Original Investigation

Nationwide Trends in Mastectomy for Early-Stage Breast Cancer

Kristy L. Kummerow, MD; Liping Du, PhD; David F. Penson, MD, MPH; Yu Shyr, PhD; Mary A. Hooks, MD, MBA

IMPORTANCE Accredited breast centers in the United States are measured on performance of breast conservation surgery (BCS) in the majority of women with early-stage breast cancer. Prior research in regional and limited national cohorts suggests a recent shift toward increasing performance of mastectomy in patients eligible for BCS.

OBJECTIVE To examine whether mastectomy rates in patients eligible for BCS are increasing over time nationwide, and are associated with coincident increases in breast reconstruction and bilateral mastectomy for unilateral disease.

DESIGN, SETTING, AND PARTICIPANTS We performed a retrospective cohort study of temporal trends in performance of mastectomy for early-stage breast cancer using multivariable logistic regression modeling to adjust for pertinent covariates and interactions. We studied more than 1.2 million adult women treated at centers accredited by the American Cancer Society and the American College of Surgeons Commission on Cancer from January 1, 1998, to December 31, 2011, using the National Cancer Data Base.

EXPOSURES Year of breast cancer diagnosis.

MAIN OUTCOMES AND MEASURES Proportion of women with early-stage breast cancer who underwent mastectomy. Secondary outcome measures include temporal trends in breast reconstruction and bilateral mastectomy for unilateral disease.

RESULTS A total of 35.5% of the study cohort underwent mastectomy. The adjusted odds of mastectomy in BCS-eligible women increased 34% during the most recent 8 years of the cohort, with an odds ratio of 1.34 (95% CI, 1.31-1.38) in 2011 relative to 2003. Rates of increase were greatest in women with clinically node-negative disease (odds ratio, 1.38; 95% CI, 1.34-1.41) and in situ disease (odds ratio, 2.05; 95% CI, 1.95-2.15). In women undergoing mastectomy, rates of breast reconstruction increased from 11.6% in 1998 to 36.4% in 2011 ($P < .001$ for trend). Rates of bilateral mastectomy for unilateral disease increased from 1.9% in 1998 to 11.2% in 2011 ($P < .001$).

CONCLUSIONS AND RELEVANCE In the past decade, there have been marked trends toward higher proportions of BCS-eligible patients undergoing mastectomy, breast reconstruction, and bilateral mastectomy. The greatest increases are seen in women with node-negative and in situ disease. Mastectomy rates do not yet exceed current American Cancer Society/American College of Surgeons Commission on Cancer accreditation benchmarks. Further research is needed to understand factors associated with these trends and their implications for performance measurement in American Cancer Society/American College of Surgeons Commission on Cancer centers.

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The introduction of breast conservation as an alternative to mastectomy is attributed to clinical trials published in the 1980s.[1,2] After several subsequent studies confirmed equivalent outcomes for early-stage breast cancer, breast conservation surgery (BCS) was endorsed by a National Institutes of Health Consensus Conference in 1990 and has become a standard of excellence in breast cancer care.[3,4] For the decade after the National Institutes of Health Consensus Statement, the use of breast conservation for management of early-stage breast cancer increased steadily. However, there is evidence that this trend is reversing. Facility-level and regional studies have found a decline in breast conservation rates beginning in the early 2000s.[5-9] Nationwide analyses of data from the Surveillance, Epidemiology, and End Results (SEER) program, which samples about 28% of the US population, demonstrated decreasing rates of mastectomy for early-stage breast cancer from the 1980s through the mid-2000s but subsequent increasing rates from 2005 to 2008.[10,11] Reasons for this apparent shift in surgical management remain unclear.

The National Cancer Data Base (NCDB) is a nationwide oncology outcomes database created jointly by the American Cancer Society and American College of Surgeons Commission on Cancer (ACS/CoC) in 1989 that captures clinical and outcomes data for patients who receive care at an ACS/CoC-approved center. It includes approximately 70% of newly diagnosed cancer cases in the United States.[12] We sought to evaluate nationwide trends in mastectomy rates for early-stage breast cancer using this near-comprehensive nationwide data set. Furthermore, we aimed to quantify the contributions of breast reconstructive surgery and contralateral prophylactic mastectomy to these changing trends.

Methods

The study was deemed exempt by the Vanderbilt University Institutional Review Board given our use of a deidentified data set. We analyzed temporal trends in mastectomy for early-stage breast cancer among patients treated at ACS/CoC-accredited centers from January 1, 1998, to December 31, 2011, using data from the NCDB. The cohort included adult women of all ages with newly diagnosed unilateral primary breast cancer for whom TNM clinical stage information was available. We excluded patients who were diagnosed but not treated at the reporting center and those with metastatic breast cancer. Cases were included if tumors were 5 cm or less in largest dimension with 9 or fewer involved axillary lymph nodes or isolated involvement of internal mammary nodes based on clinical staging (T0-2, N0-2, and M0). The analysis included only women who underwent surgical resection of the primary tumor.

Breast conservation surgery and mastectomy were categorized based on Surgery of the Primary Site codes (eTable in the Supplement). Cases treated by lumpectomy, segmental mastectomy, or re-excision of the biopsy site were considered to have undergone BCS. The non-breast conservation (mastectomy) category consisted of cases treated by subcutaneous mastectomy, total (simple) mastectomy, modified radical mastectomy, or radical mastectomy. Mastectomy with reconstruction and bilateral mastectomy with or without reconstruction were also included in this category. All reconstructive methods (tissue, implant, and combined) were included in the reconstruction subanalysis. Separate categorization schemes were defined for tumor size (in centimeters), invasive vs in situ disease, clinically positive nodes, and hormone receptor positivity based on site-specific codes. Reporting facility locations were categorized into 4 regions—Northeast, South, Midwest, and West—based on US Census regions. Patient urban-rural locations of residence were categorized based on the National Center for Health Statistics Urban-Rural Classification Scheme for counties. Regional educational levels, based on the proportion of people in a patient's zip code of residence who completed high school, were determined using US Census data. Patient comorbid conditions were classified by Charlson-Deyo comorbidity scores, which were available starting in 2003 and ranged from 0 to 2, with higher scores truncated at 2.

We calculated annual rates of mastectomy in this cohort of women with early-stage breast cancer. We used the Pearson χ^2 test for the trends of mastectomy rate and related secondary outcomes, including temporal trends in mastectomy with reconstruction and bilateral mastectomy. We created a multivariable logistic regression model to adjust for relevant clinical and demographic factors as well as interactions. Covariates included in the multivariable model were determined a priori based on their potential to confound or modify the association between year of diagnosis and mastectomy rates, and included age, race, Hispanic ethnicity, payer status, urban vs rural residence, Charlson-Deyo comorbidity score, treating facility type, treating facility geographic region, educational level, invasive vs in situ disease, tumor size, nodal status, and estrogen receptor status. Progesterone receptor status was not included due to colinearity with estrogen receptor status. Participant age was modeled using a restricted cubic spline due to its nonlinear relationship with likelihood of mastectomy. In addition, the model included interaction terms for the associations of age with tumor size, clinically positive lymph node disease, Charlson-Deyo score, and facility regions based on statistical evidence of effect modification and theoretical plausibility. The final model included cases only from 2003 to 2011 because Charlson-Deyo comorbidity scores were not available before 2003. We also created stratified models by tumor size and clinical nodal status to better explicate temporal trends in mastectomy based on disease-specific factors.

We conducted sensitivity analyses to evaluate the robustness of the results. We performed multivariable logistic regression modeling of the entire range of years (1998-2011) but excluding Charlson-Deyo scores. We also redefined the cohort based on pathologic (postresection) rather than clinical stage, repeated the analyses of trends, and created a separate multivariable logistic regression model of mastectomy with this cohort.

Results

The NCDB breast data set contains information on more than 2.7 million primary breast cancer cases. Of those, we ex-

cluded cases involving males, those who were not treated at the reporting facility, and those for whom clinical staging was not available. Of the remaining more than 1.4 million cases, 89.3% had early-stage breast cancer. An additional 2.8% of patients were excluded because they did not undergo surgical resection or their surgical status was unknown, yielding a cohort of 1 216 820 women with early-stage breast cancer who underwent resection of the primary tumor during the study period.

A total of 64.5% of patients underwent BCS while 35.5% underwent mastectomy. Those who underwent BCS differed from those who underwent mastectomy by demographic and tumor characteristics (**Table 1**). The mean age was slightly younger (59.6 vs 61.6 years) and there were fewer racial and ethnic minorities in the mastectomy group. Among patients treated with mastectomy, 45.0% underwent total mastectomy, 34.7% underwent modified radical mastectomy, 19.5% were treated with bilateral mastectomy, and 0.8% underwent radical mastectomy. On univariable analysis, mastectomy was more likely in women with more comorbid conditions, those with no insurance or with managed care or Medicare, women who received treatment in the South, those who lived in areas with a lower educational level, and those with tumors that were invasive (vs in situ), larger, less differentiated, or associated with clinically positive nodes.

Year of diagnosis was significantly associated with likelihood of mastectomy. The proportion of BCS-eligible women who underwent mastectomy increased from 34.3% in 1998 to 37.8% in 2011 ($P < .001$ for trend) (**Figure 1**). In the general multivariable model for the most recent 8 years, the odds of mastectomy increased 34% by 2011 relative to 2003 (odds ratio, 1.34; 95% CI, 1.31-1.38), with the most notable rise in mastectomy rates occurring after 2006 (**Table 2** and **Table 3**). Age and tumor size were the most influential covariates in the multivariable model. Younger women were more likely to undergo mastectomy irrespective of tumor size, while in older women mastectomy was strongly associated with tumor size greater than 2 cm (**Figure 2**).

Temporal trends in performance of mastectomy were reproduced in a parallel analysis using pathologic rather than clinical staging, as well as analyses using the full range of study years (1998-2011) but excluding Charlson-Deyo scores, and those restricted to smaller tumors and node-negative disease. The restricted models demonstrated steeper increases in mastectomy rates during the study period for women with node-negative disease, smaller tumors, and noninvasive lesions (Tables 2 and 3). Specifically, women with clinically negative nodes had 38% greater odds of mastectomy in 2011 compared with 2003 (odds ratio, 1.38; 95% CI, 1.34-1.41) (Table 3), and women with in situ tumors had 200% greater odds of mastectomy in 2011 relative to 2003 (odds ratio, 2.05; 95% CI, 1.95-2.15) (Table 2).

Temporal trends were similar for the secondary outcomes in the mastectomy group. There were notable increases in the proportion of women who underwent breast reconstruction and bilateral mastectomy starting in the mid-2000s, with a continued increasing trend over time (**Figure 3**). Specifically, breast reconstruction in women undergoing mastectomy increased from 11.6% in 1998 to 36.4% in 2011. Bilateral mastectomy for unilateral disease also increased significantly, from 1.9% of all BCS-eligible women in 1998 to 11.2% in 2011. Among women undergoing any type of mastectomy for unilateral disease, bilateral mastectomy increased from 5.4% in 1998 to 29.7% in 2011. Reconstruction was performed in 57.2% of women who underwent bilateral mastectomy in 2011 compared with 36.9% in 1998. Increasing rates of mastectomy are largely attributable to performance of bilateral mastectomy and unilateral mastectomy with reconstruction, while rates of unilateral mastectomy without reconstruction decreased during the study period (Figure 3).

Discussion

Our analysis of surgical management of early-stage breast cancer using the NCDB demonstrates increasing mastectomy rates in patients eligible for BCS with coincident increases in breast reconstruction and bilateral mastectomy. The cohort includes 70% of the nation's early-stage breast cancer cases over 14 years through 2011, which is the most recent year for which NCDB data are available. We found that the proportion of women with early-stage breast cancer (T0-2, N0-2, M0) who underwent mastectomy increased from 34.3% in 1998 to 37.8% in 2011. The observed temporal trends were upheld in our multivariable logistic regression model. Steeper increases were seen in women with node-negative and noninvasive disease.

These findings are generally consistent with trends noted in other state, regional, and national studies.[6,8,9] A prior cohort of patients with T0-2, N0-3 lesions in SEER had higher baseline mastectomy rates with a similar downward trend from 40% in 2000 to 36% in 2005-2006, but a subsequent increase to 38% in 2008.[10] Higher rates in the SEER analysis may be explained by the smaller sample of cases in the registry, which includes about 28% of the nation's cancer cases, as well as the inclusion of patients with N3 disease. Another SEER study limited to patients with stage I breast cancer found a stable rate of 32% to 33% from 1988 to 2007 but data are not available after that point.[11] Our study found that the most significant increases in rates occurred between 2006 and 2007, so subsequent analyses of SEER data may find similar increases in mastectomy rates after that point.

The observed increase in mastectomy rates is largely attributable to a rise in bilateral mastectomy for unilateral, early-stage disease, from 5.4% of mastectomies in 1998 to 29.7% in 2011, with a concurrent increase in reconstructive procedures in this group from 36.9% to 57.2% during the same time period. These most recent rates are higher than those previously documented in the SEER population and regional centers. This phenomenon is not well understood.[6,13] Qualitative studies point to physican recommendation, patient concern about recurrence, increased use of breast magnetic resonance imaging, and desire for symmetry as the primary reasons women undergo bilateral mastectomy.[14,15] Patients without an identified high-risk genetic mutation have been found to overestimate their risk of contralateral breast cancer.[16]

Table 1. Patient and Tumor Characteristics for Early Breast Cancer Cohort

Characteristic	Patients, No.	BCS	Mastectomy
Age, mean, y	1 216 798	61.6	59.6
Race, %			
White	1 043 886	64.7	35.3
Black	116 524	63.5	36.5
Asian/Pacific Islander	33 7000	59.7	40.3
American Indian	2473	60.2	39.8
Other	6848	61.9	38.1
Hispanic ethnicity, %			
Non-Hispanic	1 071 350	64.6	35.4
Hispanic	52 476	61.5	38.5
Unknown	92 972	64.8	35.2
Primary payer, %			
Private	676 035	64.4	35.6
Managed care	51 166	57.7	42.3
Medicare	9124	60.5	39.5
Medicaid	435 733	65.8	34.2
Not insured	20 738	58.7	41.3
County of residence (population), %			
Metropolitan			
Large (≥1 million)	634 637	66.0	34.0
Medium (250 000-1 million)	150 705	64.6	35.4
Small (<250 000)	116 364	61.6	38.4
Nonmetropolitan			
≥20 000	69 696	62.6	37.4
2500-19 999	77 214	58.4	41.6
<2500	18 736	57.1	42.9
Charlson-Deyo comorbidity score, %			
0	776 228	64.7	35.3
1	106 627	58.1	41.9
≥2	21 758	54.2	45.8
Year of diagnosis, %			
1998-1999	125 072	66.2	33.8
2000-2001	125 920	67.0	33.0
2002-2003	127 880	67.6	32.4
2004-2005	123 701	67.2	32.8
2006-2007	148 043	65.4	34.6
2008-2009	275 092	62.1	37.9
2010-2011	291 090	61.9	38.1
Treating facility, %			
Community cancer program	128 590	64.8	35.2
Comprehensive community cancer program	713 522	64.3	35.7
Academic/research program	346 911	64.9	35.1
Other cancer program	27 775	62.5	37.5
Geographic region, %			
Northeast	296 406	71.8	28.2
South	398 400	59.8	40.2
Midwest	306 021	63.7	36.3
West	215 971	64.2	35.8
Educational level (% in patient zip code without high school degree)			
<14	158 706	60.1	39.9
14-19.9	238 889	63.1	36.9
20-28.9	271 786	65.1	34.9
≥29	486 017	66.2	33.8

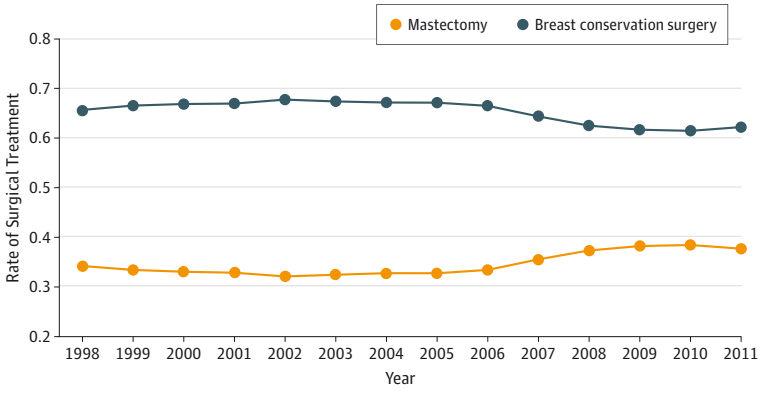
(continued)

Table 1. Patient and Tumor Characteristics for Early Breast Cancer Cohort (continued)

Characteristic	Patients, No.	BCS	Mastectomy
Invasive disease, %			
In situ	337 319	70.7	29.3
Invasive	879 479	62.1	37.9
Tumor size, cm, %			
<0.5	100 109	71.5	28.5
0.5-0.99	200 504	75.4	24.6
1-1.99	398 692	68.8	31.2
≥2	367 106	49.3	50.7
Clinically positive nodes, %			
No	1 106 491	66.7	33.3
Yes	110 307	42.2	57.8
Tumor grade, %			
Well differentiated	241 929	71.8	28.2
Moderately differentiated	443 937	63.5	36.5
Poorly differentiated/undifferentiated	355 469	57.8	42.2
Unknown or in situ	175 463	70.2	29.8
Estrogen receptor positive, %			
No	519 818	64.1	35.9
Yes	625 344	64.4	35.6
Progesterone receptor positive, %			
No	600 718	63.7	36.3
Yes	535 662	64.8	35.2

Abbreviation: BCS, breast conservation surgery.

Figure 1. Temporal Trends in Surgical Treatment of Early Breast Cancer



Proportion of women with early breast cancer who underwent mastectomy (orange line) and breast conservation surgery (blue line) by year of diagnosis in the National Cancer Data Base. All trends are significant ($P < .001$).

Coincident with increasing mastectomy rates is a trend toward more women undergoing breast reconstruction. This may be explained by 2 factors. First, the National Accreditation Program for Breast Centers expects that all women undergoing mastectomy be offered reconstruction.[4] Second, the Women's Health and Cancer Rights Act, which was passed in 1998, mandated insurance coverage of postmastectomy reconstruction. Prior research has demonstrated that this law significantly increased the proportion of women insured by Medicare and Medicaid who underwent reconstructive procedures.[17]

These trends in surgical management of early-stage breast cancer have important implications for quality measurement. While there is no established "appropriate" mastectomy rate in early breast cancer, the National Accreditation Program for Breast Centers upholds as a criterion for center accreditation that BCS be performed for at least 50% of patients with early-stage breast cancer (0, I, or II).[4] Even with trends toward increasing mastectomy rates, the current rates of BCS (62% nationwide) remain above 50% at ACS/CoC centers. European centers have established higher benchmarks for BCS, expecting that at least 70% of women with stage I or II breast cancer with lesions smaller than 3 cm undergo BCS.[18] Most of the T2 lesions in our cohort are smaller than 3 cm, so based on our analyses of trends in the management of smaller tumors, current US rates probably would not meet the European benchmark. Furthermore, the steepest rises in mastectomy rates in the United States are seen in younger women with noninvasive disease, those with smaller tumors, and those with node-negative disease. This suggests an increasing influence of factors unrelated to disease burden or concern about attaining locoregional control in performance of mastectomy, par-

Table 2. Mastectomy by Year of Diagnosis and Tumor Size for Clinically Node-Negative Cases[a]

Year of Diagnosis	Adjusted Odds Ratio (95% CI)		
	Node Negative, cm		
	2-5	≤2	Noninvasive
2003	1 [Reference]	1 [Reference]	1 [Reference]
2004	0.85 (0.80-0.91)	1.08 (1.04-1.13)	1.44 (1.36-1.54)
2005	0.86 (0.81-0.92)	1.05 (1.01-1.10)	1.43 (1.34-1.52)
2006	0.89 (0.83-0.95)	1.08 (1.03-1.12)	1.50 (1.41-1.59)
2007	0.99 (0.93-1.05)	1.19 (1.14-1.24)	1.66 (1.57-1.76)
2008	1.05 (0.88-1.11)	1.30 (1.25-1.34)	1.91 (1.82-2.01)
2009	1.08 (1.02-1.14)	1.36 (1.31-1.41)	2.05 (1.95-2.16)
2010	1.13 (1.07-1.19)	1.34 (1.29-1.39)	2.09 (1.99-2.20)
2011	1.06 (1.00-1.12)	1.30 (1.26-1.35)	2.05 (1.95-2.15)

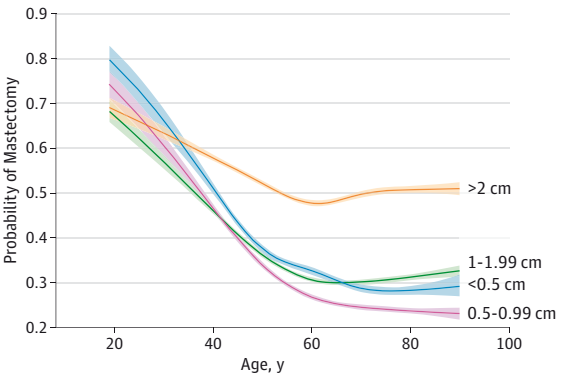
[a] Multivariable models are stratified by tumor size and invasive vs in situ disease. The 3 models are similarly adjusted for age, race, ethnicity, insurance, urban/rural residence, educational level, facility type, facility region, Charlson-Deyo score, tumor size, tumor grade, and estrogen receptor status with nonlinear age parameters and interactions of age with facility region and Charlson-Deyo score.

Table 3. Mastectomy by Year of Diagnosis and Clinical Nodal Status[a]

Year of Diagnosis	Adjusted Odds Ratio (95% CI)	
	T0-2, N1-2	T0-2, N0
2003	1 [Reference]	1 [Reference]
2004	0.95 (0.87-1.03)	1.09 (1.06-1.13)
2005	0.92 (0.85-1.00)	1.08 (1.04-1.11)
2006	0.97 (0.90-1.05)	1.10 (1.07-1.14)
2007	1.02 (0.94-1.10)	1.23 (1.19-1.26)
2008	1.19 (1.10-1.28)	1.34 (1.31-1.38)
2009	1.18 (1.10-1.27)	1.41 (1.38-1.46)
2010	1.20 (1.12-1.29)	1.42 (1.38-1.46)
2011	1.19 (1.10-1.28)	1.38 (1.34-1.41)

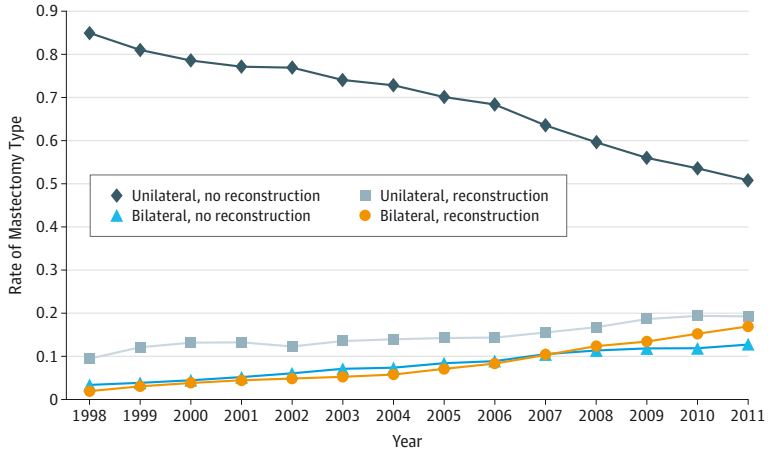
[a] Multivariable models are stratified by tumor size and invasive vs in situ disease. The 3 models are similarly adjusted for age, race, ethnicity, insurance, urban/rural residence, educational level, facility type, facility region, Charlson-Deyo score, tumor size, tumor grade, and estrogen receptor status with nonlinear age parameters and interactions of age with facility region and Charlson-Deyo score.

Figure 2. Adjusted Probability of Mastectomy by Age and Tumor Size



Multivariable logistic regression model adjusted for race, ethnicity, insurance, urban/rural residence, educational level, facility type, facility region, Charlson-Deyo score, positive nodes, invasive vs in situ, tumor grade, and estrogen receptor status. Each curve represents a different tumor size category (in centimeters).

Figure 3. Temporal Trends in Type of Mastectomy for Early Breast Cancer



Proportion of mastectomies for early breast cancer that were unilateral without reconstruction (dark blue line with diamonds), unilateral with reconstruction (light blue line with squares), bilateral without reconstruction (bright blue line with triangles), and bilateral with reconstruction (orange line with circles) by year of diagnosis in the National Cancer Data Base. Operative categories determined based on definitive operation for each breast cancer case (includes staged approaches). Reconstruction categories include tissue, implant, and combined reconstructive approaches. All trends are significant ($P < .001$).

ticularly in younger women. Considering the variation in standards internationally, as well as the upward direction of trends in mastectomy in the United States, ongoing assessment of appropriate indications for mastectomy and alignment with quality metrics will be needed to ensure that providers and centers are incentivized to offer appropriate care. Furthermore, while

the National Accreditation Program for Breast Centers provides criteria for referral and documentation of genetic counseling, to our knowledge, there are no established metrics for appropriate use of bilateral mastectomy. Further evaluation of the risks, benefits, and influential factors in surgical management by leaders in breast cancer care are needed to establish appropriate standards for these procedures.

There are some limitations to this work. Clinical staging information was not available for a significant proportion of the population as a consequence of limitations on allowable data, which restricted reportable elements to those that were documented by the managing physician. Comparison of cases for which clinical stage was or was not available reveals similar distributions by facility type and region, patient demographic factors, and surgical procedures. There are differences by year, with most missing clinical stage data being from earlier in the study period (1998-2006). Of note, our observed trend magnifies around 2006-2007, so if the staging information were missing in a systematic fashion this could explain the observed association between later years and higher mastectomy rates. However, based on our analysis of the distribution of missing data, we do not identify any type of pattern that could explain such a bias. Furthermore, the temporal trend is significant even when considering only years 2007-2011, from which we can conclude that rates truly are increasing, at least during this most recent period.

We do not have information regarding *BRCA* status or triple-negative tumors in the NCDB. These factors are probably strongly associated with bilateral mastectomy in this population, and adjustment for these may dampen the observed associations between other covariates and mastectomy rates. The prevalence of *BRCA* positivity in women with breast cancer is approximately 3%, so this does not completely explain the high rates of bilateral mastectomy, which accounted for 11% of all operations for early-stage breast cancer in 2011, the most recent year for which data are available.[19] National Cancer Data Base reporting of *ERBB2* (formerly *HER2*) status began in 2010,so there was inadequate information from prior years to evaluate whether an association exists with mastectomy for early-stage breast cancer. Our study suggests that BCS-eligible women with hormone receptor-positive tumors are slightly less likely to undergo mastectomy.

While the NCDB is the largest national cancer registry, it does not contain information on the 30% of patients with cancer who are treated at centers that are not accredited by the ACS/CoC. Participating centers tend to be larger, more urban, and more likely affiliated with a medical school or residency program, and offer more cancer-related services.[5] We are unable to comment on whether the observed trends are upheld in nonparticipating centers.

Finally, we are unable to determine the specific reasons that mastectomy was performed in any individual case reported in the NCDB. Physicians and patients take into account multiple factors when deciding how to surgically manage an individual breast cancer case, some of which are not captured in this study. Previous work on decision making in patients with early-stage breast cancer demonstrated greater discordance between patient goals and ultimate surgical treatment in women who underwent mastectomy than in those who underwent BCS.[20] Furthermore, less than 50% of women reported being asked by their physicians whether they preferred BCS or mastectomy, and more than 80% of women reported that their physicians made a specific recommendation for either BCS or mastectomy. This suggests that physicians may strongly influence whether a woman with early-stage breast cancer undergoes BCS or mastectomy.

Conclusions

Our finding of still-increasing rates of mastectomy, breast reconstruction, and bilateral mastectomy in women with early-stage breast cancer using 14 years of data from the NCDB has implications for physician and patient decision making as well as quality measurement. Further research is needed to understand patient, provider, policy, and social factors associated with these trends.

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Study concept and design: Kummerow, Hooks.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: Kummerow, Shyr, Hooks.
Critical revision of the manuscript for important intellectual content: Kummerow, Du, Penson, Hooks.
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Invited Commentary

The Swinging Pendulum

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After the landmark National Surgical Adjuvant Breast and Bowel Project–B27 study, which showed no survival difference between mastectomy and lumpectomy with radiation, breast conservation surgery (BCS) emerged as the preferred option for early-stage cancers.[1,2] This led to a steady increase in BCS, but the seminal article in this issue by Kummerow et al[3] reveals a surprising rise in the rate of mastectomy for early-stage cancers. The authors attribute this rate increase to developments in reconstructive techniques, better served by mastectomy.

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This study raises several questions. Were all patients BCS candidates? This is difficult to assess without accounting for findings on magnetic resonance imaging, family history, clinical stage, and tumor to breast ratio, all of which are now taken into consideration. What was the actual availability of reconstruction and newer techniques such as skin- and nipple-sparing mastectomies? Kummerow et al[3] show that the post-mastectomy reconstruction rate rose while the rate of mastectomy without reconstruction fell. These points hint at a more basic question: Why are more women opting for mastectomy over BCS, and are those reasons valid?

Most important, younger age was associated with mastectomy and there was a disproportionate rise in bilateral mastectomies for unilateral, early-stage cancers. Understandably, concern for genetic predisposition carries influence, as does recent media exposure. It is crucial to properly address these concerns. While the choice to pursue mastectomy over BCS is never wrong, it must be made for the right reasons, a topic recently addressed in *JAMA Surgery*.[4] Current guidelines use the rate of BCS as a quality measure based on cancer stage.[5] So, when presenting these surgical options, we must ensure that decisions are not based on misconceptions.

Existing guidelines are in place to ensure that patients are offered the appropriate options. The article by Kummerow et al[3] should at least serve as a wake-up call that as we fulfill that responsibility, and use every modality of care to give patients the best quality of life and survival advantage, the guidelines may need to change again.

ARTICLE INFORMATION

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