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Association between survival time with metastatic breast cancer and aggressive end-of-life care

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Abstract

Purpose—For women with stage IV breast cancer (BC), the association between survival time (ST) and use of aggressive end-of-life (EOL) care is unknown.

Methods—We used the SEER-Medicare database to identify women with stage IV BC diagnosed 2002–2011 who died by 12/31/2012. Aggressive EOL care was defined as receipt in the last month of life: >1 ED visit, >1 hospitalization, ICU admission, life-extending procedures, hospice admission within 3 days of death, IV chemotherapy within 14 days of death, and/or 10 unique physician encounters in the last 6 months of life. Receipt of aggressive EOL care and hospice in the last month of life were determined using claims, and multivariable analysis was used to identify factors associated with receipt. Costs of care were also evaluated.

Results—We identified 4521 eligible patients. Of these, 2748 (60.8%) received aggressive EOL care. Factors associated with aggressive EOL care were race (OR 1.45, 95% CI 1.19–1.81 for blacks compared to whites) and more frequent oncology office visits (OR 1.56, 95% CI 1.28–1.90). Patients who lived >12 months after diagnosis were less likely to receive aggressive EOL care (OR 0.44, 95% CI 0.38–0.52), and more likely to utilize hospice (OR 1.43, 95% CI 1.21–1.69) compared to patients who lived ≤6 months. Patients with a shorter ST had significantly higher costs of care per-month-alive compared to patients with longer ST.

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Compliance with ethical standards

Conflicts of interest The authors have no conflicts of interest to declare.

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Conclusion—Patients with a shorter ST were more likely to receive aggressive EOL care and had higher costs of care compared to patients who lived longer.

Keywords

End-of-life care; Health services overuse; Healthcare quality; Hospice; Breast cancer

Introduction

Compared to other types of cancer, patients with metastatic breast cancer (MBC) may utilize more aggressive end-of-life (EOL) care. A population-based study of 215,484 elderly patients who died of cancer between 1993 and 2000 showed that patients with breast cancer compared to patients with lung cancer were 63% more likely to receive chemotherapy within the last 14 days of death, 21% more likely not to utilize hospice care, and 21% more likely to be admitted to hospice within 3 days of death [1]. Similarly, a single-institution evaluation of patients with MBC reported that one-third of women did not utilize hospice services, and of the patients who were admitted to hospice, only 22% had a documented advanced directive discussion in their medical record [2].

The National Comprehensive Cancer Network (NCCN) and the American Society of Clinical Oncology (ASCO) recommend against aggressive care at the EOL [3–5]. Aggressive EOL care includes in the last month of life: more than one emergency department (ED) visit, more than one hospital admission, admission to the intensive care unit (ICU), receipt of life-extending procedures such as a feeding tube, ventilation, or cardiopulmonary resuscitation (CPR), admission to hospice within 3 days of death, receipt of intravenous (IV) chemotherapy within 14 days of death, and/or 10 unique physician encounters in the last 6 months of life [6–8, 12]. Despite these recommendations, 30–65% of patients with advanced cancer receive aggressive EOL care [6–10]. Use of hospice has been shown to reduce the number of ED visits, hospitalizations, and total costs of care, and is associated with improved quality of EOL care [3, 11–13]. NCCN guidelines call for consideration of hospice care in the management of patients with advanced cancer who experience disease progression or unacceptable toxicity from treatment; despite these recommendations, hospice care is only utilized in about 60% of patients with advanced cancer, and when utilized, 10.9% enroll within three days of death [3, 14, 15]. A population-based study of 6956 women with ovarian cancer found that, despite a significant increase of hospice use from 1997 to 2007, aggressive EOL care also increased significantly, suggesting that hospice may be introduced too late in the course of disease [8].

Survival time may also impact the receipt of aggressive EOL care. A population-based analysis showed that at least 65% of patients with poor prognosis cancers, including lung and pancreatic cancers, utilized aggressive EOL care. It is unknown how survival time (ST) impacts receipt of aggressive EOL care among patients with stage IV breast cancer (BC). The objectives of this study were to determine the association between length of time alive with stage IV BC and aggressive EOL care, and its associated costs.

Methods

Data source

We used data from the Surveillance, Epidemiology, and End Results (SEER)-Medicare database [16]. The SEER registries encompass approximately 28% of the US population and the database contains information on patient sociodemographic characteristics, tumor details, and survival outcomes for cancers occurring within those populations [17]. Linkage with the Medicare database allows the longitudinal evaluation of cancer care and characterizes inpatient, outpatient, and physician-billed services, including diagnoses, and healthcare costs [18].

Cohort selection

We identified all women 66 years of age with histologically confirmed stage IV breast cancer diagnosed between January 1, 2002 and December 31, 2011, who died by December 31, 2012. We excluded patients who were enrolled in a Medicare health maintenance organization or who were not continuously enrolled by Medicare Parts A and B for a period of 12 months before diagnosis through death or the end of the study period. We also excluded patients who were enrolled in Medicare due to end-stage renal disease, as well as patients with other primary cancers. We also excluded patients whose reporting source of death was autopsy or death certificate, whose reason for entitlement was not age, whose date of death differed by >3 months between SEER and Medicare, and those with missing claims from 45 days before diagnosis through 180 days after diagnosis. Patients who died within 30 days of diagnosis were also excluded.

End-of-life care

Aggressive EOL care was defined as in the last month of life having any one of the following: more than one ED visit, more than one hospital admission, greater than 14 days hospitalized, admission to the ICU, admission to hospice within 3 days of death, receipt of IV chemotherapy within 14 days of death, or the use of life-extending procedures (feeding tube placement, ventilation, and/or cardiopulmonary resuscitation) [6–8, 10]. We also included ten or more encounters with unique physicians in the last 6 months of life in our definition of aggressive EOL care [10]. We identified ICU admissions using International Classification of Diseases, Ninth Revision (ICD-9) codes (96.7x) and diagnosis-related group codes (475 or 483) for mechanical ventilation and the ICU indicator variable in the Medicare inpatient file [19, 20]. Hospice admissions were identified through billing claims in the Medicare hospice files and were categorized as home and/or facility hospice (hospital and/or skilled nursing facility [SNF]). In addition, we examined length of stay (LOS) among patients admitted to the hospital, ICU, and hospice in the last month of life [8].

Among patients who utilized hospice, the source of referral (inpatient, SNF, or outpatient) was identified using billing claims; patients who enrolled in hospice within 2 days of hospital discharge were characterized as inpatient referrals, patients enrolled within 2 days of SNF discharge were characterized as SNF referrals, and other enrollments were characterized as outpatient referrals [8, 21].

Survival time (ST)

Patients were categorized by the time from diagnosis of breast cancer until death. This was classified as: 6 months, 6–12 months, and >12 months.

Costs of care

Costs of care were calculated from Medicare reimbursement claims from physician, hospital, outpatient, durable medical equipment, and hospice filings between the date of diagnosis and the date of death [22, 23]. Costs were categorized as costs per-month-alive after diagnosis, which were calculated as totals costs divided by the number of months alive after diagnosis; and costs in the last month of life.

Location of death

Location of death (LOD) was determined using discharge status codes on claims from the death date, including care received in the hospital, SNF, facility and home hospice. Patients without a hospice discharge prior to their death date were considered to have died in hospice. If there was a hospital or SNF claim on their death date their LOD was categorized as facility hospice; if there was no facility claim on their death date their LOD was categorized as home hospice. If patients were never enrolled in hospice or discharged prior to their death date, with hospital or SNF claims on their death date their LOD was considered hospital or SNF, respectively; if no claims on their death date their LOD was considered home without hospice [24].

Covariates

Demographic covariates included age at diagnosis (66–69, 70–74, 75–79, and 80 years), year of diagnosis, marital status (married, single, unknown), race (white, black, other), hospital location (urban, rural), region (East, Midwest, West), Charlson comorbidity score (0, 1, 2), and socioeconomic status. Tumors were categorized as hormone receptor (estrogen receptor [ER] and/or progesterone receptor [PR]) positive, negative, or unknown. Other covariates included medical oncology office visits, defined as the number of visits per-month alive by tertile (low, medium, high). To define medical oncology office visits, physician files were used to determine provider specialty and date of office visit. Visits were identified through HCPCS codes [23].

Statistical analysis

Univariate analyses comparing patient and tumor characteristics with patient prognosis were performed with *t* tests for continuous variables and χ^2 tests for categorical variables. We developed logistic regression models to determine the associations between clinical, demographic, and prognostic factors and receipt of aggressive EOL care and hospice care in the last month of life. For analyses of hospice care in the last month of life, hospice enrollment within 3 days of death was excluded from the analysis. Trends over time in median EOL expenditures and expenditure per-month-alive were evaluated by ST. Logistic regression was used to assess the association of year of death with aggressive EOL care utilization and location of death, which was adjusted for patient characteristics described to predict the yearly proportion of patients with each outcome. Then a linear trend test over

time using orthogonal polynomial coefficients was conducted to determine if there was significant change in the adjusted proportions between 2002 and 2011 [8, 25]. All analyses were conducted with SAS version 9.4 software (SAS Institute, Cary, NC) and STATA 14 software (College Station, TX). All statistical tests were two-sided, with $\alpha < 0.05$.

Results

We identified 4521 women with an initial diagnosis of MBC between 2002 and 2011 who were eligible for analysis. The cohort was predominantly white (83.0%), without comorbidities (48.7%), and had hormone receptor (HR)-positive MBC (56.3%, Table 1). The median survival of the total cohort was 9.8 months, while 2040 (45.1%) patients lived at least 12 months from their diagnosis. The majority of patients 2748 (60.8%) received aggressive EOL care as defined (Supplemental Table 1). The most common LOD was home hospice (37.7%) followed by the hospital (22.0%).

In a multivariable model (Table 2), race (OR 1.46, 95% CI 1.19–1.81 for blacks compared to whites), and higher oncology office visit volume (OR 1.56 95% CI 1.28–1.90 compared to low volume) were associated with aggressive EOL care. Patients who never saw an oncologist (OR 0.67, 95% CI 0.55–0.81) and patients with a longer time alive since diagnosis (OR 0.47, 95% CI 0.39–0.58 among patients who lived 6–12 months, and OR 0.44 95% CI 0.38–0.52 among patients who lived >12 months) were less likely to receive aggressive EOL care than those who lived <6 months.

Among the total cohort, 62.8% of patients enrolled in hospice care at some point during their treatment course. The majority of patients enrolled in hospice had outpatient referrals (55.4%, Table 3), and received home hospice without facility hospice (50.9%). Patients who died within 6 months of diagnosis compared to patients who lived 6–12 months and >12 months were more likely to receive inpatient hospice referrals (44.9% vs. 31.5%, vs. 28.9%, respectively, $p < 0.0001$); and were more likely to utilize facility hospice (50.9% vs. 37.0% vs. 31.7%, respectively, $p < 0.0001$).

Receipt of hospice in the last month of life was evaluated in a multivariable model (Table 2), the following variables were associated with hospice utilization in the last month of life: diagnosis year (OR 1.10 95% CI 1.07–1.12), higher socioeconomic (SES) status (OR 1.43 95% CI 1.17–1.76 SES 4 vs. SES 1, and OR 1.56 95% CI 1.21–2.00 SES 5 vs. SES 1), patients with longer ST (OR 1.25, 95% CI 1.02–1.053 among patients who lived 6–12 months, and OR 1.43 95% CI 1.21–1.69 among patients who lived >12 months versus those who lived <6 months), and patients who did not utilize aggressive EOL care (OR 1.94 95% CI 1.64–2.28). Patients who received at least two measures of aggressive EOL care (OR 0.30 95% CI 0.25–0.35) were less likely to utilize hospice.

Total costs per-month-alive and in the last month of life were significantly higher among patients who lived <6 months compared to patients who lived 6–12 months and >12 months (Fig. 1). The majority (65.5%) of total costs per-month-alive were related to inpatient care, and inpatient care costs were significantly higher among patients who lived <6 months compared to patients who lived 6–12 months and >12 months (\$8923 vs. \$3639 vs. \$1512,

respectively, $p < 0.001$). The results were similar for costs in the last month of life. Overall median costs per-month-alive significantly increased during this time frame among patients who lived ≤ 6 months from \$7649 to \$11,184 ($p < 0.0001$, Fig. 2), and among patients who lived 6–12 months from \$4182 to \$6937 ($p = 0.006$), costs did not significantly change from 2002 to 2011 among patients who lived >12 months from diagnosis.

Despite increasing costs over time, the proportion of patients who received aggressive EOL care did not vary much from 2002 to 2011 6.0 versus 5.95% ($p = 0.62$), and only significantly increased with regard to ICU admission 11.2 to 18.3% ($p < 0.0001$) and life sustaining measures 6.7 to 9.6% ($p = 0.007$). In contrast, from 2002 to 2011 the proportion of patients who died in home hospice increased from 34.7 to 43.0% ($p = 0.0007$, Fig. 3) and the proportion of patients decreased who died in the hospital 25.2 to 19.3% ($p = 0.02$).

Discussion

In our population-based study of women with stage IV breast cancer who expired, we found that approximately 60% of patients diagnosed with BC received aggressive EOL care, and that patients with a shorter survival time were more likely to receive aggressive EOL care and less likely to receive hospice. Patients who live ≤ 6 months from their diagnosis have higher EOL costs compared to those who live beyond 6 months, and the bulk of these costs are attributed to inpatient care. Despite an increase in hospice use over time, costs per-month alive have increased among all patients with MBC, and particularly among those who live ≤ 6 months.

Hospice care at the end-of-life is considered an essential component of high quality care [7, 24, 26]. In an analysis of cancer patients using Medicare data from 2003 to 2010, approximately one quarter of deaths occurred in the hospital, and over 60% of patients were hospitalized in the last month of life [27]. In 2010, 61.3% of patients enrolled in hospice, and 10.9% enrolled in the last three days of life; the average hospice LOS was only 9 days [27]. Patients with longer admissions to hospice (>3 days) reported higher quality of life, and their caregivers were significantly less likely to experience major depressive disorder after their loved one's death [28–30]. We found a significant increase in the number of patients with MBC who died in hospice from 2002 to 2011, and a significant decrease in hospital and skilled nursing facility deaths. Despite this trend, the mean hospice LOS was only 10.9 days, suggesting that the majority of patients are still enrolling within two weeks of death.

Patients who lived a short time with MBC (<6 months) were more than twice as likely to utilize aggressive EOL care and one-third less likely to utilize hospice care, compared to patients who lived longer than 6 months from diagnosis. Compared to patients who lived longer, patients who died within 6 months of diagnosis were more likely to die in the hospital or in a skilled nursing facility and less likely to die at home. These results are similar to a population-based analysis of EOL care among elderly patients with poor prognosis cancers which found frequent hospitalizations and ICU admissions in the last month of life, and an average hospice LOS of 8.4 days [10].

It is possible that patients who die quickly after diagnosis don't establish a relationship with a multidisciplinary care team to discuss advanced care planning and, therefore, they utilize more aggressive EOL care. Interestingly, we found that patients who saw their oncologists more frequently were more likely to utilize aggressive EOL care. In our previous work, we found that patients who had more frequent oncology visits were up to three times more likely to be extreme-users of disease monitoring tests, and that patients who were extreme-users of disease monitoring tests were more likely to utilize aggressive EOL care [23]. These findings suggest that it is possible that patients and/or physicians who are overly-aggressive with breast cancer treatment may drive healthcare utilization apart from disease severity.

Previous research has shown significant racial/ethnic disparities related to adequacy of pain and symptom control, and perceived unmet needs for supportive services [31–34]. In addition, other studies have found that among patients with MBC at the EOL, elderly black women were less likely to utilize hospice [34]. In addition to underuse of services, disparities also exist with overuse of treatment in the EOL setting. Compared to elderly white women, elderly black women with MBC are more likely to die in the hospital, and be admitted to the ICU, hospital, or ED within the last month of life [34]. These results are also similar to our own results which found that elderly black women with MBC were more likely to utilize aggressive EOL care compared to elderly white women with MBC.

Our work has several important limitations. The SEER-Medicare database includes only patients who are 65 years or older with Medicare insurance and may not be generalizable to all patient populations. We only included patients who died in our total cohort which may result in selection bias, meaning that patients who survived for a long period of time were excluded from our analysis; however, we expect this effect to be small. We included patients who died of all causes, but the majority, 3375 (74.7%) of patients included died from breast cancer. Additionally, a sensitivity analysis was performed on all analyses among only those patients whose cause of death was attributed to breast cancer, and all results were similar. Our cost estimates did not include costs associated with oral therapies, and, therefore, may be an underestimate of total cancer costs, but are similar to EOL care costs reported in the literature [35, 36]. Survival time was determined retrospectively by the interval from diagnosis until death; there is currently no objective prospective method to determine which patients will live longer and this may present a challenge to apply our results in clinical practice.

In summary, we found approximately 60% of elderly women with MBC received aggressive EOL care. Patients who died quickly after diagnosis were more likely to receive aggressive EOL care and have higher EOL care costs compared to patients who lived longer. Patients with rapidly progressive MBC should be targeted for interventions to curb aggressive EOL care and introduce advanced care planning earlier in the treatment course.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Fig. 1.
a Mean direct costs of care per-month alive for patients with MBC ($N=4521$). Costs of care in each category were significantly different between groups by length of time with metastatic breast cancer. **b** Mean direct costs of care in the last month of life for patients with MBC ($N=4521$). Costs of care in each category were significantly different between groups by length of time with metastatic breast cancer except for outpatient costs of care

Fig. 2.
Unadjusted trends in median expenditures per-month-alive by survival time with stage IV breast cancer ($N = 4521$)

Fig. 3. Adjusted yearly proportion of location of death from 2002 to 2012 ($N = 4521$). Logistic regression models were adjusted for age, diagnosis year, race, marital status, hospital location, region, comorbidities, socioeconomic status, hormone receptor status, oncology office volume, survival time. Linear trend test over time of the predicted value using orthogonal polynomial coefficients

Table 1
Patient and hospital characteristics of women with metastatic breast cancer diagnosed 2002–2011

	Total		Length of time with MBC (time from diagnosis until death)								P value
			6 months		6–12 months		> 12 months				
	N	%	N	%	N	%	N	%			
	4521	100	1752	38.8	729	16.1	2040	45.1			
Median survival ^a	9.8		2.5		8.6		27.2				
Age										< 0.0001	
66–69	736	16.3	207	11.8	109	14.9	420	20.6			
70–74	953	21.1	309	17.6	169	23.2	475	23.3			
75–79	994	22.0	377	21.5	161	22.1	456	22.3			
80–84	935	20.7	387	22.1	151	20.7	397	19.5			
85	903	19.9	472	27.0	139	19.1	292	14.3			
Diagnosis year										< 0.0001	
2002	519	11.5	196	11.2	77	10.6	246	12.2			
2003	488	10.8	180	10.3	62	8.5	246	12.1			
2004	527	11.7	174	9.9	86	11.8	267	13.1			
2005	530	11.7	170	9.7	97	13.3	263	12.9			
2006	493	10.9	200	11.4	66	9.0	227	11.1			
2007	488	10.8	177	10.1	68	9.3	243	11.9			
2008	448	9.9	184	10.5	70	9.6	194	9.5			
2009	412	9.1	156	8.9	77	10.6	179	8.8			
2010	355	7.8	163	9.3	64	8.8	128	6.2			
2011	261	5.8	152	8.7	62	8.5	47	2.3			
Race										0.02	
White	3753	83.0	1426	81.4	602	82.6	1725	84.5			
Black	592	13.1	263	15.0	97	13.3	232	11.4			
Other/unknown	176	3.9	63	3.6	30	4.1	83	4.1			
Marital status										< 0.0001	
Married	3040	67.2	1258	71.8	500	68.6	1282	62.8			

	Total		Length of time with MBC (time from diagnosis until death)								P value		
			6 months				6–12 months					> 12 months	
	N	%	N	%	N	%	N	%	N	%			
	4521	100	1752	38.8	729	16.1	2040	45.1					
Single	1277	28.3	417	23.8	184	25.2	676	33.2					
Unknown	204	4.5	77	4.4	45	6.2	82	4.0					
Hospital location											0.42		
Urban	4072	90.1	1565	89.3	660	90.5	1847	90.5					
Rural	449	9.9	187	10.7	69	9.5	193	9.5					
Region											0.40		
East	1217	26.9	471	26.9	180	24.7	566	27.7					
Midwest	1868	41.3	741	42.3	305	41.8	822	40.3					
West	1436	31.8	540	30.8	244	33.5	652	32.0					
Charlson comorbidity											< 0.0001		
0	2198	48.7	730	41.8	339	46.5	1129	55.4					
1	1149	25.4	450	25.7	187	25.7	512	25.1					
2	1169	25.9	568	32.5	203	27.8	398	19.5					
Socioeconomic status											0.45		
1 (low)	1376	30.5	556	31.7	228	31.3	592	29.0					
2	1018	22.5	404	23.1	144	19.8	470	23.1					
3	650	14.4	242	13.8	111	15.2	297	14.6					
4	952	21.1	355	20.3	155	21.3	442	21.7					
5 (high)	522	11.5	195	11.1	90	12.4	237	11.6					
ER/PR status											< 0.0001		
Positive	2545	56.3	764	43.6	366	50.2	1415	69.4					
Negative	822	18.2	390	22.3	182	25.0	250	12.2					
Unknown	1154	25.5	598	34.1	181	24.8	375	18.4					
Location of death											< 0.0001		
Home hospice	1703	37.7	562	32.1	297	40.7	844	41.4					
Facility hospice	902	19.9	346	19.7	146	20.0	410	20.1					
Hospital	995	22.0	454	25.9	137	18.8	404	19.8					

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	Total		Length of time with MBC (time from diagnosis until death)						P value
			6 months		6–12 months		> 12 months		
	N	%	N	%	N	%	N	%	
	4521	100	1752	38.8	729	16.1	2040	45.1	
SNF	330	7.3	175	10.0	47	6.5	108	5.3	
Home without hospice	591	13.1	215	12.3	102	14.0	274	13.4	

All bolded values are $p < 0.05$

^aMedian survival in months

Table 2

Multivariable analysis of factors associated with aggressive end-of-life care and hospice utilization in the last month of life ($N = 4521$)

Factor	Aggressive EOL care ^a			Hospice use last month of life ^b		
	OR	95% CI	p value	OR	95% CI	p value
Age						
66–69	0.94	0.76–1.17	0.58	0.85	0.69–1.05	0.14
70–74	Reference			Reference		
75–79	0.86	0.71–1.05	0.13	1.10	0.90–1.34	0.36
80–84	0.66	0.54–0.80	< 0.0001	1.01	0.83–1.25	0.89
85	0.49	0.40–0.60	< 0.0001	0.93	0.75–1.16	0.52
Diagnosis year	1.02	0.99–1.04	0.19	1.10	1.07–1.12	< 0.0001
Race						
White	Reference			Reference		
Black	1.46	1.19–1.81	0.0004	0.82	0.66–1.01	0.06
Other/unknown	1.17	0.83–1.63	0.37	0.68	0.48–0.96	0.03
Marital Status						
Married	1.04	0.90–1.21	0.59	0.94	0.81–1.09	0.41
Single	Reference			Reference		
Unknown	1.29	0.94–1.77	0.12	0.99	0.72–1.36	0.97
Hospital location						
Urban	Reference			Reference		
Rural	0.75	0.60–0.93	0.01	0.74	0.58–0.93	0.01
Region						
East	Reference			Reference		
Midwest	0.64	0.54–0.76	< 0.0001	1.65	1.38–1.98	< 0.0001
West	0.60	0.50–0.71	< 0.0001	1.02	0.86–1.22	0.82
Charlson comorbidity						
0	Reference			Reference		
1	1.20	1.03–1.39	0.02	0.95	0.81–1.12	0.53
2	2.00	1.70–2.35	< 0.0001	0.86	0.73–1.01	0.07
Socioeconomic status						

Factor	Aggressive EOL care ^a		Hospice use last month of life ^b	
	OR	95% CI	OR	95% CI
1 (low)	Reference		Reference	
2	0.81	0.68–0.97	1.10	0.91–1.33
3	0.91	0.74–1.13	1.18	0.95–1.47
4	0.99	0.81–1.20	1.43	1.17–1.76
5 (high)	0.95	0.75–1.21	1.56	1.21–2.00
ER/PR status				
Positive	Reference		Reference	
Negative	0.99	0.83–1.18	1.06	0.90–1.29
Unknown	0.65	0.56–0.76	1.05	0.88–1.22
Survival time				
6 months	Reference		Reference	
6–12 months	0.47	0.39–0.58	1.27	1.02–1.53
>12 months	0.44	0.38–0.52	1.45	1.21–1.69
Oncology office visit volume				
Never saw	0.67	0.55–0.81	1.00	0.82–1.21
Low	Reference		Reference	
Medium	1.02	0.85–1.23	1.13	0.93–1.38
High	1.56	1.28–1.90	1.03	0.84–1.26
Number of aggressive EOL resources utilized				
0	–	–	1.94	1.64–2.28
1	–	–	Reference	
2	–	–	0.30	0.25–0.35

All bolded values are $p < 0.05$

^a Aggressive end-of-life care included: in the last month of life: ≥ 1 emergency department visit, ≥ 1 hospital admission, ≥ 14 days hospitalized, admission to the intensive care unit (ICU), admission to hospice within 3 days of death, receipt of intravenous (IV) chemotherapy within 14 days of death, life-extending procedures such as a feeding tube placement, ventilation, and/or cardiopulmonary resuscitation, or ten or more encounters with unique physicians in the last 6 months of life

^b In the multivariable model of hospice, aggressive end-of-life care included all measures listed above except admission to hospice within 3 days of death

Hospice referral source and location of services among elderly patients with metastatic breast cancer who enrolled in hospice ($N = 2838$, 62.8% of total cohort)

Table 3

	Total	Prognosis (time from diagnosis until death)						<i>p</i> value	
		6 months		6–12 months		> 12 months			
		<i>N</i>	%	<i>N</i>	%	<i>N</i>	%		
	4521	100	1752	38.8	729	16.1	2040	45.1	
Median survival (months)	9.8		2.5		8.6		27.2		
Hospice enrollment	2821	100	975	34.6	476	16.9	1370	48.5	< 0.0001
Source of referral									< 0.0001
Inpatient	984	34.9	438	44.9	150	31.5	396	28.9	
SNF	273	9.7	143	14.7	29	6.1	101	7.4	
Outpatient	1564	55.4	394	40.4	297	62.4	873	63.7	
Hospice location									< 0.0001
Home	1436	50.9	418	42.9	253	53.1	765	55.8	
Facility	1106	39.2	496	50.9	176	37.0	434	31.7	
Both	279	9.9	61	6.2	47	9.9	171	12.5	

All bolded values are $p < 0.05$