Comparing Stage at Diagnosis Among Patients With Breast Cancer Served by Military and Civilian Medical Care Systems

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Abstract

Background: Breast cancer (BC) remains one of the top causes of cancer-related deaths in women in the United States, and little is known about the differences in access to health care between military and civilians. This study compared the differences in access to health care between military and civilian female patients with BC. In particular, this study examined whether patients with BC, in an equal access health care system such as the military, are diagnosed at an earlier stage of disease process in comparison to the patients with BC in the civilian health care system.

Methods: Independent variables included military versus civilian care and demographic variables. Dependent variable was the stage of cancer at diagnosis. This cross-sectional study of 2 groups included data from 2198 women with BC (439 military and 1759 civilian) for years 2004 through 2008. Multiple logistic regression was used to analyze the data.

Results: There was no difference in the early BC stage (0, I, and II) diagnosis prevalence rate between the military and the civilian groups (95% confidence interval [CI], $P = .15$). The logistic regression analysis indicated that both the health systems had equal performance with respect to the stage at diagnosis indicator but found that black patients had higher odds of being in the late stage (III and IV) BC group at diagnosis (1.62 OR, 1.14-2.30 CI, $P = .0068$) than white patients.

Conclusions: Although no difference was found between the performance of the 2 health systems in the early (0, I, and II) versus late stage (III and IV) at diagnosis indicator, this study further confirms the existence of racial disparities in late-stage BC regardless of whether the patient was diagnosed in the civilian or military health system. More research is needed to further investigate the potential explanations of racial disparities other than just differences in access to health care.

Keywords

stage at diagnosis, breast cancer, military, civilian

Introduction

Breast cancer (BC) ranks second among the death-causing cancers in women and is the most common nonskin cancer in the United States.[1] Although the prevalence of BC is highest among white women, the mortality rate is highest among black women. Although BC diagnosis and death rates have decreased since 2000, the mortality gap between black and white women has widened when compared to the 1990s data. In 2010, there were 207 090 new cases of women with BC and 39 840 died from BC, according to the National Cancer Institute (NCI) estimates.

Financial access is an important factor. Patients without health insurance and underinsured patients have a greater likelihood of being diagnosed with BC at an advanced stage of disease, in comparison to patients with a private or Medicare insurance.[2-5] Other studies also indicated that patients without health insurance, and those with Medicaid insurance, were less likely to receive adequate screening and follow-up treatments.[3] Additionally, racial and ethnic differences were also a factor in the time of diagnosis, starting from detection

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Table 1. Characteristics of the Study Sample.

Characteristics	Military Group, N = 439	Civilian Group, N = 1759	P Value
Patient age, % (no. of patients), y			
20-49		23.3 (410)	.0001
50-64		39.5 (648)	
65-89		37.2 (701)	
Race, % (no. of patients)			
Caucasian	78.4 (344)	80.9 (1418)	.0065
African American	14.8 (65)	9.9 (174)	
Other	6.8 (30)	9.1 (160)	
Ethnicity, % (no. of patients)			
Hispanic	19 (82)	5.8 (102)	.0001
Non-Hispanic	81 (349)	94.2 (1657)	
Marital status, % (no. of patients)			
Married	78.7 (344)	57.4 (948)	.0001
Not married	21.3 (93)	42.6 (703)	
Stage, % (no. of patients)			
Stage 0	27.1 (119)	23.9 (420)	.0622
Stage I	31.7 (139)	37.2 (654)	
Stage II	24.6 (108)	25.8 (435)	
Stage III	12.3 (54)	8.5 (149	
Stage IV	4.3 (19)	4.7 (83)	

through diagnosis to treatment.[6] Furthermore, few studies have explored the disparity between various populations of patients with BC in settings with equal access to health care.[7]

The purpose of this study was to test whether patients with BC in the military hospital and general civilian patients differed in regard to the stage of BC at diagnosis. Late-stage diagnosis was used as an indicator of access to appropriate medical care. The military medical care system is designed to provide equal access for all of its beneficiaries, thus making it an ideal setting for studying this type of access indicator by comparing it with the civilian health care system.

Methods

This cross-sectional study tested the differences between 2 groups and included retrospective data. The data for the military group were obtained from Brooke Army Medical Center (BAMC) Cancer Registry at Fort Sam Houston, Texas, and consisted of 439 de-identified records of female patients diagnosed with BC in the 5-year time period from 2004 through 2008. The data for the civilian group were obtained from NCI Surveillance, Epidemiology, and End Results tumor registries (NCI SEER), where the de-identifed sample records were selected from the same time period. The SEER 9 research data cover approximately 9.5% of the US population and include the following geographic areas: San Francisco, Connecticut, Detroit (Metropolitan), Hawaii, Iowa, New Mexico, Seattle (Puget Sound), Utah, and Atlanta (Metropolitan). From the available 115 641 records, 1759 were randomly selected, yielding an approximate 4:1 ratio between the civilian and the military records. The BAMC institutional review board approved

the study. The inclusion criteria were age 20 to 89, female, and BC initial diagnosis between 2005 and 2008. Patients with BC having disease recurrence were excluded.

The categories for age at diagnosis were set as follows: 20-49, 50-64, and 65-89. Marital status was coded as *married* or *not married*. The first included married and common law relationships, while the *not married* included single, separated, divorced, widowed, unmarried, and domestic partner (opposite sex, same sex, or unregistered). The race category was divided into *white*, *black*, and *other*. Other included Native Americans, all Asians, and Pacific Islanders, and any category listed as "other." Finally, the ethnicity was divided into 2 categories, *Hispanic* and *non-Hispanic*. The former included all participants of Spanish or Hispanic origin or surname, such as Mexican, Puerto Rican, and Cuban. The American Joint Committee on Cancer (AJCC) criteria determined the stage at diagnosis. Early stage was defined as stages 0, I, and II, while the late stage was defined as III and IV

Results

The characteristics of the study sample groups are displayed in Table 1. The mean patient age at diagnosis was 57 years in the military group and 60.1 years in the civilian group. The military group had larger percentages of patients in the age-groups 20 to 49 and 50 to 64 than the civilian group (26.9% and 49.7% vs 23.3% and 39.5%; $P < .001$), while the percentage of patients in the 65 to 89 age-group was smaller in the military group by comparison (23.5% vs 37.2%; $P < .001$).

The frequency analysis for race indicated that the military and civilian groups had a similar percentage of caucasians or whites (78.4% and 80.9%, respectively; $P = .006$) but differed in regard to the percentage of blacks and other. The military group had a higher percentage of blacks (14.8% vs 9.9%; $P = .006$) and a lower percentage of the other category (6.8% vs 9.1%, $P = .006$). In regard to ethnicity, the military group had a higher percentage of Hispanics than the civilian group (19% vs 5.8%; $P < .001$). The military group also had a higher percentage of married patients than the civilian group (78.7% vs 57.4%; $P < .001$).

The logistic regression model included military versus SEER, race, ethnicity, age, and marital status (see Table 2). The significant variable was the race, indicating that black patients had higher odds than white patients to be in the late-stage BC group at diagnosis (1.62 odds ratio [OR], 1.14-2.30 confidence interval [CI], $P = .0068$). There was also a statistical difference between the *other* race category (encompassing Asians, Native Americans, etc) and white (0.54 OR, 0.30-0.95 CI, $P = .03$), thus indicating that patients from *other* race category also had higher odds than white patients to be in the late-stage BC group at diagnosis. The marital status variable also indicated that unmarried patients had higher odds than married patients to be in the late-stage BC group (1.45 OR, 1.11-1.89 CI, $P = .0051$). The age at diagnosis variable was significant for the age category 65 to 89 years, increasing their odds of being in the late-stage BC group in comparison to the

Table 2. Unconditional Logistic Regression for All Independent Variables.[a]

Term	Odds Ratio	95% CI	Coefficient	SE	Z Statistic	P Value
SEER vs military	0.7867	0.5787-1.0694	−0.2399	0.1566	−1.5317	.1256
Age-group						
20-49 (reference)						
50-64	0.8163	0.6045-1.1023	−0.2030	0.1532	−1.3246	.1853
65-89	0.5935	0.4239-0.8310	−0.5217	0.1717	−3.0376	.0024
Race						
White (reference)						
Black	1.6244	1.143 -2.3076	0.4852	0.1791	2.7087	.0068
Other	0.5403	0.3067-0.9517	−0.6157	0.2889	−2.1314	.0331
Not married vs married	1.4567	1.1194-1.8956	0.3762	0.1344	2.7994	.0051
Hispanic vs not	1.2286	0.7975-1.8928	0.2059	0.2205	0.9338	.3504

Abbreviations: CI, confidence interval; SE, standard error; SEER, Surveillance, Epidemiology, and End Results.
[a] N = 2106.

age category 20 to 49 years (0.59 OR, 0.42-0.83 CI, $P = .0024$). Nonsignificant variables were group (military vs civilian patients, 0.78 OR, 0.57-1.06 CI, $P = .12$; and ethnicity, 1.22 OR, 0.79-1.89 CI, $P = .35$). Therefore, adjusting for covariates (race, ethnicity, age, and marital status) revealed that the groups (military vs SEER) did not differ significantly in early versus late stage at the time of diagnosis.

Discussion

The purpose of this study was to test whether patients with BC in the military hospital differed from civilian patients in regard to the stage of BC at diagnosis. The study examined the differences in access to health care between military and civilian female patients with BC by looking at cancer stage at diagnosis. More specifically, this study examined whether patients with BC, in an equal access health care system such as the military, are diagnosed at an earlier stage of the disease process in comparison to the patients with BC in the civilian health care system.

The logistic regression analysis revealed that the performance of military and civilian health systems on the stage of diagnosis indicator was equivalent in the early versus late stage at diagnosis, wherein the early stage was defined as stages 0, I, and II and the late stage as III and IV. However, the race variable was statistically significant, thus further confirming the presence of racial disparities among patients with BC regardless of the health system. Ethnicity was not significant in our results. These finding are partially congruent with previous reports. Lantz et al reported that black and Hispanic female patients were less likely than white women to be diagnosed at an earlier stage of disease.[8] Miranda et al found racial and ethnic differences and indicated that women from Mexico and Central and South America had the lowest rates in reported use of mammograms, the highest rates of never having mammograms, and the highest uninsured rates.[9]

Previous research reported that uninsured and Medicaid insured patients were more likely to present with advanced stages of BC, and other cancers, at diagnosis than patients with private or Medicare insurance, with an elevated risk for black and Hispanic women.[3,4] Furthermore, previous research showed racial differences in the rates of receiving stage-appropriate, guideline-recommended BC care[10] and in timely follow-up after abnormal mammogram[11] or receiving diagnostic evaluation and starting treatment after self-examination by the patients.[6] The published literature usually did not examine equal access settings. Most have found racial and/or ethnic differences in regard to some aspect of BC care or in regard to insurance status among patients with BC. The results of these studies indicated health disparities among various segments of the US population and recommended equal opportunity and access to health care.[7,12] The few studies that examined equal access settings, either some variant of equal access[7] or the military equal access health system,[12,13] have also found racial differences in regard to some aspects of BC care.

The results of this study are important because few studies have examined differences between the 2 health systems (military vs civilian) in regard to the access to health care using the stage of disease at diagnosis as the dependent variable. This study made comparisons between patients with BC from 2 different health care settings, the military equal access and the civilian health care systems, based on the early- (0, I, and II) versus late- (III and IV) stage BC at diagnosis indicator. This staging system has been predetermined by AJCC and is of high reliability.

The study design was cross-sectional, limiting our ability to the assessment of association at a single point in time. At the time the study was conducted, the latest available data from SEER were from 2008. Health insurance status was not available for this time period. Although health insurance status could have enhanced our understanding of the differences in the stage at diagnosis among the civilian patients with BC in the 2 health systems, it was less relevant to the patients in the military care system. Nevertheless, in this study, insurance status could only be stated indirectly such as equal access military health system (all members provided with health insurance) versus nonequal access civilian health system (inconsistency in availability and level of health insurance).

Furthermore, the inclusion of other socioeconomic variables such as education or income may have shed more light on any other potential confounders in this study. However, these data were not available in the SEER database at the time the database was requested for this study. Also, this study did not include potential biological, environmental, or behavioral risk factors for BC that could have had confounding effects on the variables had they been examined.

The data for the military patients with BC were obtained from BAMC Cancer Registry. The BAMC Command consists of a large single inpatient medical facility and regional military treatment facilities with various and often changing groups of military beneficiaries and their families. The population mix from this institution may have differed from the populations at other military institutions located elsewhere and serving different military beneficiary groups.

As a single institution, BAMC might have not provided the necessary population sample for generalizability purposes. The civilian data for this study were drawn from the SEER 9 database that covers about 9.5% of the US population. Again, the population mix obtained from these registries could have differed from the populations in other SEER registries and thus offered different results. Finally, the population and findings from this database might not be generalizable for some regions that did not participate in the SEER database.

Most researchers agreed that further research efforts in regard to BC care should be aimed at examining disparities in BC outcomes[8,13] and identifying associated risk factors and barriers to these disparities.[11,12] Although there was a general agreement in the literature about the importance of health insurance and many researchers advocated for implementation of equal access to health care, there were specific recommendations to identify and study other factors besides insurance status and equal access to health care, such as social, economic, cultural, or biological factors that may be also responsible for racial disparities.[8,10,12,13]

Although this study did not specifically look at the stage distribution differences between the systems, there were no statistically significant differences noted in regard to the individual stages of disease at diagnosis. Advancements in early detection technology should be moving the overall stage distribution toward the earlier stages. Future research could be directed toward determining whether there are any differences in stage distributions between the 2 systems, military and civilian. Also, comparison of the stage at diagnosis with differently defined cutpoints between the stages, such as placing the cutpoint between Stage I and II or between IIa and IIb, may yield new results.

Furthermore, future research should focus on identifying specific factors that contribute to racial disparity in BC care, starting with prevention through screening, diagnosis to treatment, in the civilian as well as in the military equal access health systems. Finally, evaluating the impact of various health disparity mitigating activities, such as offering easy access to information on cancer and screening, providing cancer treatment options within minority communities, eliminating language and cultural barriers, or providing affordable health insurance, would be an important step toward achieving a better BC care for all individuals.

Conclusions

The findings of this study revealed that the military and civilian health systems showed equivalent performance with regard to the stage at diagnosis indicator in the early (0, I, and II) versus late (III and IV) stage and that any apparent differences were due to the statistical significance of the race variable. Specifically, the findings indicated that black and *other* race category women with BC had higher odds of being in the late-stage BC group at diagnosis than white women with BC. Despite the limitations, the results of this research provide further evidence on racial disparity among patients with BC in the United States.

Declaration of Conflicting Interests

Funding

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