Surgeon Recommendations and Receipt of Mastectomy for Treatment of Breast Cancer

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Context There is concern that mastectomy is overused in the United States.

Objectives To evaluate the association of patient-reported initial recommendations by surgeons and those given when a second opinion was sought with receipt of initial mastectomy; and to assess the use of mastectomy after attempted breast-conserving surgery (BCS).

Design, Setting, and Patients A survey of women aged 20 to 79 years with intraductal or stage I and II breast cancer diagnosed between June 2005 and February 2007 and reported to the National Cancer Institute's Surveillance, Epidemiology, and End Results registries for the metropolitan areas of Los Angeles, California, and Detroit, Michigan. Patients were identified using rapid case ascertainment, and Latinas and blacks were oversampled. Of 3133 patients sent surveys, 2290 responded (73.1%). A mailed survey was completed by 96.5% of respondents and 3.5% completed a telephone survey. The final sample included 1984 female patients (502 Latinas, 529 blacks, and 953 non-Hispanic white or other).

Main Outcome Measures The rate of initial mastectomy and the perceived reason for its use (surgeon recommendation, patient driven, medical contraindication) and the rate of mastectomy after attempted BCS.

Results Of the 1984 patients, 1468 had BCS as an initial surgical therapy (75.4%) and 460 had initial mastectomy, including 13.4% following surgeon recommendation and 8.8% based on patient preference. Approximately 20% of patients (n=378) sought a second opinion; this was more common for those patients advised by their initial surgeon to undergo mastectomy (33.4%) than for those advised to have BCS (15.6%) or for those not receiving a recommendation for one procedure over another (21.2%) ($P<.001$). Discordance in treatment recommendations between surgeons occurred in 12.1% (n=43) of second opinions and did not differ on the basis of patient race/ethnicity, education, or geographic site. Among the 1459 women for whom BCS was attempted, additional surgery was required in 37.9% of patients, including 358 with reexcision (26.0%) and 167 with mastectomy (11.9%). Mastectomy was most common in patients with stage II cancer ($P<.001$).

Conclusion Breast-conserving surgery was recommended by surgeons and attempted in the majority of patients evaluated, with surgeon recommendation, patient decision, and failure of BCS all contributing to the mastectomy rate.

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CONCERNS ABOUT EXCESSIVE USE of mastectomy for patients with breast cancer have been raised for more than 2 decades.[1-3] Rates of breast-conserving surgery (BCS) have been used by some as a quality measure.[4-7] Despite a marked increase in BCS, concerns persist that women with breast cancer are being overtreated with mastectomy.[8-12] Several studies suggest that many women who undergo mastectomy have either a contraindication to BCS or adjuvant radiation therapy, or prefer mastectomy, often despite strong support for BCS by their surgeons.[9,11] However, other studies have not confirmed these findings.[13] None of these studies disaggregated the initial treatment attempted from subsequent surgery.

Reasons for receipt of mastectomy have not been well studied in populations. Surgeons may recommend mastectomy initially because of a contraindication to BCS or belief that mastectomy confers a lower risk of local recurrence. Patients may prefer mastectomy to BCS, or mastectomy may be performed after unsuccessful attempts at BCS. We performed an observational study based in 2 large urban areas to determine the reasons women undergo initial mastectomy for treatment of breast cancer and the frequency of mastectomy after BCS is attempted.

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METHODS

Study Population and Data Collection

Details of the data collection protocol have been published elsewhere.[14] Women in the metropolitan areas of Los

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Angeles, California, and Detroit, Michigan, aged 20 to 79 years and diagnosed with ductal carcinoma in situ or invasive breast cancer (stages I through III)[15] between June 2005 and February 2007, which were reported to the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program registries, were eligible for sample selection. A target sample size was selected that was sufficient to address both treatment outcomes and non–treatment-related outcomes in this urban population of women with breast cancer.

Patients were excluded if they had stage IV breast cancer, died prior to the survey, or could not complete a questionnaire in English or Spanish. Asian women in Los Angeles also were excluded because of enrollment in other studies. Latina (in Los Angeles) and black (in both Los Angeles and Detroit) patients were oversampled to ensure sufficient representation of race/ethnic minorities.

Eligible patients were identified via rapid case ascertainment as they were reported monthly to the collaborating SEER registries. This method yields a study sample that is representative of the 2 metropolitan areas. Physicians were notified of our intent to contact patients, followed by a patient mailing of a letter, survey materials, and a $10 cash gift to eligible study participants. To encourage survey response, the Dillman survey method was used and was composed of (1) an initial mailing of an introductory letter, risk and benefit consent sheet, survey materials, return envelope, and $10 cash gift; (2) a reminder contact; (3) a second survey to nonrespondents; and (4) follow-up calls to assess final status.[16] All materials were sent in English and Spanish to those with Spanish surnames.[14] The study protocol was approved by the institutional review boards of the University of Michigan, University of Southern California, and Wayne State University and endorsed implicit patient consent based on the provision of appropriate information about the study and completion of the survey.

Outcome Measures

Patients were asked which surgical procedure was recommended by the first surgeon they consulted. Those who reported that the surgeon recommended a mastectomy were asked to describe the reason based on a list of clinical contraindications to BCS.[17] Patients were asked whether they consulted a second surgeon about surgical treatment options prior to undergoing treatment and what that second surgeon recommended. Patients also were asked to identify the first surgery they received after initial biopsy (and which surgeon performed it). Those who reported BCS were asked whether they had a second lumpectomy to remove more breast tissue from the same breast and whether they had a subsequent mastectomy on the same breast.

Receipt of mastectomy was described across 3 categories: (1) initial mastectomy based on the recommendation by the first surgeon if the patient received mastectomy as the first procedure after biopsy; (2) initial mastectomy based on a patient-directed decision if their surgeon recommended BCS or did not recommend one procedure over another; and (3) mastectomy after unsuccessful BCS if they had 1 or more attempts at lumpectomy followed by mastectomy. The involvement of the second surgeon in this categorization scheme was not considered because only 2.2% of patients in the entire study population reported that a second surgeon recommended a procedure that was discordant with the first surgeon's recommendation. Additional variables included age, education, and race/ethnicity (all self-identified from the survey); and American Joint Committee on Cancer stage[15] and SEER site (from SEER). This information was collected specifically for this study.

Analysis

The sample in this analysis was limited to patients with stages 0, I, or II breast cancer (N = 1984) because surgery decisions for women with later-stage disease differ substantively from those with earlier-stage disease. The distribution of the different surgery options and the patterns and outcomes related to the surgeons' recommendations were described. These outcomes were evaluated across age, race/ethnicity, education, and SEER site. We then examined patterns of additional surgery after unsuccessful attempts at BCS. All results were weighted to account for the sampling design and differential nonresponse. Results are presented as unweighted values, with weighted percentages. The χ^2 and t tests (2-tailed) were used to test for differences in proportions and means by subgroups. Statistical analyses were conducted using STATA software version 10.0 (StataCorp, College Station, Texas).[18]

RESULTS

A total of 3252 eligible patients were identified (approximately 70% of the Latina and black patients and approximately 30% of non-Latina white patients) from the metropolitan areas of Los Angeles and Detroit. After initial patient and physician contact, 119 women were removed from the sample. Of the 3133 patients eligible to be sent surveys, 432 (13.8%) could not be contacted and 411 (13.1%) were contacted but did not return the survey. Thus, 2290 patients returned surveys (73.1% response rate; FIGURE), 96.5% of whom completed a written survey and 3.5% of whom completed a telephone survey. The response rates were 73.4% for Hispanic women, 66.7% for black women, and 76.5% for non-Latina white and other women. Surveys were returned a mean of 9 months after diagnosis (range, 5-14 months).

Compared with respondents, nonrespondents were more likely to be black (34.9% vs 26.2%; $P < .001$); to have never married (23.0% vs 19.3%; $P = .01$); and to have stage II or stage III disease (43.4% vs 40.5%; $P = .005$). Nonrespondents were less likely to receive BCS compared with respondents (54.5% vs 63.2%; $P = .02$).

TABLE 1 shows the characteristics of the study sample and the distribution

of surgery by categories. The mean (SD) patient age was 58.6 (11.3) years; 69.2% were white and non-Latina and 33.5% were high school graduates or attended high school for some time. Of the 1984 patients, 66.6% received BCS only; 13.4% received initial mastectomy based on surgeon recommendation; 8.8% received initial mastectomy when the first surgeon did not recommend one procedure over another or recommended BCS; and 8.8% received mastectomy after unsuccessful attempts at BCS.

Of the 1984 patients, 66.2% reported that their first surgeon recommended BCS, 17.2% reported a recommendation for mastectomy, and 16.7% reported that the first surgeon did not recommend one procedure over another. Among the 341 patients whose surgeons recommended mastectomy, 67.4% reported a contraindication to BCS, representing 11.3% of the total sample. There were no significant differences in the patterns of recommendation by the first surgeon consulted or initial receipt of mastectomy by race/ethnicity, education, or SEER site.

Of the total patient sample (N=1984), 378 women (19.1%) sought a second opinion about surgical options prior to treatment. This was more common for women with a higher education level (13.0% for ≤high school degree, 20.8% for some college, and 26.7% for ≥college degree) ($P<.001$) and for those advised to undergo mastectomy (33.4%) vs those advised to have BCS (15.6%) or those who did not receive a recommendation for one procedure over another (21.2%) ($P<.001$).

Among patients who sought a second opinion (n=378), discordance between recommendations of the first and second surgeon was not common; 20.2% of patients whose first surgeon recommended mastectomy received a second opinion for BCS; conversely, 11.9% of patients who received an initial BCS recommendation received a second opinion for mastectomy (TABLE 2). Only 12.1% of the patients who consulted a second surgeon received a discordant opinion (n=43). The majority of patients who did not receive a first surgeon's recommendation similarly did not receive one from a second surgeon. These results were consistent across race/ethnicity, education, and SEER site. Among the 378 patients who sought a second opinion, 44.0% received surgery from the second surgeon. Overall, 90.3% of the total patient sample received surgery from the first surgeon consulted.

Most patients received the procedure recommended by their surgeons. Among the 1544 patients who did not obtain a second opinion, only 2.1% received a mastectomy when the first surgeon recommended BCS, whereas 88.8% of patients received mastectomy when their surgeon recommended it (TABLE 3). Most patients received the recommended treatment when the first and second surgeon concurred on their recommendation. Only 1.9% of patients received mastectomy when both surgeons recommended BCS, while 77.6% of patients received mastectomy when both surgeons recommended the procedure. Patient adherence to surgeon recommendation was also high when the first surgeon made no specific recommendation but the second surgeon did. Only 3.9% of

Figure. Flow of Patients in the Study

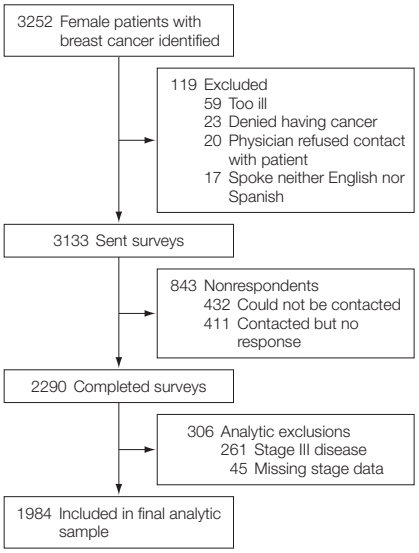

Table 1. Population Characteristics (N = 1984)

	No. of Patients	Weighted, %[a]
Race/ethnicity		
Latina	502	12.6
Black	529	16.2
White (non-Latina)	903	69.2
Other[b]	50	2.0
Age, mean (SD), y	1976[c]	58.6 (11.3)
Education		
≤High school degree	780	33.5
Some college	663	34.9
≥College degree	504	29.5
Missing	37	2.1
AJCC stage		
Ductal carcinoma in situ	458	23.3
Stage I	833	43.9
Stage II	693	32.8
Receipt of surgery option		
BCS only	1298	66.6
Surgeon recommendation for mastectomy	288	13.4
No recommendation for mastectomy[d]	172	8.8
Mastectomy after unsuccessful BCS attempt	170	8.8
No additional surgery after biopsy	34	1.4
Missing	22	1.0

Abbreviations: AJCC, American Joint Committee on Cancer; BCS, breast-conserving surgery.
[a] Values are weighted to account for the sample design.
[b] Category includes Asians, Pacific Islanders, and American Indians.
[c] Missing data for 8 patients.
[d] Indicates that the surgeon did not recommend one procedure (BCS or mastectomy) over another.

patients received mastectomy when the second surgeon recommended BCS, while 92.9% received mastectomy when the second surgeon recommended it. About one-third of patients received a mastectomy when the first surgeon did not make a recommendation for one procedure over another and no second surgeon was consulted.

TABLE 4 shows surgical outcomes for 1459 patients for whom BCS was attempted. No additional surgery was required for 62.1% of the patients. Reexcision lumpectomy was the most common additional surgical procedure performed (26.0%) and 11.9% of patients underwent mastectomy after BCS was attempted. Conversion to mastectomy after a single attempt at lumpectomy occurred in 7.7% of patients and 4.2% had a reexcision followed by a mastectomy.

The likelihood of additional surgery after BCS differed by cancer stage ($P<.001$). Women with ductal carcinoma in situ experienced the highest rate of additional surgery because they had the greatest likelihood of reexcision lumpectomy (30.7% for ductal carcinoma in situ vs 23.7% for women with stage I disease and 24.0% for stage II disease). Patients with stage II disease were at highest risk for post-BCS mastectomy (18.0% vs 12.0% for ductal carcinoma in situ and 8.3% for stage I disease; $P<.001$). Initial BCS failure was particularly high for the few women who underwent this procedure despite receiving an initial recommendation for mastectomy; 46.5% of the 68 patients who underwent BCS after initial recommendation for mastectomy required conversion to mastectomy.

Table 2. Frequency and Outcomes of Second Opinions

Recommendation by Second Surgeon	No. of Patients (n = 378)[a]	Recommendation by First Surgeon, No. (Weighted %)		
		Breast-Conserving Surgery	Mastectomy	Neither[b]
Breast-conserving surgery	166	130 (73.9)	19 (20.2)	17 (28.0)
Mastectomy	102	24 (11.9)	69 (65.6)	9 (15.5)
No recommendation	82	27 (14.2)	14 (14.2)	41 (56.5)
Total	**350**	**181** (100)	**102** (100)	**67** (100)

[a] There were 28 patients with missing information (7.4%).
[b] Indicates that the surgeon did not recommend one (breast-conserving surgery or mastectomy) procedure over another.

Table 3. Percentage of Patients Who Received Mastectomy as Initial Treatment by Surgeon Recommendation[a]

Recommendation by Second Surgeon	No. of Patients	Recommendation by First Surgeon, No. (Weighted %)[b]		
		Breast-Conserving Surgery	Mastectomy	Neither[c]
No second opinion	1544	1052 (2.1)	241 (88.8)	251 (34.8)
Breast-conserving surgery	167	131 (1.9)	19 (33.8)	17 (3.9)
Mastectomy	105	24 (26.6)	72 (77.6)	9 (92.9)
No recommendation	83	28 (36.5)	14 (32.3)	41 (45.9)

[a] There were 85 patients with missing information.
[b] Indicates the weighted percentage of those patients who received initial mastectomy. For instance, of the 1052 patients for whom their first surgeon recommended breast-conserving surgery and who did not obtain a recommendation from a second surgeon, 2.1% (weighted percentage) had a mastectomy as the initial treatment.
[c] Indicates that the surgeon did not recommend one (breast-conserving surgery or mastectomy) procedure over another.

Table 4. Surgical Outcomes by Stage for Patients Who Received Initial Breast-Conserving Surgery[a]

Surgical Outcomes	All (n = 1459)[b]	Ductal Carcinoma in Situ (n = 359)	Stage I (n = 652)	Stage II (n = 448)
No further surgery	934 (62.1)	218 (57.3)	444 (68.0)	273 (58.0)
Reexcision only	358 (26.0)	100 (30.7)	152 (23.7)	105 (24.0)
Reexcision and then mastectomy	63 (4.2)	22 (6.3)	22 (3.0)	19 (4.6)
Mastectomy only	104 (7.7)	19 (5.7)	34 (5.3)	51 (13.4)

[a] Values are expressed as number (weighted percentage). There were 9 patients with missing information.
[b] $P<.001$ for differences in patterns of surgery by stage.

COMMENT

In this large regional study of women recently diagnosed with stages 0 through II breast cancer, we found that one-third of patients underwent mastectomy as final treatment. Of the total patient population, 13.4% underwent mastectomy following the recommendation from their surgeon, and most of these women reported a contraindication to BCS or radiation; 8.8% of patients underwent initial mastectomy based on a patient-directed decision (eg, their first surgeon recommended BCS or did not recommend one procedure over another); and 8.8% underwent mastectomy after 1 or more unsuccessful attempts at BCS. These results were consistent across race/ethnicity, education, and SEER site.

The results of this study suggest that most surgeons in 2 large, diverse urban regions appropriately recommended local therapy options for patients with breast cancer. The majority of women who received a surgeon recommendation for initial mastectomy reported a clinical contraindication to breast conservation. Only 6.2% of patients who did not report a clinical contraindication received a surgeon recommendation for mastectomy, suggesting that surgeons have largely adopted appropriate contraindications to BCS in clinical practice.

Appropriate selection of patients for initial surgical treatment is further supported by our finding that only a small proportion of patients (12.1%) who sought a second opinion received a recommendation for a different procedure from a second surgeon. Additionally, the low rate of conversion to mastectomy after initial attempts at BCS (11.9%) suggests that surgeons accurately determined candidates for BCS. The high failure rate (46.5%) of the few

patients (n=68) who underwent BCS despite surgeon recommendation for mastectomy further underscores the accuracy of the surgical evaluation.

Our findings suggest that patient preferences play an important role in initial receipt of mastectomy, especially in the absence of a surgeon recommendation favoring one procedure over another. This is consistent with other studies that have shown that when both procedures are medically appropriate, more patient involvement in breast surgery decisions is associated with a greater probability of mastectomy.[9,11] Our finding that some patients reported that their surgeons did not recommend one surgery option over another is consistent with results from a recent survey of surgeons in Detroit and Los Angeles, which showed that (in the absence of clinical contraindications) some surgeons give women the choice of procedures without favoring one over another.[19]

Some aspects of our study merit comment. The generalizability of the results is limited to a diverse urban population, and some ethnic groups (eg, Asian American women) were excluded from the sample. We only assessed patient recall about communication with clinicians and thus we do not know what surgeons actually discussed or recommended with regard to surgery options.

Patient recall of detailed communication issues may be prone to bias. In particular, we may have underestimated the number of patients with clinical contraindications to BCS because this item was based on detailed patient recall of reasons for treatment recommendations. However, additional analyses of our data suggest that the content and criterion validity of patient recall about the type and sequence of surgery they received and the recommendations made by their surgeons was valid. It is possible that patient recall may vary over time, influencing the accuracy of our results. However, patient surveys were completed shortly after surgery, and our prior work has shown that patient reports do not vary within this sampling time frame.[9] Finally, nonresponse and missing data may have biased some of our results, particularly because nonresponders were noted to differ from responders in some demographic and clinical characteristics.

Our results have important implications for clinical and health policy. There are lingering concerns that mastectomy may be overused in the United States. Indeed, some medical centers have used their rate of BCS as a quality indicator.[4-6] Our results provide a framework for considering whether mastectomy is overused today. If there is a problem, is it with (1) the initial surgeon recommendations for mastectomy; (2) the failure of initial surgical treatment with BCS; or (3) patient decision making for initial mastectomy?

Our results suggest that surgeon recommendations for surgical treatment of breast cancer in this large population-based study were sound. Recommendations for mastectomy were largely based on clinical contraindications to BCS. Moreover, the failure rate after initial BCS was low; whereas, the failure rate for BCS following surgeon recommendation for mastectomy was high. This suggests that more detailed preoperative imaging evaluations are unlikely to have a substantial effect on the number of patients requiring conversion from BCS to mastectomy, a finding confirmed in several recent studies that examined the use of magnetic resonance imaging for breast cancer treatment selection.[8,20,21]

Our observation that patients with stage II disease had the highest rate of conversion to mastectomy after attempted BCS suggests that an expanded use of preoperative chemotherapy could result in a decrease in the mastectomy rate. In randomized trials,[22,23] the use of initial chemotherapy reduced the mastectomy rate by about 30% in patients deemed to have tumors too large for BCS at presentation. Yet only 47% of surgeons in a recent survey endorsed the use of preoperative chemotherapy to allow BCS.[24] Other studies have shown that, in practice, the use of neoadjuvant therapy in patients with larger cancers allowed successful BCS in approximately half of the cases.[25] The increased use of neoadjuvant therapy has the potential to reduce both the number of unsuccessful attempts at BCS and the number of initial recommendations for mastectomy.

Our results also suggest that reexcision after initial attempted BCS is an important clinical issue. Overall, 525 patients (37.9%) who initially received BCS required a second surgical procedure—a result consistent with other studies that show highly variable rates of reexcision ranging from 10%[26] to 50%[27] of BCS cases. The reasons for this variation are multifactorial, but a major contributing factor is a lack of consensus as to what constitutes an adequate margin of resection for a lumpectomy.[28] Reexcision, even when successful, has multiple adverse consequences, including worsened cosmetic outcome, delay in adjuvant therapy, and higher cost of care. While we did not directly query patients regarding the effect of the potential need for multiple surgeries or their choice of surgical treatment, a major difference between mastectomy and BCS is the much greater likelihood of requiring a single operation when mastectomy is chosen, and this may have influenced patient preference.

Our results also suggest that patient preferences may play an important role in shaping the pattern of surgical treatment for breast cancer. One-third of patients appear to choose mastectomy as initial treatment when not given a specific recommendation for BSC or mastectomy by their surgeon, accounting for about one-quarter of total mastectomy use. Patients may prefer mastectomy for peace of mind or to avoid radiation. Indeed, patient preferences for mastectomy are strongly influenced by concerns about disease recurrence, and inconvenience and fears of radiation.[9,11,29] Prior research has suggested that actual patient knowledge about these issues with regard to the treatment options was quite low.[30] Thus,

there may be opportunities to improve patient decision making regarding initial local therapy.

In conclusion, findings of this survey of women with breast cancer demonstrate that the etiology of current mastectomy rates is multifactorial, but that BCS is recommended by surgeons and attempted in a majority of patients. Efforts to decrease mastectomy rates by focusing on improved patient selection for BCS, either through the increased use of second opinions or more detailed imaging evaluations, are not likely to have a major effect. Our findings suggest that a combined approach of education for patients and health care professionals targeting specific areas may improve decision making.

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Study concept and design: Morrow, Hawley, Katz.
Acquisition of data: Hamilton, Graff, Katz.
Analysis and interpretation of data: Morrow, Jagsi, Alderman, Griggs, Hawley, Katz.
Drafting of the manuscript: Morrow, Hawley, Katz.
Critical revision of the manuscript for important intellectual content: Morrow, Jagsi, Alderman, Griggs, Hawley, Hamilton, Graff, Katz.
Statistical analysis: Hawley, Katz.
Administrative, technical, or material support: Graff, Hamilton, Hawley, Katz.
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REFERENCES

1. Edwards BK, Brown ML, Wingo PA, et al. Annual report to the nation on the status of cancer, 1975-2002, featuring population-based trends in cancer treatment. *J Natl Cancer Inst*. 2005;97(19):1407-1427.
2. Locker GY, Sainsbury JR, Cuzick J; ATAC Trialists' Group. Breast surgery in the Arimidex, Tamoxifen Alone or in Combination (ATAC) trial: American women are more likely than women from the United Kingdom to undergo mastectomy. *Cancer*. 2004;101(4):735-740.
3. Nattinger AB, Gottlieb MS, Hoffman RG, Walker AP, Goodwin JS. Minimal increase in use of breast-conserving surgery from 1986 to 1990. *Med Care*. 1996;34(5):479-489.
4. Avon Foundation Breast Center at Johns Hopkins. Quality corner. http://www.hopkinsbreastcenter.org/about_us/quality. Accessed September 3, 2009.
5. Cedars-Sinai Medical Center. Measuring quality of care at the Saul and Joyce Brandman Breast Center. http://www.csmc.edu/14831.html. Accessed September 3, 2009.
6. University of Virginia Health System. Breast cancer page. http://www.healthsystem.virginia.edu/internet/quality/breastcancer/breastcancer3tier.cfm. Accessed September 3, 2009.
7. Katz SJ, Hawley ST. From policy to patients and back: surgical treatment decision making for patients with breast cancer. *Health Aff (Millwood)*. 2007;26(3):761-769.
8. Katipamula R, Degnim AC, Hoskin T, et al. Trends in mastectomy rates at the Mayo Clinic Rochester: effect of surgical year and preoperative magnetic resonance imaging. *J Clin Oncol*. 2009;27(25):4082-4088.
9. Katz SJ, Lantz PM, Janz NK, et al. Patient involvement in surgery treatment decisions for breast cancer. *J Clin Oncol*. 2005;23(24):5526-5533.
10. Katz SJ, Lantz PM, Janz NK, et al. Patterns and correlates of local therapy for women with ductal carcinoma in situ. *J Clin Oncol*. 2005;23(13):3001-3007.
11. Hawley ST, Griggs JJ, Hamilton AS, et al. Decision involvement and receipt of mastectomy among racially and ethnically diverse breast cancer patients [published online August 31, 2009]. *J Natl Cancer Inst*. doi:10.1093/jnci/djp271.
12. Tuttle TM, Habermann EB, Grund EH, Morris TJ, Virnig BA. Increasing use of contralateral prophylactic mastectomy for breast cancer patients: a trend toward more aggressive surgical treatment. *J Clin Oncol*. 2007;25(33):5203-5209.
13. Mandelblatt J, Kreling B, Figueriedo M, Feng S. What is the impact of shared decision making on treatment and outcomes for older women with breast cancer? *J Clin Oncol*. 2006;24(30):4908-4913.
14. Hamilton AS, Hofer TP, Hawley ST, et al. Latinas and breast cancer outcomes: population-based sampling, ethnic identity and acculturation assessment. *Cancer Epidemiol Biomarkers Prev*. 2009;18(7):2022-2029.
15. Greene FL, Page DL, Fleming ID, eds, et al. *AJCC Cancer Staging Manual*. 6th ed. New York, NY: Springer-Verlag; 2002.
16. Dillman DA. *Mail and Telephone Surveys: The Total Design Method*. New York, NY: John Wiley & Sons; 1978.
17. American College of Radiology. Practice guideline for the breast conservation therapy in the management of invasive breast carcinoma. *J Am Coll Surg*. 2007;205(2):362-376.
18. StataCorp. *STATA Reference Manual: Release 10.0*. College Station, TX: STATA Press; 2007.
19. Katz SJ, Lantz PM, Janz NK, et al. Surgeon perspectives about local therapy for breast carcinoma. *Cancer*. 2005;104(9):1854-1861.
20. Bleicher RJ, Ciocca RM, Egleston BL, et al. Association of routine pretreatment magnetic resonance imaging with time to surgery, mastectomy rate, and margin status. *J Am Coll Surg*. 2009;209(2):180-187.
21. Drew PJ, Harvey I, Hanby A, et al. The UK NIHR multicentre randomised COMICE trial of MRI planning for breast conserving treatment for breast cancer. *Cancer Res*. 2009;69(suppl 2):75S.
22. Rastogi P, Anderson SJ, Bear HD, et al. Preoperative chemotherapy: updates of National Surgical Adjuvant Breast and Bowel Project Protocols B-18 and B-27. *J Clin Oncol*. 2008;26(5):778-785.
23. van der Hage JA, van de Velde CJ, Julien JP, Tubiana-Hulin M, Vandervelden C, Duchateau L. Preoperative chemotherapy in primary operable breast cancer: results from the European Organization for Research and Treatment of Cancer Trial 10902. *J Clin Oncol*. 2001;19(22):4224-4237.
24. Morrow M, Graff JJ, Katz SJ. Adoption of new breast cancer therapies: is evidence important? *J Clin Oncol*. 2008;26(15S):629.
25. Lee MC, Rogers K, Griffith K, et al. Determinants of breast conservation rates: reasons for mastectomy at a comprehensive cancer center. *Breast J*. 2009;15(1):34-40.
26. Grobmyer SR, Mortellaro VE, Marshall J, et al. Is there a role for routine use of MRI in selection of patients for breast-conserving cancer therapy? *J Am Coll Surg*. 2008;206(5):1045-1052.
27. Wright MJ, Park J, Fey JV, et al. Perpendicular inked versus tangential shaved margins in breast-conserving surgery: does the method matter? *J Am Coll Surg*. 2007;204(4):541-549.
28. Taghian A, Mohiuddin M, Jagsi R, Goldberg S, Ceilley E, Powell S. Current perceptions regarding surgical margin status after breast-conserving therapy: results of a survey. *Ann Surg*. 2005;241(4):629-639.
29. Collins ED, Moore CP, Clay KF, et al. Can women with early-stage breast cancer make an informed decision for mastectomy? *J Clin Oncol*. 2009;27(4):519-525.
30. Fagerlin A, Lakhani I, Lantz PM, et al. An informed decision? breast cancer patients and their knowledge about treatment. *Patient Educ Couns*. 2006;64(1-3):303-312.

