6-1-2018

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HHS Public Access

Author manuscript

J Natl Compr Canc Netw. Author manuscript; available in PMC 2019 June 01.

Published in final edited form as:

J Natl Compr Canc Netw. 2018 June ; 16(6): 703–710. doi:10.6004/jnccn.2018.7004.

Receipt of Guideline-Concordant Care Among Older Women With Stage I–III Breast Cancer: A Population-Based Study

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Abstract

Background: This study examined receipt of guideline-concordant care (GCC) according to evidence-based treatment guidelines and quality measures and specific types of treatment among older women with breast cancer.

Patients and Methods: A total of 142,433 patients aged ≥66 years diagnosed with stage I–III breast cancer between 2007 and 2011 were identified in the SEER-Medicare linked database. Algorithms considering cancer characteristics and the appropriate course of care as per guidelines versus actual care received determined receipt of GCC. Multivariable logistic regression estimated the likelihood of GCC and specific types of treatment for women aged ≥75 versus 66 to 74 years.

Results: Overall, 39.7% of patients received GCC. Patients diagnosed at stage II or III, with certain preexisting conditions, and of nonwhite race were less likely to receive GCC. Patients with hormone-negative tumors, higher grade tumors, and greater access to oncology care resources were more likely to receive GCC. Patients aged ≥75 years were approximately 40% less likely to

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Author contributions: *Study concept:* LeMasters, Madhavan. *Study design:* All authors. *Data analysis:* LeMasters, Sambamoorthi, Hazard-Jenkins. *Data interpretation:* All authors. *Manuscript preparation:* LeMasters, Madhavan, Sambamoorthi. *Critical revision:* Madhavan, Sambamoorthi, Hazard-Jenkins, Kelly, Long.

The authors have disclosed that they have no financial interests, arrangements, affiliations, or commercial interests with the manufacturers of any products discussed in this article or their competitors.

receive GCC or adjuvant endocrine therapy, 78% less likely to have any surgery, 61% less likely to have chemotherapy, and about half as likely to have radiation therapy than those aged 66 to 74 years.

Conclusions: Fewer than half of older women with breast cancer received GCC, with the lowest rates observed among the oldest age groups, racial/ethnic minorities, and women with later-stage cancers. However, patients with more aggressive tumor characteristics and greater access to oncology resources were more likely to receive GCC. Considering that older women have the highest incidence of breast cancer and that many are diagnosed at stages requiring more aggressive treatment, efforts to increase rates of earlier stage diagnosis and the development of less toxic treatments could help improve GCC and survival while preserving quality of life.

Background

More than 50 years of research has guided the development of evidence-based treatment guidelines for breast cancer, including those published by NCCN.[1,2] Although the course of treatment for each woman is primarily determined by her tumor characteristics and extent of disease, multiple treatment pathways exist that are dependent on patient characteristics and preferences. However, not all patients receive guideline-concordant care (GCC). Vulnerable populations, such as racial and ethnic minorities or those who are socioeconomically disadvantaged, are more likely to experience treatment disparities.[3–7] Independent of these characteristics, older women are less likely to receive GCC due to increasing age and declining health and functional status associated with older age.[6,8,9] The NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines) for Breast Cancer contain 2 age-based treatment concessions. The first is the omission of radiation therapy (RT) following breast-conserving surgery (BCS) for patients aged ≥70 years with stage I, estrogen receptor (ER)–positive breast cancer and that they should receive adjuvant endocrine therapy (AET) based on the CALGB C9343 trial findings.[2,10,11] The second is the recommendation that the decision to treat women aged >70 years with chemotherapy be made on a case-by-case basis, considering patient preferences, health, and risks, citing insufficient evidence for this age group.[2,12] Guidelines note that older women who received chemotherapy in trial studies experienced similar survival outcomes but had an increased risk for side effects and treatment-related mortality.[13,14]

Despite flexibility in treatment guidelines, treatment disparities reported by previous studies raise concern that older women are undertreated more frequently than warranted. Recent studies have reported that among women aged ≥65 years, 21% to 29% did not receive RT following BCS for early-stage breast cancer regardless of their ER status,[4,15] 67% with lymph node–positive disease did not receive chemotherapy,[9] 50% did not receive trastuzumab,[16] and 17% to 40% did not receive AET when indicated.[5] Moreover, age and comorbidity have been found to be the strongest predictors of treatment, irrespective of clinical indications.[17–20] These findings are of particular concern considering that women aged ≥65 years represent 43% of newly diagnosed breast cancer cases,[21] and that undertreatment is associated with worse disease-specific survival for many older patients.[15,17,20]

Although undertreatment is commonly reported among older women with breast cancer, it is difficult to discern how inappropriate or problematic this is if the treatment is in accordance with evidence-based treatment guidelines that provide age-based treatment considerations, depending on individual circumstances. Therefore, the extent to which older women with invasive breast cancer receive GCC, considering all available treatment options, remains unknown. Bearing these thoughts in mind, the goal of this study was to determine US population-based estimates of the prevalence and associations with GCC for breast cancer among older women, as well as receipt of specific types of treatments using the US population-based SEER-Medicare data.

Patients and Methods

Data Source and Cohort Definition

The SEER-Medicare linked database was created in a collaborative effort by the NCI and Centers for Medicare & Medicaid Services. SEER data are collected from 17 tumor registries representing 26% of the US population, and are successfully matched to Medicare enrollment records for 94% of patients aged ≥65 years.[22] SEER-Medicare data contains information about date of diagnosis, cancer site, stage, tumor characteristics, treatment, healthcare use, patient enrollment and eligibility, selected demographic characteristics, and vital status information. Medicare claims are available for Part A (inpatient), Part B (outpatient), and Part D (prescription drug) services.[23] County and state identifiers were used to link SEER-Medicare data to the US Department of Health & Human Service's 2009 Area Resource File (ARF) to identify the area-level health resources.[24]

We identified 431,212 women aged ≥66 years diagnosed with breast cancer as their first or only primary tumor between January 1, 2007, and December 31, 2011. We excluded women without a pathologic diagnosis (n=9,954) and those diagnosed with breast cancer at death or autopsy (n=30); who died within 366 days of diagnosis (n=23,729); diagnosed with stage 0 or stage IV disease (n=105,189); not continuously enrolled in Medicare Parts A and B fee-for-service programs for 12 months before and after diagnosis (n=9,469); not continuously enrolled in Medicare Part D services for 4 months before diagnosis and 12 months after diagnosis (n=124,231); enrolled in a health maintenance organization plan during the 12 months before and after diagnosis (n=14,542); and whose records were missing tumor size (n=484) and surgeon specialty (n=1,151). The final analytic cohort consisted of 142,433 patients (Figure 1).

Dependent Variables

The primary outcome was receipt of GCC, defined as treatment, including surgery, RT, chemotherapy, and AET, received according to the NCCN Guidelines for Breast Cancer, Version 1.2009.[25] Measures assessed by this study remained unchanged in previous and later versions of the guidelines published during the cohort study period. Initiation of chemotherapy within 120 days of diagnosis, when indicated, as specified by the joint ASCO/NCCN quality measures,[26] and receipt of ER and progesterone receptor (PR) testing were also included in the definition of GCC. Hormone receptor testing was ascertained using a previously described method that considers documentation of a "positive," "negative," or

"borderline" ER and PR status as an indication that hormone receptor testing was conducted, and an "unknown" or "missing" status as an indication that testing was not conducted.[27] Receipt of GCC was determined using algorithms that compared the correct course of care with the actual care received (Figure 2). As stated in the NCCN Guidelines, omission of RT after BCS if the patient was aged ≥70 years; had stage I, ER-positive breast cancer; and received AET was considered GCC. Omission of chemotherapy, when indicated, was considered GCC among women aged >70 years. If chemotherapy was received, then time to initiation of chemotherapy was assessed. Surgery, RT, chemotherapy, and AET were ascertained by identifying ICD-9 diagnostic and procedure codes and Healthcare Common Procedure Coding System/ Current Procedural Terminology codes for generic drug names (see supplemental eTable 1, available with this article at JNCCN.org).

The secondary outcome was receipt of individual tests and treatments: ER testing, PR testing, BCS, mastectomy, RT, chemotherapy, initiation of chemotherapy within 120 days of diagnosis, and AET when indicated.

Independent Variables

Independent variables included year of diagnosis, age, preexisting chronic conditions, frequency of primary care provider (PCP) visits, clinical prognostic factors, oncology care resources, and demographic characteristics. Specific preexisting chronic conditions prevalent among older individuals examined were anxiety, depression, dementia, arthritis, osteoporosis, diabetes, hypertension, hyperlipidemia, heart disease, stroke, and chronic obstructive pulmonary disease, identified using methods described by the Working Group on Health Outcomes for Older Persons With Multiple Chronic Conditions.[28] Frequency of PCP visits was calculated by counting the number of unique PCP claim dates recorded 1 year before diagnosis in the physician claims file and dividing by the lower and upper 50th percent median cutoff (low, high). Clinical prognostic factors examined were stage at diagnosis, tumor size, lymph node status, ER status, PR status, and tumor grade. Measures of oncology care resources were the density (low vs high) of area-level mammography screening centers and oncology treatment centers relative to each woman's location of residence using data from the ARF, and were then categorized by the lower and upper 50th percent median cutoff. Surgeon specialty was assessed using provider specialty claims codes 02 and 49 (general) and 83, 90, 91, and 98 (oncology) from the physician claims file variable "hcfaspec" to determine the type of surgeon seen (general only, oncology only, both). Demographic characteristics examined were race/ethnicity, marital status, 2010 Census measure of education and annual income, and metropolitan status.

Statistical Analysis

Pearson and Mantel-Haenszel chi-square tests were used to compare the proportions of patients receiving GCC. Multivariable logistic regression models estimated the adjusted odds of receiving GCC (yes vs no), adjusting for all covariates. A secondary analysis was performed to further investigate the association of age of receipt of GCC and specific tests and treatments, controlling for all other covariates using multivariable logistic regression models. Age was dichotomized by women aged ≥75 years versus 66 to 74 years, because findings from the primary analysis showed a significant decrease in GCC after 74 years of

age. Parameter estimates are presented as adjusted odds ratios (AORs) with their corresponding 95% CIs; $P \leq .05$ was considered statistically significant. All analyses were conducted using SAS 9.4 (SAS Institute Inc.). This study was approved for exemption by the West Virginia Institutional Review Board.

Results

Cohort Characteristics

Patient characteristics are presented in supplemental eTable 2. Most were aged >80 years at diagnosis, white, diagnosed at stage I, lymph node–negative, ER-positive, and diagnosed with hypertension and hyperlipidemia. Most patients received BCS (60.8%), RT (57.4%), and AET (49.7%). Overall, 39.7% received GCC.

Receipt of GCC

Rates of GCC were highest among women aged 70 to 74 years and lowest for those aged ≥80 years (50.5% vs 28.1%; $P<.001$; supplemental eTable 2). Lower rates of GCC were observed among women with preexisting depression, dementia, arthritis, diabetes, or heart disease compared with those without these conditions. Women diagnosed at stage I had higher rates of GCC than those diagnosed at stages II and III (42.0% vs 37.2% and 36.9%, respectively; $P<.001$), as did women with hormone-negative and higher-grade tumors. Women treated by an oncology surgeon or both an oncology and general surgeon had higher rates of GCC than women treated by a general surgeon (37.9% and 43.3% vs 19.2%; $P<.001$). White women had higher rates of GCC than those who were black, Hispanic/Latino, and other races (41.8% vs 32.5%, 36.5%, 37.2%, respectively; $P<.001$). Multivariable regression analyses confirmed findings of the bivariate analysis (Table 1). Compared with women aged 66 to 69 years, those aged ≥80 years were approximately half as likely to receive GCC (AOR, 0.52; 95% CI, 0.51–0.54). Women with hypertension (AOR, 1.15; 95% CI, 1.12–1.19) and stroke (AOR, 1.45; 95% CI, 1.38–1.52) were more likely to receive GCC than those without these conditions. Conversely, women with arthritis (AOR, 0.88; 95% CI, 0.85–0.90), depression (AOR, 0.48; 95% CI, 0.46–0.51), dementia (AOR, 0.68; 95% CI, 0.63–0.72), diabetes (AOR, 0.79; 95% CI, 0.77–0.81), hyperlipidemia (AOR, 0.91; 95% CI, 0.88–0.93), and heart disease (AOR, 0.77; 95% CI, 0.75–0.80) were less likely to receive GCC. Compared with women diagnosed at stage I, those diagnosed at stage II (AOR, 0.64; 95% CI, 0.61–0.68) and stage III (AOR, 0.66; 95% CI, 0.61–0.71) were less likely to receive GCC. Women with ER- and PR-negative tumors were more likely to receive GCC than those with positive tumors (AOR, 2.58; 95% CI, 2.46–2.70 and AOR, 1.15; 95% CI, 1.11–1.20, respectively). Women with moderately and poorly differentiated tumors were more likely to receive GCC than those with highly differentiated tumors. Women residing in an area with a high density of mammography screening centers or those treated by an oncology surgeon only or both an oncology and a general surgeon were more likely to receive GCC than women treated by a general surgeon only. Women who were black (AOR, 0.60; 95% CI, 0.58–0.62), Hispanic/Latino (AOR, 0.70; 95% CI, 0.65–0.75), and of other races (AOR, 0.57; 95% CI, 0.53–0.61) were less likely to receive GCC than white women.

Receipt of Tests and Treatments

Compared with women aged 66 to 74 years at diagnosis, those aged ≥75 years were more than 40% less likely to receive GCC (AOR, 0.59; 95% CI, 0.57–0.60) or AET (AOR, 0.63; 95% CI, 0.61–0.65), almost 80% less likely to have any type of surgery (AOR, 0.22; 95% CI, 0.20–0.24), approximately half as likely to have RT (AOR, 0.53; 95% CI, 0.52–0.54), and approximately 61% less likely to have chemotherapy (AOR, 0.39; 95% CI, 0.38–0.40) and 34% less likely to experience an appropriate time to chemotherapy (AOR, 0.66; 95% CI, 0.63–0.69) (Table 2).

Discussion

This study evaluated the extent to which older women with invasive breast cancer receive GCC in accordance with NCCN and ASCO evidence-based guidelines using the large, population-based SEER-Medicare database. Findings showed that only 40% received GCC, and rates were lowest among the oldest women (aged ≥80 years). A recent study of women of all ages with breast cancer reported an 80% GCC rate, but also found that GCC decreased with age.[29] The difference in rate of GCC reported between these studies is likely attributable to the difference in age composition of the study populations.

Interestingly, women between ages 70 and 74 years were more likely to receive GCC. A probable explanation for this finding is that RT is not recommended for a subset of women aged ≥70 years with stage I breast cancer, and the decision to treat with chemotherapy is recommended to be made on a case-by-case basis for women aged >70 years. Therefore, many women >70 years of age who did not receive these treatments still received GCC by definition. However, even after these age-based treatment exemptions were considered in the definition of GCC, rates of GCC began to decrease for those aged ≥75 years. Findings from comparisons made between women aged 66 to 74 and those aged ≥75 years also show that women aged ≥75 years were less likely to receive every type of treatment, even receipt of ER status testing and AET. This finding suggests that treatment decisions were made based on reasons other than clinical indications. As expected and consistent with previous research, rates of GCC were the lowest among women aged >80 years.[9,17,28] However, a recent study reported no significant difference in overall survival between octogenarians and nonagenarians who did and did not receive adjuvant treatments for early-stage breast cancer.[30] Therefore, the lower rates of GCC observed among the oldest age groups of women may be reasonable, considering individual patient circumstances. Moreover, because of functional status, quality of life, and life expectancy, oncologists often cite increasing age, with or without comorbidity, as the primary reason for use of less aggressive treatment.[31–35] Patient preferences also play an important role in treatment decision-making, and older patients with breast cancer more frequently prefer to omit adjuvant treatments compared with younger patients.[36] However, regardless of age or health, patients with hormone-negative and higher-grade tumors were more likely to receive GCC, a finding that has also been reported by previous research.[17]

The increasing prevalence of chronic conditions and multimorbidity among elderly patients with cancer presents additional treatment challenges, and is often associated with undertreatment.[4,20,37] This study found that the presence of specific conditions, such as

diabetes and heart disease, decreased the likelihood of GCC. Diabetes can decrease the likelihood of GCC by having a more severe impact on patient health, creating competing health demands and increasing the risk of treatment complications, intolerance, and adverse reactions,[38–40] whereas certain other chronic conditions may increase the likelihood of GCC through increased contact with healthcare providers, without creating competing health demands and treatment complications. In fact, patients with breast cancer with a greater frequency of PCP visits were more likely to receive GCC.

This study has several strengths, including a comprehensive examination of the association between GCC among older women with breast cancer and health, clinical, oncology resource, and demographic characteristics using a large population-based data set. Complex algorithms were used to determine receipt of GCC by calculating the correct course of care according to each patient's tumor characteristics and comparing that with the actual care received.

However, several limitations should be kept in mind when interpreting the results of this study. This study did not measure completion of RT or chemo-therapy, only the initiation of therapy. It also did not distinguish between the receipt of neoadjuvant and adjuvant chemotherapy. Neoadjuvant chemotherapy is given to some women to shrink larger tumors and provide an opportunity for BCS after clinical staging but before pathologic staging. Although tumor size was used to determine the need for postmastectomy RT, the number of positive lymph nodes was not. This study only accessed the presence of positive or negative nodes. Because the SEER program only began recording information about the status of HER2/neu breast cancer cases in 2011, this study did not assess treatment for HER2/neu-positive tumors. Nor does SEER-Medicare collect information regarding results of any Oncotype testing that may influence treatment choices.

Conclusions

A little more than half of older women received GCC for breast cancer, even after incorporating age-based considerations into the definition of GCC. Variations in GCC by age group likely reflect the differing definitions of GCC by age, given than women aged ≥75 years were less likely to receive certain treatments. However, patients with more aggressive breast cancer characteristics were more likely to receive GCC. Given that older women represent close to half of all newly diagnosed breast cancers, and many are diagnosed at stages that require RT or chemotherapy, increasing rates of earlier-stage diagnosis and the development of less toxic treatments could help to improve GCC and survival while preserving quality of life.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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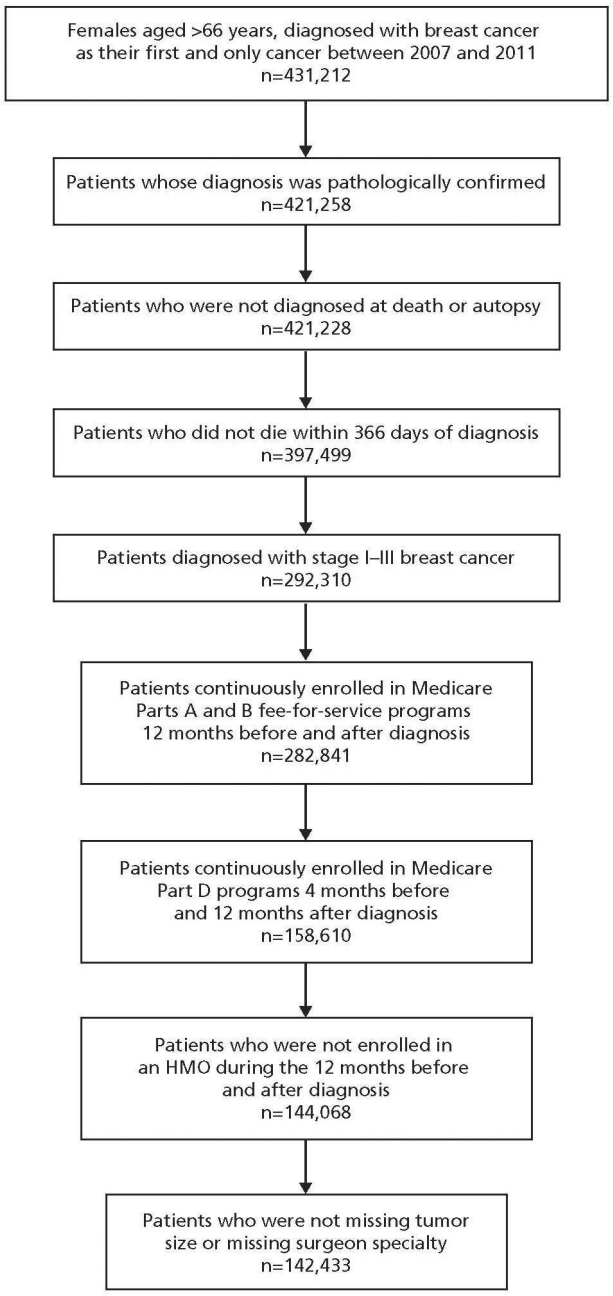

Figure 1.

Flow diagram for study cohort selection.

Abbreviation: HMO, health maintenance organization.

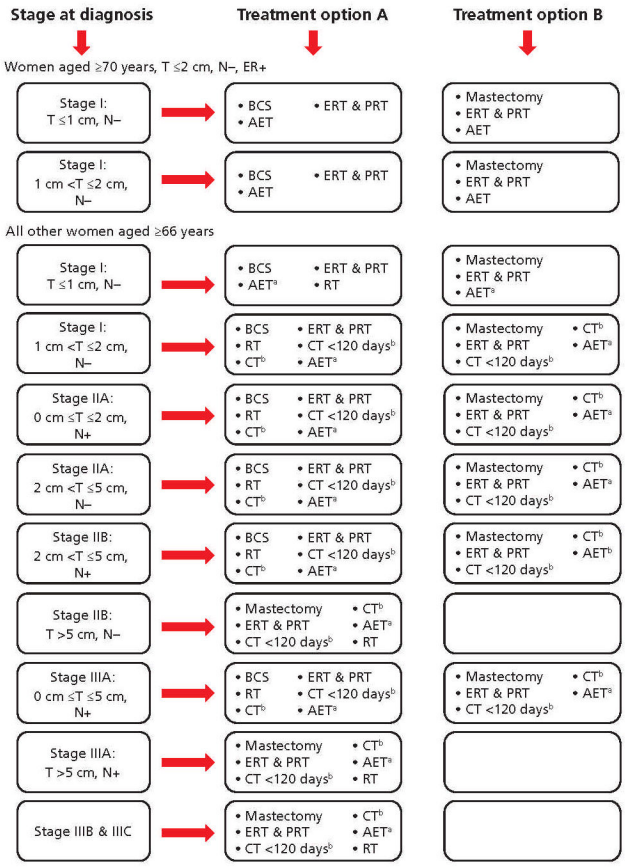

Figure 2.

Guideline-concordant treatment options by tumor size and lymph node status.

Abbreviations: AET, adjuvant endocrine therapy; BCS, breast-conserving surgery; CT, chemotherapy; ER, estrogen receptor; ERT, estrogen receptor testing; N, nodal status; PR, progesterone receptor; PRT, progesterone receptor testing; RT, radiation therapy; T, tumor size.

[a]AET recommended when breast tumors are ER- and/or PR-positive.

[b]Recommended that, for women aged >70 years, the decision to treat with chemotherapy should be made on an individual patient basis.

Table 1.

Multivariable Logistic Regression of Guideline-Concordant Care

	Concordant vs Discordant		
	AOR	**95% CI**	***P* Value**
Year of diagnosis			
2007	1.00	Ref	
2008	1.08	1.04–1.13	<.001
2009	1.07	1.03–1.11	<.001
2010	1.39	1.33–1.45	<001
2011	1.44	1.38–1.49	<.001
Age at diagnosis, y			
66–69	1.00	Ref	
70–74	1.48	1.43–1.53	<001
75–79	1.01	0.97–1.05	
≥80	0.52	0.51–0.54	<001
Health factors			
PCP visits			
Low	1.00	Ref	
High	1.16	1.13–1.19	<.001
Anxiety			
Yes	1.08	1.03–1.13	.001
No	1.00	Ref	
Depression			
Yes	0.48	0.46–0.51	<.001
No	1.00	Ref	
Dementia			
Yes	0.68	0.63–0.72	<001
No	1.00	Ref	
Arthritis			
Yes	0.88	0.85–0.90	<001
No	1.00	Ref	
Osteoporosis			
Yes	0.96	0.92–1.00	.032
No	1.00	Ref	
Diabetes			
Yes	0.79	0.77–0.81	<.001
No	1.00	Ref	
Hypertension			
Yes	1.15	1.12–1.19	<.001
No	1.00	Ref	

	Concordant vs Discordant		
	AOR	**95% CI**	***P* Value**
Hyperlipidemia			
Yes	0.91	0.88–0.93	<.001
No	1.00	Ref	
Heart disease[a]			
Yes	0.77	0.75–0.80	<001
No	1.00	Ref	
Stroke			
Yes	1.45	1.38–1.52	<001
No	1.00	Ref	
Chronic obstructive pulmonary disease			
Yes	0.99	0.95–1.03	.657
No	1.00	Ref	
Clinical prognostic factors			
Stage at diagnosis			
I	1.00	Ref	
II	0.64	0.61–0.68	<.001
III	0.66	0.61–0.71	<.001
Tumor size, cm			
<1	1.00	Ref	
1 to<2	0.79	0.77–0.82	<.001
2–5	1.43	1.35–1.51	<.001
>5	0.23	0.21–0.26	<.001
Lymph nodes			
Positive	0.99	0.94–1.03	.585
Negative	1.00	Ref	
ER status			
Positive	1.00	Ref	
Negative	2.58	2.46–2.70	<.001
Borderline/Unknown	0.0	0.00–2.00	.715
PR status			
Positive	1.00	Ref	
Negative	1.15	1.11–1.20	<001
Borderline/Unknown	0.28	0.24–0.31	<.001
Tumor grade			
Well-differentiated	1.00	Ref	
Moderately differentiated	1.27	1.23–1.31	<.001
Poorly differentiated	1.51	1.45–1.57	<.001
Undifferentiated/ Unknown	0.59	0.56–0.63	<001

	Concordant vs Discordant		
	AOR	**95% CI**	***P* Value**
Oncology care resources			
Mammography screening centers			
Low	1.00	Ref	
High	1.63	1.43–1.84	<.001
Oncology treatment centers			
Low	1.00	Ref	
High	0.96	0.84–1.08	.476
Specialty of treating surgeons			
General	1.00	Ref	
Oncology	1.62	1.52–1.73	<.001
General & oncology	3.02	2.90–3.15	<001
Demographic characteristics			
Race/Ethnicity			
White	1.00	Ref	
Black	0.60	0.58–0.62	<001
Hispanic/Latino	0.70	0.65–0.75	<.001
Other	0.57	0.53–0.61	<001
Education			
<15% college degree	1.04	1.01–1.07	.005
≥15% college degree	1.00	Ref	
Annual income			
≤$35,000	1.03	1.00–1.06	.037
>$35,OOO	1.00	Ref	
Married/Partnered			
Yes	1.00	Ref	
No	5	1.00–1.05	.079
Region			
Metropolitan	0.69	0.66–0.73	<001
Nonmetropolitan	1.00	Ref	

Abbreviation: AOR, adjusted odds ratio; ER, estrogen receptor; PCP, primary care physician; PR, progesterone receptor.

[a]Includes coronary artery disease and cardiac arrhythmia.

Table 2.

Multivariable Logistic Regression of Treatment in Women Aged ≥75 Versus 66–74 Years

	AOR	95% CI	*P* Value
Guideline-concordant care			
Yes	0.59	0.57–0.60	<.001
No	1.00	Ref	
ER status tested			
Yes	0.91	0.91–0.91	<.001
No	1.00	Ref	
PR status tested			
Yes	1.00	1.00–1.00	<.001
No	1.00	Ref	
Received AET			
Yes	0.63	0.61–0.65	<.001
No	1.00	Ref	
Received any surgery			
Yes	0.22	0.20–0.24	<001
No	1.00	Ref	
Received BCS			
Yes	0.8B	0.82–0.87	<001
No	1.00	Ref	
Received mastectomy			
Yes	0.95	0.93–0.98	<.001
No	1.00	Ref	
Received radiation therapy			
Yes	0.53	0.52–0.54	<.001
No	1.00	Ref	
Received chemotherapy			
Yes	0.39	0.38–0.40	<.001
No	1.00	Ref	
Time to chemotherapy			
Appropriate	0.66	0.63–0.69	<.001
Not appropriate	1.00	Ref	
No chemotherapy	1.93	1.84–2.02	<.001

Abbreviations: AET, adjuvant endocrine therapy; AOR, adjusted odds ratio; BCS, breast-conserving surgery; ER, estrogen receptor; PR, progesterone receptor.