

Hospital Outcomes of Male Breast Cancer in the United States

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Breast cancer is frequently diagnosed and clinically impacts the mortality of women in the United States.¹ In 2019, 268,600 women were estimated to be diagnosed with breast cancer, and 41,760 women were estimated to die due to breast cancer.² Breast cancer can also be diagnosed in men, as men have breast tissue in which breast cancer can develop.³ Approximately 2670 men were estimated to be diagnosed with breast cancer in 2019.² The prevalence of male breast cancer accounts for less than 1% among total cases of breast cancer⁴; however, the incidence of male breast cancer has steadily increased from 0.85 to 1.44 per 100,000 since 1975.⁵

Physicians treating male patients with breast cancer are advised to extrapolate from the results of clinical trials of female breast cancer or to follow the guidelines for female breast cancer.^{6,7} This may be due to the relatively scarce clinical evidence of male breast cancer compared with female breast cancer, as only one-third of trials for patients with breast cancer have been open to male patients.⁸ However, patients with breast cancer show different clinical characteristics by gender. For example, male patients present at older ages and have a higher percentage of estrogen receptor (ER)-positive tumors compared with female patients, and the molecular subtypes and distinct immunophenotypic profiles differ between female and male patients with breast cancer.^{9,10} Moreover, the risk of mortality is higher in male patients with breast cancer compared with female patients.^{10,11} These differences necessitate research focusing on male breast cancer.

Female breast cancer imposes a substantial economic burden in the United States because of the medical costs and the high incidence rate.^{1,12-14} A previous US study found that breast cancer treatment increased substantial health care costs in the managed care population. The study estimated the mean monthly total health care costs per patient with breast cancer at \$4421, and hospitalizations mainly induced those costs with a mean expense of \$1576.¹⁵ The health care costs for patients with breast cancer were higher than those for patients without cancer (mean monthly total health care costs, \$3352; mean monthly hospital costs, \$213). Another study reported that the highest portion of medical expenses in

ABSTRACT

OBJECTIVES: Hospital utilization and costs of female breast cancer have been well documented. However, evidence focusing on male breast cancer is scarce, despite the different clinical characteristics between female and male breast cancer. We aim to estimate hospital length of stay (LOS) and costs associated with male breast cancer in the United States.

STUDY DESIGN: Retrospective observational study.

METHODS: We analyzed the 2012-2016 Health Care Utilization Project National Inpatient Sample of 416 hospitalization events of male patients with breast cancer. Patients who had breast cancer diagnoses were selected based on the primary *International Classification of Disease, Ninth Revision or Tenth Revision, Clinical Modification* codes. A negative binomial regression and a generalized linear model with a gamma distribution and log-link function were conducted to estimate the LOS and hospital costs after controlling for sociodemographics, clinical characteristics (eg, metastatic status, Elixhauser Comorbidity Index [ECI] score), and hospital characteristics.

RESULTS: On average, male patients with breast cancer stayed for 2.42 days and expensed \$9059 per hospital visit. Patients with metastatic status had longer LOS (5.39 vs 3.24 days; $P = .005$) and higher hospital costs (\$11,185 vs \$8547; $P = .03$) than those without. Patients with an ECI score of 3 or more showed longer LOS (4.05 vs 2.68 days; $P = .003$) and higher hospital costs (\$10,043 vs \$7022; $P < .001$) than those with an ECI score of 0.

CONCLUSIONS: LOS and hospital costs for male patients with breast cancer were associated with metastatic status and comorbidities. This information can be used to assess the health care resources needed to treat male breast cancer.

Am J Manag Care. 2021;27(6):e181-e187. doi:10.37765/ajmc.2021.88666

TAKEAWAY POINTS

- ▶ It is well known that there is a substantial economic burden of managed care for the female population with breast cancer in the United States. However, information on health care utilization and costs for male patients with breast cancer is sparse despite the epidemiological differences between male and female breast cancer.
- ▶ We found that male patients with breast cancer experienced an estimated hospital stay duration of 2.4 days and costs of \$9059 per hospitalization in the United States. Metastatic status and comorbidities were the major predictors of a longer stay and higher costs.
- ▶ Our findings will be helpful for the allocation of health care resources for men with breast cancer.

female breast cancer is used for hospitalization.¹⁶ Hospital costs for female breast cancer were estimated to be \$4100 per day, the second highest cancer-related hospital expenditures in 2009.¹⁷ Breast cancer was one of the most common cancer hospitalizations among adult women in 2009.¹⁷

Although the economic burden due to hospitalization is well known in female breast cancer, no study about hospital utilization and costs in male breast cancer in the United States has been conducted. Estimating hospital utilization and costs is necessary to inform decision makers of the health care resources needed to prevent and treat male breast cancer. Therefore, we aimed to assess hospital utilization and costs associated with male breast cancer in the United States.

MATERIALS AND METHODS

Data Source

We used the hospital discharge data from the 2012–2016 Health Care Utilization Project National Inpatient Sample (HCUP-NIS), which is managed by the Agency for Healthcare Research and Quality (AHRQ). This database is based on information at the hospitalization event level. The HCUP-NIS contains information on hospital inpatient stays extracted from the billing data of hospitals to statewide data organizations across the United States.¹⁸ This database covers more than 97% of the US population based on a 20% stratified sample of discharges from US community hospitals except for rehabilitation and long-term acute care hospitals.

Study Sample

We identified a total of 416 hospital discharges of male patients with breast cancer for this study, with the discharges being those with the diagnosis code of breast cancer using the primary *International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM)* or *Tenth Revision, Clinical Modification (ICD-10-CM)* code. We defined patients between 2012 and the third quarter of the 2015 database as having code 175 (malignant neoplasm of male breast) using *ICD-9-CM*, and patients between the fourth quarter of 2015 and 2016 as having code C50 (malignant neoplasm of breast) using *ICD-10-CM*.¹⁹ We pooled the data from 2012 to 2016 to ensure a sufficient sample size for reliable estimates. We excluded hospitalization events of patients younger than 18 years at discharge.

Variables

The outcome variables were length of stay (LOS) and hospital costs. The LOS was measured as the number of days per hospitalization. The hospital costs were calculated by multiplying the total charge and cost to charge ratio per hospitalization event. The value of cost to charge ratio provided by the AHRQ was used in this calculation.²⁰ The costs for 2012 to 2015 were inflated to 2016 US\$ using the index of personal consumption expenditures for

medical care and hospitalization.^{21,22}

The clinical and hospital characteristics included surgical treatment (yes or no), metastatic status (yes or no), in-hospital mortality (yes or no), Elixhauser Comorbidity Index (ECI) score (0, 1, 2, or ≥ 3), timing of admission (weekday or weekend), hospital location and teaching status (rural, urban and nonteaching, or urban and teaching), hospital census region (Northeast, Midwest, South, or West), and hospital size (small, medium, or large). Other covariates were age (< 50, 50–64, 65–79, or ≥ 80 years), race/ethnicity (White, Black, Hispanic, or others), household income (lowest, second, third, and highest quartiles), and primary payer (government including Medicare/Medicaid, private insurance including health maintenance organization, and others including self-pay and charity).^{19,23}

The surgical treatment variable was based on the *ICD-9/10-CM* procedure coding system of breast conservation surgery and mastectomy surgery.^{24,25} The ECI score was calculated taking into account the target population of patients with breast cancer.²⁶ The codes for defining surgical treatment and metastatic status are presented in the [eAppendix Table](#) (available at [ajmc.com](#)).²³

Statistical Analyses

We conducted simple descriptive analyses, such as calculating the mean for the continuous variables and percentages for the categorical variables. A negative binomial regression and a generalized linear model with a gamma distribution and log-link function were conducted to estimate LOS and hospital costs adjusted by factors of sociodemographic, clinical, and hospital characteristics. We then estimated the margins for LOS and hospital costs by each factor from the regression models. Margins were generated by the average marginal effects method. The analyses applied the sampling weights to account for the stratification of the national sample. The threshold for significance was 0.05 for all statistical analyses. All analyses were conducted using Stata version 16 for Windows (StataCorp LLC).

RESULTS

We identified 416 hospitalization events of male patients with breast cancer 18 years and older from the data during 2012 to 2016. The weighted observations were calculated as 416 using the 2012–2016 NIS database, which contains a 20% sample of discharges.

The sociodemographic, clinical, and hospital characteristics for the study population are presented in **Table 1**. More than half of the patients were 65 years or older at the time of discharge (n = 238; 57.2%) and more than two-thirds were White (n = 303; 72.8%). Among the patients discharged, approximately 80% received surgeries such as breast conservation surgery or mastectomy (n = 335; 80.5%), and approximately 18% had metastatic status (n = 77; 18.5%). Patients stayed for a mean (standard error [SE]) of 2.42 (0.15) days while spending a mean (SE) of \$9059 (\$345) per hospitalization.

Table 2 shows the negative binomial regression estimates on LOS for hospitalization events of male patients with breast cancer. Inpatient hospitalization with surgical treatment showed a significantly lower LOS (incidence rate ratio [IRR], 0.57; 95% CI, 0.41-0.79; $P < .001$) relative to that without surgical treatment. Those who received surgical treatment during hospitalization had significantly shorter stays (1.87 days) compared with those who did not (3.30 days). In-hospital mortality also significantly lowered the LOS (IRR, 0.61; 95% CI, 0.40-0.94; $P = .025$). Patients with metastatic status at the time of discharge stayed 1.67 times (95% CI, 1.17-2.37; $P = .005$) longer than patients without metastatic status. Patients with an ECI score of 3 or greater showed longer LOS (IRR, 1.51; 95% CI, 1.15-1.99; $P = .003$) than those with a score of 0. Otherwise, LOS was not influenced by age group, household income, primary payer, timing of admission, and hospital-related variables including hospital location, census region, and size of hospital.

Table 3 presents the generalized linear model estimates on hospital costs among male patients with breast cancer. Looking at hospital costs, they were not influenced by surgical treatment (cost ratio, 0.99; 95% CI, 0.78-1.26; $P = .954$). Metastatic status was positively associated with higher hospital costs (cost ratio, 1.31; 95% CI, 1.03-1.67; $P = .030$) than nonmetastatic status (\$11,185 vs \$8547). The results showed that patients with an ECI score of 1 had 1.19 times higher (95% CI, 1.02-1.39; $P = .025$) hospital costs than patients who had a score of 0. The likelihood increased with higher ECI scores (score of 2: cost ratio, 1.20; 95% CI, 1.01-1.43; $P = .039$; score of ≥ 3 : cost ratio, 1.43; 95% CI, 1.21-1.69; $P < .001$). Hospitalizations

TABLE 1. Characteristics of Hospitalized Male Patients With Breast Cancer in the United States

Patient characteristics	n	Weighted %
Total discharge events ^a	416	100.0
Mean (SE) age in years	66.7 (0.65)	
Age group in years		
18-49	44	10.6
50-64	134	32.2
65-79	161	38.7
≥ 80	77	18.5
Race/ethnicity		
White	303	72.8
Black	69	16.6
Hispanic	22	5.3
Others	22	5.3
Household income		
Lowest quartile	102	24.5
Second quartile	80	19.2
Third quartile	99	23.8
Highest quartile	135	32.5
Primary payer		
Government (Medicare/Medicaid)	258	62.0
Private, including HMO	134	32.2
Other (self-pay, charity) and unknown	24	5.8
Timing of admission		
Weekday	399	95.9
Weekend	17	4.1
Surgical treatment ^b		
None	81	19.5
BCS	17	4.1
Mastectomy	321	77.2
Metastatic breast cancer		
Yes	77	18.5
No	339	81.5
Mean (SE) ECI score	1.99 (0.08)	
ECI score group		
0	76	18.3
1	109	26.2
2	91	21.9
≥ 3	140	33.7
Severity of illness subclass		
Minor loss of function	213	51.2
Moderate loss of function	134	32.2
Major loss of function	59	14.2
Extreme loss of function	10	2.4
Discharge status		
Routine	267	64.2
Transfer ^c	139	33.4
In-hospital mortality	10	2.4

(continued)

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TABLE 1. (Continued) Characteristics of Hospitalized Male Patients With Breast Cancer in the United States

Patient characteristics	n	Weighted %
Hospital location and teaching status		
Rural	37	8.9
Urban and nonteaching	110	26.4
Urban and teaching	269	64.7
Hospital census region		
Northeast	152	36.5
Midwest	77	18.5
South	110	26.4
West	77	18.5
Hospital size		
Small	61	14.7
Medium	124	29.8
Large	231	55.5
Mean (SE) length of stay in days	2.42 (0.15)	
Mean (SE) hospital cost in US\$	9059 (345)	

BCS, breast conservation surgery; ECI, Elixhauser Comorbidity Index; HMO, health maintenance organization; SE, standard error.

*The number of weighted total discharge events is 416. The weighted value was calculated from the 5 years of data, which contain 20% of the stratified samples of discharges from US community hospitals.

†Total is more than 416 patients due to the patients who underwent both surgeries (BCS and mastectomy).

‡Includes short-term hospital; skilled nursing facility, intermediate care facility, and another type of facility; home health care; and against medical advice.

TABLE 2. Adjusted Incidence Rate Ratio and Predicted Mean Length of Stay for Hospitalized Male Patients With Breast Cancer in the United States

	Incidence rate ratio (95% CI)	P	Mean length of stay in days (95% CI)
Age group in years			
< 50	1.00	–	3.18 (2.07-4.29)
50-64	0.99 (0.75-1.32)	.971	3.17 (2.16-4.17)
65-79	1.09 (0.80-1.48)	.602	3.46 (2.30-4.61)
≥ 80	1.10 (0.79-1.53)	.556	3.51 (2.24-4.79)
Race/ethnicity			
White	1.00	–	3.44 (2.44-4.44)
Black	1.01 (0.75-1.34)	.966	3.46 (2.19-4.74)
Hispanic	0.80 (0.55-1.16)	.239	2.75 (1.48-4.02)
Others	0.73 (0.54-0.99)	.045	2.52 (1.52-3.51)
Household income			
Lowest quartile	1.00	–	3.93 (2.70-5.17)
Second quartile	0.70 (0.51-0.97)	.033	2.76 (1.82-3.69)
Third quartile	0.86 (0.61-1.20)	.381	3.38 (2.11-4.66)
Highest quartile	0.73 (0.52-1.02)	.066	2.87 (1.86-3.88)
Primary payer			
Government (Medicare/Medicaid)	1.00	–	3.34 (2.30-4.37)
Private including HMO	0.82 (0.63-1.08)	.156	2.75 (1.75-3.75)
Other (self-pay, charity)	1.48 (0.96-2.30)	.079	4.94 (2.86-7.02)

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with in-hospital mortalities had lower hospital costs compared with hospitalizations without mortalities (\$5846 vs \$8678), but the difference in hospital costs by in-hospital mortality was not statistically significant (cost ratio, 0.67; 95% CI, 0.38-1.18; $P = .168$).

DISCUSSION

According to the PubMed library, 262,175 articles containing the key words “breast cancer” in the title or abstract have been published as of 2019. Of those articles, only 1406 contained the keywords “male breast cancer,” representing less than 1% among the articles about breast cancer. These search results show that most studies about breast cancer have focused on female breast cancer. Studies reporting the hospital utilization or discharge costs focusing on male breast cancer were absent. The lack of evidence on health care resource utilization of male breast cancer is even more apparent.

To our knowledge, this is the first study to estimate the LOS and costs of inpatient settings and also the first to explore the association between hospital utilization and costs with sociodemographic, clinical, and hospital-level characteristics among male patients with breast cancer using a nationwide database. We found that men with breast cancer stayed for a mean of 2.42 days and cost a mean of \$9059 per hospitalization event in the United States. We found that LOS and hospital costs were associated with the metastatic status and the ECI score of patients. The mean LOS and hospital costs increased to 5.39 days and \$11,185 for patients with metastatic status. Patients with an ECI score of 3 or more had a mean LOS of 4.05 days and \$10,043 in mean hospital costs. Surgery and in-hospital mortality decreased LOS, but hospital costs did not significantly differ by those specific factors.

In male breast cancer treatment, the number of patients who used hormonal therapy steadily increased among ER-positive patients since 2004.²⁷ Additionally, the proportion of orders for Oncotype DX testing increased among male patients with lymph node–negative, ER-positive, and HER2-negative breast cancer. These changes in male breast cancer treatment may have influenced hospital-related outcomes (eg, in-hospital mortality, hospital costs, LOS).

Unfortunately, no previous studies have focused on hospital-related outcomes in male breast cancer to compare with the results of this current study. Therefore, we compared the results on hospital-related outcomes for both male and female patients. Previous studies, including reports from HCUP, reported that patients with breast cancer, including both men and women, were hospitalized for approximately 2.5 days.^{17,28-32} This value is similar to our current result of LOS (2.42 days). However, the results on hospital costs differed by the study setting. The current study estimated the mean hospital costs as \$9059 in 2016. The HCUP report, which analyzed the hospital costs for patients with breast cancer overall, reported the costs as \$10,300 in 2009.¹⁷ Considering inflation, the costs from the HCUP report can be adjusted to \$11,523 in 2016 (Consumer Price Index in 2009, 214.537; 2016, 240.007).³³ Thus, the hospital costs of overall patients with breast cancer are higher than those of male-only patients with breast cancer. A previous study about health care costs suggested that women generally tend to use more health care resources and generate more costs than men.^{34,35} However, it is hard to conclude from this previous study alone that this higher hospital cost of overall patients with breast cancer is associated with female patients with breast cancer. Therefore, we suggest further studies to compare the health care costs of patients with breast cancer by gender and to identify the influential factors that induce the differences in cost by gender.

In this research, we showed that the patients with higher ECI scores had a longer LOS and higher hospital costs compared with those with scores of 0. Our findings of the association between specific clinical characteristics (eg, metastatic status and comorbidity) and hospital outcomes (eg, LOS and hospital costs) also aligned with results of a previous study of female patients with breast cancer.³⁶ In this previous study, which included female patients with breast cancer who underwent surgery, results showed increasing LOS with increasing severity of comorbidities, which was measured by the Charlson Comorbidity Index. Moreover, this similar trend was identified in studies of other cancer types.^{37,38} Results of those studies showed that LOS and hospital costs significantly increased according to a

TABLE 2. (Continued) Adjusted Incidence Rate Ratio and Predicted Mean Length of Stay for Hospitalized Male Patients With Breast Cancer in the United States

	Incidence rate ratio (95% CI)	P	Mean length of stay in days (95% CI)
Timing of admission			
Weekday	1.00	–	3.15 (2.22-4.08)
Weekend	1.22 (0.83-1.81)	.314	3.85 (2.18-5.52)
Surgical treatment			
No	1.00	–	3.30 (2.34-4.25)
Yes	0.57 (0.41-0.79)	.001	1.87 (1.55-2.19)
Metastatic breast cancer			
No	1.00	–	3.24 (2.26-4.22)
Yes	1.67 (1.17-2.37)	.005	5.39 (4.15-6.64)
In-hospital mortality			
No	1.00	–	3.33 (2.36-4.29)
Yes	0.61 (0.40-0.94)	.025	2.04 (1.07-3.01)
ECI score			
0	1.00	–	2.68 (1.73-3.64)
1	1.22 (0.90-1.67)	.205	3.28 (2.15-4.41)
2	0.93 (0.69-1.24)	.616	2.49 (1.66-3.32)
≥3	1.51 (1.15-1.99)	.003	4.05 (2.80-5.31)
Hospital location and teaching status			
Rural	1.00	–	3.23 (1.93-4.54)
Urban and nonteaching	1.03 (0.71-1.49)	.884	3.32 (2.20-4.45)
Urban and teaching	1.02 (0.76-1.37)	.906	3.29 (2.33-4.26)
Hospital census region			
Northeast	1.00	–	3.15 (2.09-4.20)
Midwest	1.16 (0.90-1.49)	.253	3.65 (2.43-4.86)
South	1.08 (0.86-1.35)	.503	3.40 (2.21-4.58)
West	0.92 (0.69-1.24)	.604	2.91 (2.01-3.80)
Hospital size			
Small	1.00	–	2.97 (1.89-4.05)
Medium	0.99 (0.76-1.30)	.956	2.94 (1.88-4.01)
Large	1.19 (0.92-1.54)	.182	3.53 (2.54-4.53)

ECI, Elixhauser Comorbidity Index; HMO, health maintenance organization.

TABLE 3. Adjusted Ratio for Hospital Cost and Predicted Mean Hospital Costs for Hospitalized Male Patients With Breast Cancer in the United States

	Ratio for hospital cost (95% CI)	P	Mean hospital cost in US\$ (95% CI)
Age group in years			
< 50	1.00	–	8753 (6438-11,067)
50-64	1.00 (0.82-1.22)	.986	8737 (6675-10,799)
65-79	0.98 (0.80-1.20)	.827	8557 (6623-10,491)
≥80	0.94 (0.73-1.19)	.597	8198 (5989-10,407)
Race/ethnicity			
White	1.00	–	8688 (6797-10,580)
Black	1.00 (0.85-1.17)	.958	8651 (6455-10,847)
Hispanic	0.94 (0.72-1.23)	.635	8140 (5281-10,999)
Others	1.01 (0.83-1.24)	.911	8788 (6298-11,278)

(continued)

TABLE 3. (Continued) Adjusted Ratio for Hospital Cost and Predicted Mean Hospital Costs for Hospitalized Male Patients With Breast Cancer in the United States

	Ratio for hospital cost (95% CI)	P	Mean hospital cost in US\$ (95% CI)
Household income			
Lowest quartile	1.00	–	8767 (6736-10,798)
Second quartile	0.90 (0.75-1.09)	.278	7916 (5861-9972)
Third quartile	1.07 (0.87-1.30)	.524	9357 (6990-11,723)
Highest quartile	0.96 (0.79-1.15)	.638	8386 (6327-10,444)
Primary payer			
Government (Medicare/Medicaid)	1.00	–	8780 (6713-10,847)
Private including HMO	0.96 (0.83-1.11)	.596	8437 (6484-10,390)
Other (self-pay, charity)	0.91 (0.69-1.20)	.494	7975 (5562-10,387)
Timing of admission			
Weekday	1.00	–	8691 (6679-10,703)
Weekend	0.96 (0.66-1.39)	.825	8336 (5234-11,438)
Surgical treatment			
No	1.00	–	8618 (6716-10,520)
Yes	0.99 (0.78-1.26)	.954	8557 (7609-9505)
Metastatic breast cancer			
No	1.00	–	8547 (6621-10,474)
Yes	1.31 (1.03-1.67)	.030	11,185 (8803-13,567)
In-hospital mortality			
No	1.00	–	8678 (6759-10,598)
Yes	0.67 (0.38-1.18)	.168	5846 (2483-9210)
ECI score			
0	1.00	–	7022 (5269-8775)
1	1.19 (1.02-1.39)	.025	8360 (6293-10,428)
2	1.20 (1.01-1.43)	.039	8433 (6250-10,616)
≥3	1.43 (1.21-1.69)	<.001	10,043 (7729-12,357)
Hospital location and teaching status			
Rural	1.00	–	7762 (5511-10,014)
Urban and nonteaching	1.13 (0.90-1.43)	.291	8803 (6613-10,994)
Urban and teaching	1.11 (0.90-1.37)	.319	8625 (6717-10,534)
Hospital census region			
Northeast	1.00	–	8152 (6078-10,226)
Midwest	1.11 (0.94-1.28)	.239	8951 (6702-11,200)
South	0.96 (0.82-1.12)	.594	7821 (6055-9587)
West	1.26 (1.04-1.53)	.016	10,293 (7653-12,933)
Hospital size			
Small	1.00	–	8971 (6424-11,519)
Medium	0.89 (0.73-1.08)	.239	7975 (6084-9866)
Large	0.98 (0.82-1.19)	.869	8832 (6871-10,793)

ECI, Elixhauser Comorbidity Index; HMO, health maintenance organization.

higher ECI score. Therefore, proactive efforts to reduce chronic conditions may also help to reduce LOS.

Limitations

Our results should be interpreted with caution due to some limitations. First, the HCUP-NIS is a database that provides US regional and national estimates of inpatient utilization, charges, access, quality, and outcomes. Thus, the HCUP-NIS lacks information on details such as the stage of cancer, which precludes an analysis of any advanced disease in association with hospital admissions. Another limitation is that the reason for admission was not considered, as this is difficult to define from the database. Previous studies have reported that the LOS of hospitalizations related to malignant pleural effusions and febrile neutropenia was 4.6 days and 5.74 days, respectively.^{39,40} Hospitalization for febrile neutropenia resulted in mean costs of \$37,087,³⁹ and hospitalization for mastectomy and immediate breast reconstruction resulted in median costs of \$48,741 among patients with breast cancer.²⁹ Those results from previous studies are higher than the result of this current study (LOS, 2.42 days; hospital costs, \$9059). As shown in the previous studies, the reason for hospitalization might be a helpful factor to determine hospital costs.

Additionally, we could not distinguish whether 2 hospitalizations for breast cancer meant hospitalizations for 2 different individuals or for the same person, as the database reports per inpatient event. In this study, we combined the patients who underwent each surgery into a single group due to the insufficient sample size in the breast conservation surgery group (n = 17; 4.1%). Generally, patients who undergo breast conservation surgery do not need an overnight stay, whereas those with a mastectomy stay in the hospital for 1 or 2 nights. Therefore, breast conservation surgery and mastectomy may influence LOS and hospital costs differently.⁴¹

CONCLUSIONS

This study suggests that LOS and hospital costs of male patients with breast cancer are associated with some clinical characteristics, such as surgery, metastatic status, comorbidities,

and in-hospital mortality. This information can be used to assess the health care resources needed to prevent and treat breast cancer in male patients. ■

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Source of Funding: None.

Author Disclosures: The authors report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

Authorship Information: Concept and design (CP); acquisition of data (SKP, CP); analysis and interpretation of data (SKP, BPN, CP); drafting of the manuscript (SKP, BPN, HKC); critical revision of the manuscript for important intellectual content (BPN, HKC, CP); statistical analysis (SKP); administrative, technical, or logistic support (HKC); and supervision (CP).

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eAppendix Table. International Classification of Diseases (ICD) Codes for definitions of clinical characteristics

	ICD-9 version for database between 2012 and 2015 (1 st ~3 rd quarter)	ICD-10 version for database between 2015 (4 th quarter) and 2016
By clinical modification codes		
Breast cancer	175	C50
Metastatic status	'1960' '1961' '1962' '1965' '1966' '1968' '1969' '197' '198' '1990' '1991'	'C77' 'C78' 'C79' (except 'C7981')
By procedure codes		
Breast conserving surgery	166	'0HBT0ZZ', '0HBT3ZZ', '0HBT7ZZ', '0HBT8ZZ' '0HBTXZZ' '0HBU0ZZ' '0HBU3ZZ' '0HBU7ZZ' '0HBU8ZZ' '0HBUXZZ' '0HBV0ZZ' '0HBV3ZZ' '0HBV7ZZ' '0HBV8ZZ' '0HBVXZZ' '0HBYXZZ'
Mastectomy	167	'0HTT0ZZ' '0HTU0ZZ' '0HTV0ZZ'

ICD: International Classification of Diseases