2- breast cancer treated with upfront surgery followed by endocrine

therapy.[19] In the multi-centered, observational AGE GAP trial, women in the United Kingdom aged 70 years or older were followed prospectively following a diagnosis of estrogen-receptor positive breast cancer based on management strategy. Recent results reported by Wyld et al. demonstrated a non-significant difference in short-term survival outcomes amongst a propensity-matched cohort of 426 older women treated with surgery versus 240 women treated with primary endocrine therapy.[20] Of note, after 4 years, a divergence in survival favoring surgery occurred, leading the authors to suggest that primary endocrine therapy should be reserved for women with limited life expectancy of up to 4 years. The importance of appropriate patient selection and the need for close clinical surveillance has been reported in prior studies that caution around endocrine resistance after 2–3 years of primary endocrine therapy. [21] Given the likelihood of disease progression, these studies support a concerted and standardized effort to perform comprehensive geriatric assessments in order to accurately calculate life expectancy and tailor individual treatment recommendations.

For older women undergoing breast conservation for early-stage, ER + HER2- breast cancer, the omission of axillary surgery or adjuvant radiation has not been shown to alter overall survival. In the CALGB 9343 trial, Hughes et al. randomized 636 women aged 70 years or older with clinically node negative ER + breast cancer up to 2 cm in size to adjuvant radiation with Tamoxifen versus Tamoxifen alone.[4] In their trial, ALND was allowed but not encouraged, and as a result most older women did not undergo surgical nodal sampling.[22] At 10 years follow up, the addition of adjuvant radiation to endocrine therapy following lumpectomy decreased locoregional recurrences from 10–2%, with no difference in overall survival. Furthermore, among those who did not undergo axillary surgery, there were no nodal recurrences in the radiation group and a 3% 10-year axillary recurrence rate in the Tamoxifen only group. These findings and similar results from other trials[23, 24] led to the publication of the 2016 *Society of Surgical Oncology* (SSO) Choosing Wisely guidelines which recommended against the routine use of SLNB in older women with early-stage hormone receptor positive breast cancer. While further data on axillary surgery are needed to evaluate guideline adoption, population-based studies that pre-dated their publication suggest an increased uptake of axillary surgery in this population, with over 80% of older women receiving some form of surgical nodal staging.[25] In our subgroup analysis of CALGB 9343 eligible patients with stage I, ER + HER2- breast cancer treated between 2010 and 2016, we found similarly low rates of omission of SLNB, although this was more common amongst women aged 70–79 years of age. In those 80 years and older, omission of SLNB was seen in 29% of women, and in those over 90 years, two thirds of women avoided axillary staging with SLNB.

In the current study, adjuvant radiation was used in 63.3% of older women following breast conservation, while post-mastectomy radiation occurred in 18% of older women. After breast conservation, the use of radiation decreased steadily with age such that approximately half of 80–84 year-old patients and only 15% of women over 90 years received adjuvant whole breast radiation. These results validate findings from the National Cancer Database (NCDB) where Chu et al. reported octogenarians over 85 years old were less likely to receive adjuvant radiation therapy than those aged 70–74 years, and with advanced age, omission of adjuvant therapy was more common.[26] This was also demonstrated in another large NCDB study by Herskovic et al. who interestingly noted a five-year overall survival benefit in women over

65 years of age with early stage HR + HER2- breast cancer who received adjuvant radiation therapy in addition to endocrine therapy, however this difference may have been explained by significant age-imbances between radiation and non-radiation therapy groups ($p < 0.001$).[27] In another population-based study of 53,532 South Korean patients, adjuvant radiation therapy had a statistically significant overall survival benefit in the control group of younger women, however adjuvant radiation therapy after BCS did not demonstrate a significant survival benefit in elderly patients ($p = 0.123$).[28] The lack of overall survival shown from population-based studies supports level 1 evidence from randomized controlled trials performed in the United States and the United Kingdom including CALGB 9343 and PRIME II trial.[4, 5, 22] This also provides evidence as to why many clinicians believe that the use of adjuvant radiotherapy should be reserved to prevent early locoregional recurrences in older women at high risk due to large tumor size, high grade or node-positive ER + HER2- disease, or in triple negative and HER2-positive subtypes. With more convenient hypo-fractionated treatment schedules such as those put forward in the FAST-Forward trial becoming widely adopted, it remains important to avoid undertreatment in these select older women with high risk of local relapse.[29]

The strengths of this study include its large modern cohort of older women, as well as details regarding the reasons for non-operative management. However, our study has several limitations inherent to the use of large datasets. Firstly, within SEER there is the potential for information and misclassification bias, as well as limited information regarding important confounders such as medical comorbidities, functional status, and the use of endocrine therapy, which often contribute to local therapy decision making. Furthermore, minimal data were available regarding clinical presentation, patient versus physician preferences around surgery, preferences of caregivers, and adjuvant treatment decisions. Finally, although the SEER treatment database includes adjuvant radiotherapy information with a high positive predictive value of 97.6%, the sensitivity is lower at 80%, suggesting that the reported data may systematically under-estimate adjuvant radiation receipt.[13]

Conclusion

Although age is the strongest independent factor associated with non-operative management, primary breast surgery remains the dominant management strategy for the majority of older women with ER + HER2- breast cancer. Axillary staging and adjuvant radiation are omitted in only a minority of eligible women undergoing breast conservation for early-stage disease. Further studies are warranted to determine whether guideline adoption has influenced receipt of SLNB and adjuvant radiation, and whether these impact outcomes and quality of life in this older patient population.

Declarations

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Conflict of Interest: The authors have no conflicts of interest to declare.

Ethics approval (include appropriate approvals or waivers): Waived by the Institutional Review Board of the Jewish General Hospital due to the use of anonymized, publicly available de-identified data.

Availability of data and material (data transparency): Data publicly available from the National Cancer Institute's SEER database.

Code availability (software application or custom code): Available upon request.

Authors' contributions: All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by David Tejera and Stephanie M Wong. The first draft of the manuscript was written by David Tejera and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Tables

TABLE I Cohort Characteristics, SEER 2010–2016 (n = 57,351)	
Characteristic	
Age Group – <i>n</i> , (%)	
70–74 years	22681 (39.6)
75–79 years	15914 (27.8)
80–84 years	10492 (18.3)
85–89 years	5882 (10.3)
90 + years	2382 (4.2)
Marital Status – <i>n</i> , (%)	
Married*	24478 (42.7)
Widowed	19494 (34.0)
Single/Divorced/Separated	10353 (18.1)
Unknown	3026 (5.3)
Race – <i>n</i> , (%)	
White	44505 (77.6)
Black	4414 (7.7)
Hispanic	4201 (7.3)
Asian/Pacific Islander	3643 (6.4)
Other/Unknown	588 (1.0)
SEER Region – <i>n</i> , (%)	
California [†]	23203 (40.5)
Georgia [‡] , Louisiana, Kentucky	12035 (21.0)
Connecticut, New Jersey	8719 (15.2)
Seattle (Puget Sound), Hawaii, Alaska	4997 (8.7)
Detroit, Iowa	5706 (10.0)
Utah, New Mexico	2691 (4.7)

TABLE I Cohort Characteristics, SEER 2010–2016 (n = 57,351)	
Tumor histology – <i>n</i> , (%)	
Invasive Ductal Carcinoma	40686 (70.9)
Invasive Lobular Carcinoma	7368 (12.9)
Mixed Invasive Ductal & Lobular	6513 (11.4)
Other/Favorable histologies [†]	2784 (4.9)
Histologic grade – <i>n</i> , (%)	
Grade I	19120 (33.3)
Grade II	29465 (51.4)
Grade III	8766 (15.3)
Pathologic Tumor size, cm – <i>n</i> , (%)	
0–2.0 cm	32249 (56.2)
2.1–5.0 cm	13172 (23.0)
>5.0 cm	2264 (4.0)
Unknown	9666 (16.9)
Pathologic nodal status – <i>n</i> , (%)	
Negative	37034 (64.6)
Positive	11,476 (20.0)
Not examined/Unknown	8841 (15.4)
AJCC 7th edition stage – <i>n</i> , (%)	
Stage I	37939 (66.2)
Stage II	15651 (27.3)
Stage III	3761 (6.6)

*Including common law or domestic partner; [†] Includes San-Francisco-Oakland, San Jose-Monterey, Los Angeles, and Greater California; [‡]Includes Metropolitan Atlanta, Rural Georgia, and Greater Georgia;

TABLE II Logistic Regression Analysis for Receipt of Nonoperative Management in Older Women with Stage I-III Hormone Receptor Positive, HER2-negative Breast Cancer (n = 57,351)

Characteristic	Cohort	Proportion with non-operative management		Adjusted odds ratio for non-operative management
	No. (%)	%	P-value	(95% CI)**
Age Group			< 0.001	
70–74 years	22681 (39.6)	2.8		1.00
75–79 years	15914 (27.8)	4.0		1.45 (1.29–1.62)
80–84 years	10492 (18.3)	6.9		2.54 (2.27–2.84)
85–89 years	5882 (10.3)	14.0		5.33 (4.76–5.98)
90 + years	2382 (4.2)	30.1		12.93 (11.38–14.69)
Marital Status			< 0.001	
Married*	24478 (42.7)	3.6		1.00
Widowed	19494 (34.0)	8.5		1.38 (1.26–1.51)
Single/Divorced/Separated	10353 (18.1)	6.4		1.58 (1.42–1.76)
Race/Ethnicity			< 0.001	
White	44505 (77.6)	5.8		1.00
Black	4414 (7.7)	9.8		0.99 (0.88–1.12)
Hispanic	4201 (7.3)	6.5		0.87 (0.77–1.00)
Asian/Pacific Islander	3643 (6.4)	4.9		0.97 (0.85–1.11)
Other/Unknown	588 (1.0)	14.8		0.75 (0.52–1.08)

*Including common law or domestic partner; †Includes San-Francisco-Oakland, San Jose-Monterey, Los Angeles, and Greater California; ‡Includes Metropolitan Atlanta, Rural Georgia, and Greater Georgia; **Bold when statistically significant, p < 0.05.

TABLE II Logistic Regression Analysis for Receipt of Nonoperative Management in Older Women with Stage I-III Hormone Receptor Positive, HER2-negative Breast Cancer (n = 57,351)

SEER Region		< 0.001		
California [†]	23203 (40.5)	5.7	1.00	
Georgia [‡] , Louisiana, Kentucky	12035 (21.0)	5.9 9.1	1.10 (0.99–1.22)	
Connecticut, New Jersey	8719 (15.2)	5.3	1.00 (0.86–1.15)	
Seattle (Puget Sound), Hawaii, Alaska	4997 (8.7)	5.6 8.0	1.01 (0.88–1.15)	
Detroit, Iowa			1.60 (1.37–1.88)	
Utah, New Mexico	5706 (10.0)			
	2691 (4.7)			
Tumor Histology		< 0.001		
Invasive Ductal Carcinoma	40686 (70.9)	6.3	1.00	
Invasive Lobular Carcinoma	7368 (12.9)	7.1 4.5	0.95 (0.85–1.05)	
Mixed Invasive Ductal & Lobular	6513 (11.4)	5.0	0.64 (0.56–0.73)	
Other/Favorable histologies [†]	2784 (4.9)		0.70 (0.58–0.84)	
Histologic Grade		< 0.001		
Grade I	19120 (33.3)	5.1	1.00	
Grade II	29465 (51.4)	6.5	1.03 (0.94–1.12)	
Grade III	8766 (15.3)	7.5	0.93 (0.83–1.04)	

*Including common law or domestic partner; [†]Includes San-Francisco-Oakland, San Jose-Monterey, Los Angeles, and Greater California; [‡]Includes Metropolitan Atlanta, Rural Georgia, and Greater Georgia; **Bold when statistically significant, p < 0.05.

TABLE II Logistic Regression Analysis for Receipt of Nonoperative Management in Older Women with Stage I-III Hormone Receptor Positive, HER2-negative Breast Cancer (n = 57,351)

AJCC 7th Edition Stage		< 0.001		
Stage I	37939 (66.2)	5.1	1.00	
Stage II	15651 (27.3)	7.2	2.01 (1.83–2.21)	
Stage III	3761 (6.6)	12.8	3.68 (3.24–4.17)	

*Including common law or domestic partner; †Includes San-Francisco-Oakland, San Jose-Monterey, Los Angeles, and Greater California; ‡Includes Metropolitan Atlanta, Rural Georgia, and Greater Georgia; **Bold when statistically significant, p < 0.05.

Figures

Figure 1

Surgical management by age group in older women with stage I-III Hormone Receptor Positive/HER2-negative invasive breast cancer.

A)

B)

C)

Figure 2

Axillary surgery by age group in women undergoing surgical management for Hormone-receptor positive, HER2-negative invasive ductal carcinoma. (A) Patients undergoing mastectomy for stage I-III breast

cancer; (B) Patients undergoing breast-conserving surgery for stage I-III breast cancer; (C) Patients undergoing breast-conserving surgery for stage I breast cancer.

Figure 3

Adjuvant radiation by age group in women undergoing surgical management of stage I-III Hormone-Receptor Positive, HER2-negative invasive ductal carcinoma. (A) Patients undergoing mastectomy. (B) Patients undergoing breast-conserving surgery.