




The Association Between Patient Attitudes and Values and the Strength of Consideration for Contralateral Prophylactic Mastectomy in a Population-Based Sample of Breast Cancer Patients

Sarah T. Hawley, PhD, MPH ^{1,2,3}; Kent A. Griffith, MS, MPH⁴; Ann S. Hamilton, PhD⁵; Kevin C. Ward, PhD, MPH⁶; Monica Morrow, MD⁷; Nancy K. Janz, PhD³; Steven J. Katz, MD, MPH ^{1,8*}; and Reshma Jagsi, MD, DPhil ^{9,10*}

BACKGROUND: Little is known about how the individual decision styles and values of breast cancer patients at the time of treatment decision making are associated with the consideration of different treatment options and specifically with the consideration of contralateral prophylactic mastectomy (CPM). **METHODS:** Newly diagnosed patients with early-stage breast cancer who were treated in 2013-2014 were identified through the Surveillance, Epidemiology, and End Results registries of Los Angeles and Georgia and were surveyed approximately 7 months after surgery ($n = 2578$; response rate, 71%). The primary outcome was the consideration of CPM (strong vs less strong). The association between patients' values and decision styles and strong consideration was assessed with multivariate logistic regression. **RESULTS:** Approximately one-quarter of women (25%) reported strong/very strong consideration of CPM, and another 29% considered it moderately/weakly. Decision styles, including a rational-intuitive approach to decision making, varied. The factors most valued by women at the time of treatment decision making were as follows: avoiding worry about recurrence (82%) and reducing the need for more surgery (73%). In a multivariate analysis, patients who preferred to make their own decisions, those who valued avoiding worry about recurrence, and those who valued avoiding radiation significantly more often strongly considered CPM ($P < .05$), whereas those who reported being more logical and those who valued keeping their breast did so less often. **CONCLUSIONS:** Many patients considered CPM, and the consideration was associated with both decision styles and values. The variability in decision styles and values observed in this study suggests that formally evaluating these characteristics at or before the initial treatment encounter could provide an opportunity for improving patient clinician discussions. *Cancer* 2017;123:4547-55. © 2017 American Cancer Society.

KEYWORDS: breast cancer, contralateral prophylactic mastectomy, decision making, decision styles, population-based survey.

INTRODUCTION

The surge in the use of contralateral prophylactic mastectomy (CPM) after the diagnosis of breast cancer has motivated interest in understanding how the treatment decision-making process can drive a patient's desire for aggressive procedures that increase morbidity in the absence of a survival benefit. The frequency of CPM has increased from a relatively low rate among women who do not have an elevated risk of developing a second primary breast cancer to a rate greater than 20% in this population, and CPM now represents approximately half of mastectomies performed for breast cancer in the United States.¹⁻³ Importantly, many more women consider undergoing the procedure in comparison with those actually undergoing it.

Remarkably little research has been done to examine the psychological factors that drive a patient's desire for CPM. Several studies that have examined correlates of the use of CPM have observed that the procedure is undergone primarily

Corresponding author: Sarah T. Hawley, PhD, MPH, Department of Internal Medicine, Division of General Medicine, University of Michigan, 2800 Plymouth Road, 4th Floor, Ann Arbor, MI 48109; sarahawl@umich.edu.

¹Department of Internal Medicine, Division of General Medicine, University of Michigan, Ann Arbor, Michigan; ²Veterans Administration Center for Clinical Management Research, Ann Arbor VA Health Care System, Ann Arbor, Michigan; ³Department of Health Behavior and Health Education, School of Public Health, University of Michigan, Ann Arbor, Michigan; ⁴Department of Biostatistics, School of Public Health, University of Michigan, Ann Arbor, Michigan; ⁵Department of Preventive Medicine, Keck School of Medicine, University of Southern California, Los Angeles, California; ⁶Department of Epidemiology, Rollins School of Public Health, Emory University, Atlanta, Georgia; ⁷Department of Surgery, Memorial Sloan Kettering Cancer Center, New York, New York; ⁸Department of Health Management and Policy, School of Public Health, University of Michigan, Ann Arbor, Michigan; ⁹Department of Radiation Oncology, University of Michigan, Ann Arbor, Michigan; ¹⁰Center for Bioethics and Social Science in Medicine, Ann Arbor, Michigan.

*The last 2 authors contributed equally to this article.

We acknowledge the work of our project staff: Mackenzie Crawford, MPH, and Kiyana Perrino, MPH, from the Georgia Cancer Registry; Jennifer Zelaya, Pamela Lee, Maria Gaeta, Virginia Parker, BA, and Renee Bickerstaff-Magee from the University of Southern California; and Rebecca Morrison, MPH, Alexandra Jeanpierre, MPH, Stefanie Goodell, BS, Irina Bondarenko, MS, and Rose Juhasz, PhD, from the University of Michigan. We also acknowledge with gratitude the breast cancer patients who responded to our survey.

Additional supporting information may be found in the online version of this article.

DOI: 10.1002/cncr.30924, **Received:** May 10, 2017; **Revised:** June 19, 2017; **Accepted:** July 5, 2017, **Published online** August 15, 2017 in Wiley Online Library (wileyonlinelibrary.com)

by more highly educated, white, and insured patients.²⁻⁷ Research exploring the patient perspective has found women's choices for the procedure to be driven by worry about recurrence and a desire for peace of mind as well as a desire for better cosmetic outcomes.^{2,5} However, this literature has been limited by a focus on the characteristics of those patients who ultimately undergo CPM. Indeed, very little is known about all patients who think seriously about undergoing CPM, including those who do not ultimately undergo the procedure. Surgeons must be able to identify this much broader group of women, whose concerns must be addressed as part of the treatment decision-making process.

To address this gap in the literature, our study had 2 objectives. First, we characterized patient perspectives about the importance of different factors related to treatments (values) and underlying attitudes toward decision making (decision styles) in a large, diverse, population-based sample of patients with early-stage breast cancer at average risk for the development of a second primary cancer. Second, we evaluated correlates of strong consideration of CPM, including patient decision styles and values.

MATERIALS AND METHODS

Study Population

The iCanCare study, a large, diverse, population-based survey study of women with favorable-prognosis breast cancer, accrued women aged 20 to 79 years with newly diagnosed breast cancer (ductal carcinoma in situ and stage I and II cancer, <5 cm in size) as identified by rapid reporting systems from the Surveillance, Epidemiology, and End Results (SEER) registries of Georgia and Los Angeles County in 2013-2014. Black, Asian, and Hispanic women were oversampled in Los Angeles.⁸ We selected 3880 women, of whom 249 were later deemed ineligible because they had a prior cancer diagnosis or stage III or IV disease; resided outside the SEER registry area; or were deceased, too ill, or unable to complete a survey in Spanish or English. Of the 3631 eligible women remaining, 1053 did not return the mailed surveys, refused to participate, or were lost to follow-up. Among the 2578 respondents (71%), 216 were excluded because they had bilateral disease and/or were a genetic mutation carrier as reported on the survey. The resulting analytic sample was 2362 women (Supporting Fig. 1 [see online supporting information]).

Data Collection

Patients were sent surveys approximately 2 to 3 months after surgery, and the median completion time was 6 to 7

months after surgery. We provided a \$20 cash incentive and used a modified Dillman method for patient recruitment.⁹ All materials were sent in English and Spanish to those with Spanish surnames.⁸ Survey responses were then merged with clinical data from SEER. This study was approved by the institutional review boards of the University of Michigan, the University of Southern California, and Emory University.

Questionnaire Design and Content

The patient questionnaire content was guided by a conceptual framework, research questions, and hypotheses. Drawing from the literature and our prior research,¹⁰⁻¹² we chose established measures when they were available and developed new measures when it was necessary.¹⁰⁻¹² We used standard techniques to assess content validity, including a review by survey design experts, cognitive pre-testing with patients, and pilot studies in select clinic populations. Relevant measures from the iCanCare patient survey are provided in supporting information.

Primary Outcome: Consideration of CPM

We asked women to indicate on a 5-point Likert scale how much they considered having a mastectomy on their unaffected breast (from not at all to very strongly). We looked at any consideration (weak, moderate, strong, or very strong) versus not at all as well as categorization into 2 groups: strong/very strong versus other. For all but our initial descriptive analyses of this variable, we focused on the latter dichotomized comparison.

Key Independent Variables

Decision style factors

We used 3 measures designed to assess women's underlying approach to decision making (decision styles) on the basis of prior work.

Decision-making apprehension scale. This scale consisted of 4 items, each of which was scored with a 5-point Likert scale (ranging from not at all to almost always). The items were designed to assess how women normally approach the emotional side of decision making: 1) I worry about making a bad decision; 2) I struggle to decide what the right decision is; 3) once I make a decision, I don't look back; and 4) I worry a lot about the outcomes of my decisions. The Cronbach α value for the scale was .78, and it formed a single factor, with higher scores indicating more decision-making apprehension.

Decision-making traits. We asked 5 questions to assess the degree to which women indicated that they were

usually more rational or more intuitive in their approach to general decision making on the basis of literature in decision psychology.¹³ The items were scored with a 4-point Likert-like scale:

1. Did you rely on your instincts and feelings or weigh the pros and cons (scale, [1] instincts to [4] pros and cons)?
2. Were you more intuitive or more rational in your thinking (scale, [1] more intuitive to [4] more rational)?
3. Did you really think things through, or did you go with your first instinct (scale, [1] went with first instinct to [4] thought things through)?
4. Did you spend a lot of time reviewing the details, or did you make decisions quickly (scale, [1] quick decisions to [4] reviewing details)?
5. Did you do what seemed most logical, or did you just follow your heart? (scale, [1] followed heart to [4] more logical)?

Each of these items was dichotomized.

Decision autonomy preference. We asked 2 questions to assess the desired role in decision making. Patients were asked to indicate the degree to which they wanted their physician to tell them what to do and the degree to which they preferred to make their own breast cancer treatment decisions. Each item was scored on a 5-point scale ranging from not at all to all the time, and each was categorized as quite a bit/all the time or less.¹⁴

Patient values

We assessed the women's reports of the importance of 16 underlying values related to breast cancer treatment. For each value, we asked women to indicate how important it was at the time of making the treatment decision on a 5-point Likert scale (ranging from not at all important to very important). For the analysis, an indicator was created for reporting the very or quite important category versus other categories.

Covariates

The covariates used in this analysis included patient demographics obtained from the patient questionnaire. We included age, race/ethnicity (white, black, Latina, Asian, or other/unknown), educational attainment (high school graduate or less or some college or more), marital status (married/partnered vs not married/partnered), income group (<\$40,000, \$40,000 to <\$90,000, or ≥\$90,000), insurance status (private, Medicare, Medicaid, other, or none), bra cup size (A/B, C, D, or DD+), and a family history of breast cancer (none vs 1 or more first-degree relatives). We also included whether the patient reported

having undergone magnetic resonance imaging (yes, no, or missing). The stage (0, I, or II) was collected from SEER. An indicator of high risk for having a genetic mutation was created from both the patient report and the SEER variables, as described elsewhere.³ The geographic site (Georgia or Los Angeles) was also included to account for regional differences.

Statistical Analyses

We first calculated the proportion of women who considered CPM strongly or very strongly (hereafter referred to as *strong consideration*) overall and by all demographic and clinical factors, including the risk status. We generated descriptive statistics of each decision style measure and for all 16 values overall by generating the proportion indicating that each value was quite/very important. We then evaluated associations between these measures and strong consideration of CPM after adjustments for the covariates noted previously.

Multivariate logistic regression was used to explore correlates of strong consideration of CPM, including decision style factors, values, and covariates that remained significant at $P < .05$ in the adjusted analyses. Parsimonious multivariate models were constructed with backward selection techniques with a 3-step approach. First, decision style factors and values were modeled separately along with all demographic and clinical factors to determine important decision style factors and values. Second, significant decision style factors and values from each model were then modeled simultaneously, again with all demographic and clinical factors retained. Finally, significant decision style factors, values, and demographic and clinical factors were retained to arrive at the final parsimonious model. This model was adjusted for clustering at the surgeon level to account for potential surgeon-level practice attributes that could affect patients' consideration of CPM, such as the availability of or propensity to refer to reconstructive surgeons.¹⁵⁻¹⁷

All statistical analyses incorporated weights to account for differential probabilities of sample selection and nonresponse. The survey and SEER item nonresponse rate was low (<5%) for all covariates. We compared the distributions of nonrespondents and respondents for age, race, stage, and site. White patients (vs minorities) and those with stage I cancer (vs those with stage II cancer) were significantly more likely to respond, and we then addressed this via weighting to ensure that the analyses were representative of the original population.

To correct for a potential bias due to missing data, values for missing items were imputed with sequential

TABLE 1. Patient Demographic and Clinical Characteristics (n = 2362)

Characteristic	Total, No.	Weighted %	% Strongly Considering
Age at time of survey, y ^a	2362	61.8 (10.9)	56.4 (11.0)
Study site			
Georgia	1244	53.9	28.3
Los Angeles County	1118	46.1	19.2
Race/ethnicity			
White	1273	57.2	25.7
Black	422	18.0	19.4
Hispanic	402	13.6	26.8
Asian	204	8.7	19.3
Other/unknown/missing	61	2.5	22.4
Education			
At least some college	1658	71.9	26.3
High school graduate or less	679	27.1	17.7
Missing	25	1.0	33.4
Marital status			
Married/partnered	1474	62.7	26.1
Not married	859	36.0	20.7
Missing	29	1.3	22.5
Income (annual)			
<\$40,000	719	29.3	21.5
\$40,000 to <\$90,000	649	28.3	25.8
≥\$90,000	579	25.8	28.9
Missing	415	16.6	18.2
Insurance			
Private	1239	53.6	30.3
Other public	30	1.2	25.2
Medicare	672	28.7	14.3
Medicaid	319	12.6	20.7
None	11	0.5	28.0
Missing	91	3.4	20.6
Cancer stage			
0 (ductal carcinoma in situ)	425	25.2	23.1
I	1238	46.8	22.9
II	598	24.6	26.8
Missing	101	3.4	27.5
High risk (for second primary cancer)			
Yes	636	27.3	33.8
No	1668	70.7	20.5
Not known	58	2.0	18.2
Family history of breast cancer			
Yes	536	23.4	30.1
No	1650	69.2	21.9
Missing	176	7.4	25.6
Breast cup size			
A/B	750	31.9	22.8
C	730	31.0	21.7
D	473	19.7	24.0
≥DD	339	14.5	31.4
Missing	70	2.9	27.2
Magnetic resonance imaging			
Yes	1391	59.1	26.7
No	765	32.9	20.2
Missing	206	8.0	20.9

^aThe weighted mean and the standard deviation (in parentheses) are provided instead of percentages.

multiple imputation.^{18,19} Five multiply imputed data sets were analyzed, and model estimates were combined to account for additional uncertainty due to imputation. The results were compared between sequential multiple imputation analyses and complete case analyses for any meaningful differences. Odds ratios (ORs) with 95% confidence intervals (CIs) are reported for models, with *P*

values $\leq .05$ considered significant. All analyses were performed with SAS 9.4 (SAS, Cary, North Carolina).

RESULTS

Sample Characteristics

The characteristics of the sample overall and by the degree of consideration of CPM are provided in Table 1. The

When making your treatment decision, how important was it that the treatment(s)....

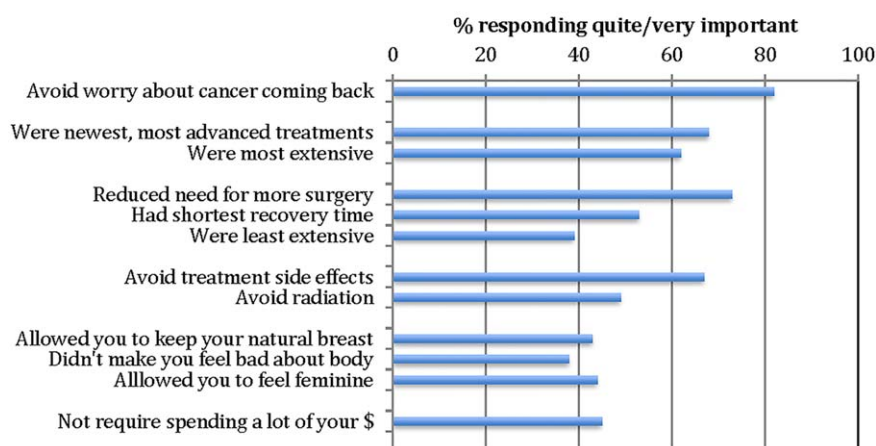


Figure 1. Patient values in breast cancer treatment decision making.

mean age was 62 years (standard deviation, 11 years). Overall, 25% of the patients had ductal carcinoma in situ, 47% had stage I disease, and 25% had stage II disease. Slightly more than half were white (57%); 430 (18%) were black, 413 (14%) were Latina, and 205 (9%) were Asian. Most had some college or more educational attainment (72%). The majority (1239 or 54%) had private insurance, but 310 had Medicaid (13%) and 672 had Medicare (29%). Approximately a quarter (23%) reported having a first-degree family member with breast cancer. Most (71%) were not at high risk for a second primary breast cancer.

Overall, approximately one-quarter (25%) of the women reported strong or very strong consideration of CPM, and another 29% considered it moderately or weakly. Of those who considered it strongly, 13% underwent unilateral mastectomy, and 16% underwent breast conservation. In bivariate analyses, women who considered CPM strongly/very strongly were younger, were more educated, were white, had private insurance, had a family history of breast cancer, and were more often from Georgia.

Decision Styles

The mean score on the decision apprehension scale was 2.5 (range, 1 [not very apprehensive] to 5 [very apprehensive]). More than half of the respondents reported that they were more rational than intuitive (75%), more often thought through decisions rather than going with their instinct (78%), more often reviewed details rather than making quick decisions (61%), and were more logical

rather than following their heart (83%) in their approach to treatment decision making. More than half (59%) indicated that they wanted their physician to tell them what to do quite/all the time, and just more than one-third (37%) reported that they preferred to make their own decisions quite a bit/all the time.

Values

There was considerable variation in the factors valued by patients in making treatment decisions. Figure 1 shows the percentage of patients who indicated that each value or value group was “very or quite important” to them in making their treatment decision. The most common value that women reported being quite/very important was allowing them to avoid worry about the cancer coming back (82%); this was followed by reducing the need for more surgery (73%), being the newest, most advanced treatment (69%), and avoiding treatment side effects (67%). The value least commonly reported to be quite/very important was receiving the same treatments that other women had received (23%).

Factors Associated With Strong/Very Strong Consideration of CPM

Table 2 shows the ORs for associations between individual decision styles and values and strong consideration of CPM after adjustments for the patient demographic and disease characteristics in separate regression models. Having a higher level of decision apprehension was modestly associated with strong consideration (OR, 1.14; 95% CI, 0.99-1.31), whereas women who reported more logical

TABLE 2. Individual Associations of Decision Style and Value Variables With the Strong Consideration of Contralateral Prophylactic Mastectomy With Adjustments for Covariates

Variable	OR (95% CI)	P
Decision styles		
Decision apprehension scale	1.14 (0.99-1.31)	.08
Decision making traits		
Rational vs intuitive	1.18 (0.89-1.57)	.24
Thinking through vs first instinct	0.91 (0.68-1.21)	.48
Reviewing in detail vs quick decisions	1.09 (0.86-1.37)	.52
Being logical vs following your heart	0.52 (0.37-0.71)	<.001
Decision autonomy preference		
Preferring to make your own decisions (all the time/most of time vs less often)	1.74 (1.39-2.18)	<.001
Prefer physician to make decision	0.69 (0.55-0.87)	0.03
Values		
Avoiding worry about cancer coming back	2.27 (1.54-3.35)	<.001
Reducing the need for more surgery	0.92 (0.71-1.20)	.54
Avoiding side effects of treatment	1.23 (0.96-1.58)	.10
Avoiding exposure to radiation	2.59 (2.03-3.30)	<.001
Requiring fewer trips back and forth for treatment	1.51 (1.18-1.92)	<.001
Not making you feel bad about your body	1.25 (0.99-1.57)	.05
Receiving most extensive treatment possible	1.45 (1.10-1.92)	<.01
Receiving least extensive treatment possible	0.70 (0.55-0.91)	<.01
Allowing you to keep your natural breast	0.15 (0.12-0.21)	<.001
Receiving same treatments that other women received	0.63 (0.46-0.86)	<.01
Receiving newest, most advanced treatments	0.82 (0.64-1.06)	.13
Having the shortest recovery time	0.77 (0.61-0.97)	.02
Not requiring you to spend a lot of your own money	0.85 (0.67-1.09)	.20

Abbreviations: CI, confidence interval; OR, odds ratio.

Adjustments were made for all covariates included in Table 1. Bolded values are significant.

approaches to decision making were less likely to have strongly considered CPM (OR, 0.52; 95% CI, 0.31-0.71). Women who preferred their physician to make the decision less often strongly considered CPM (OR, 0.69; 95% CI, 0.55-0.87), whereas women who preferred to make their own treatment decisions more often strongly considered CPM (OR, 1.74; 95% CI, 1.39-2.18). Several values were significantly associated ($P < .01$) with strong consideration of CPM among women who said that the values were quite/very important at the time of treatment decision making: avoiding worry about the cancer coming back, avoiding exposure to radiation, requiring fewer trips back and forth for treatment, and choosing the treatments that were most extensive. Conversely, women who said it was quite/very important to choose treatments that were least extensive, allowed them to keep their natural breast, and were the same as those other women had undergone were significantly ($P < .001$) less likely to strongly consider CPM.

Figure 2 displays a forest plot showing the multivariate parsimonious logistic regression results for strong consideration of CPM with adjustments for clustering at the surgeon level. Patients who had a family history of breast cancer and a larger breast cup size had higher odds of strong consideration of CPM than their

counterparts (OR with a family history of breast cancer, 2.19; 95% CI, 1.65-2.91; OR with a larger breast cup size, 1.76; 95% CI, 1.17-2.65), whereas those from Georgia had lower odds (OR, 0.60; 95% CI, 0.42-0.85). Latina women also reported strong consideration of CPM more often than white women (OR, 2.14; 95% CI, 1.37-3.34), whereas African American women reported strong consideration of CPM less often than white women (OR, 0.63; 95% CI, 0.43-0.93). Two decision styles remained significantly associated with strong consideration of CPM in the multivariate model: women who preferred to make their own treatment decisions more often strongly considered CPM (OR, 1.56; 95% CI, 1.21-2.01), whereas women who reported being more logical in their decision making less often strongly considered CPM than those who reported following their heart (OR, 0.50; 95% CI, 0.34-0.72). Three values remained significant: avoiding worry about the cancer coming back (OR, 2.26; 95% CI, 1.40-3.66) and avoiding radiation exposure (OR, 2.85; 95% CI, 2.19-3.68) were both associated with strong consideration, whereas allowing the natural breast to be kept was significantly and inversely associated with strong consideration of CPM (OR, 0.12; 95% CI, 0.08-0.17).

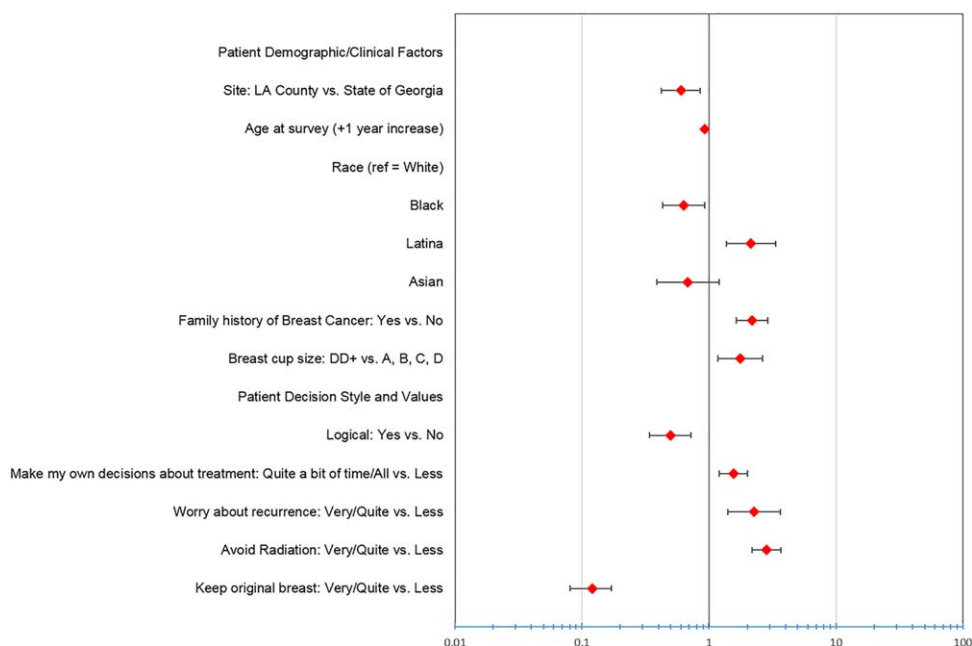


Figure 2. Adjusted associations (odds ratios) from a multivariate model explaining patients' strong consideration of contralateral prophylactic mastectomy with adjustments for clustering at the surgeon level. LA indicates Los Angeles.

DISCUSSION

In this large, diverse, population-based sample of newly diagnosed breast cancer patients with a favorable prognosis, we found considerable variation both in the manner in which patients reported approaching treatment decision making (decision styles) and in what women valued at the time of treatment decision making; although most strongly valued avoiding worry about the cancer coming back, other factors were also important to many women. We further found that nearly a quarter of women strongly or very strongly considered having their unaffected breasts removed as part of treatment for their breast cancer, and another 29% considered it moderately or weakly. Our study contributes to the literature about the rise in CPM by deconstructing the decision-making process. Before the receipt of CPM, all patients must move through a process of weighing the treatment options and consider how the procedure aligns with their values. Factors associated with consideration, particularly strong consideration, are potentially actionable targets for education and intervention.

Importantly, our results suggest that values matter slightly more than underlying personality traits in determining who strongly considers this procedure, although some decision styles are relevant. Our measure of decisional apprehension, developed to assess the type of person who may be more likely to make a decision for

extensive treatment to avoid regretting it later, was notably not significantly associated with strong consideration when other factors were included in our model. Similarly, although most of the rational-intuitive items were not associated with strong consideration, women who endorsed being more logical in their decision making less often strongly considered this procedure. This held even when we controlled for the educational status, and this further underscores the importance of this finding across all types of patients. This finding further suggests that having a better understanding of a woman's underlying approach—logical versus more emotional (ie, “going with the gut”)—may provide opportunities for individualizing the approach to education about risks and benefits.

We also found that women who reported desiring to play a more active role in decision making more often strongly considered CPM. This finding is consistent with prior work showing that more involved patients, those who reported making patient-driven decisions rather than shared or surgeon-driven decisions, more often chose mastectomy at a time when CPM was not a widely performed procedure.^{10,11} Our current results confirm that such patient-led decision making is also associated with the consideration of even more extensive surgery than unilateral mastectomy. These findings call into question the notion that simply involving patients in decision making is likely to translate into less overtreatment.²⁰ They

further suggest that perhaps we need to refocus efforts on targeting patients who desire considerable control in the decision-making process and on aspects of decision making that are not purely rational. The importance of affect in general decision making has been identified^{21,22} and highlighted in the seminal work by Kahneman.²³ Our findings support the idea that educational efforts in breast cancer treatment should address the intuitive or affective reactions that patients have to the meaning of the diagnosis and the prospects of the arduous treatment course as well as the cognitive aspects of decision making. For instance, it is not uncommon for patients to have activated intuitive/affective pathways of decision making rather than rational ones (a common psychological shortcut or heuristic).^{23,24} This may require interventions using methods targeted to this end, such as providing patient stories as well as numerical information to appeal to the emotional nature of this decision.

Several of the values measured in our study were associated with strong consideration in the anticipated direction when adjustments were made for patient and disease characteristics. When women valued things that would align with receiving more treatment, such as avoiding worry about recurrence and choosing treatments that were more extensive, they more often strongly considered CPM. Conversely, we also found that when women valued things that would align with less surgery, such as keeping their natural breast or choosing treatments that were less extensive, they less often strongly considered CPM.

The importance of these values, which have been identified in prior studies, reinforces the need to address directly patients' perceptions of the risk of recurrence and their reactions to it²⁵ because many patients overestimate the actual risk of recurrence after treatment. Furthermore, prior work by our team has shown an association between worry about recurrence and subsequent receipt of CPM.⁴ This is particularly concerning because CPM does not confer a benefit for reducing recurrence risk or for long-term survival in the population studied in this analysis (non-BRAC1/2-positive and no strong family history of breast or ovarian cancer).²⁶⁻²⁸ Our current finding, that worry is associated with consideration as well as utilization, suggests that interventions at the time when women are considering their treatment options may be useful. Furthermore, the powerful desire for many patients to avoid radiation motivates the need to ensure that they are well educated about the benefits and risks of treatment options that include this modality as an adjuvant.

Aspects of this study merit comment. The strengths of this study include a large, diverse sample, a high

participation rate, and the use of unique patient-reported measures. However, the study has some limitations. Patients lived in 2 geographic regions, so they may not represent all US breast cancer patients. We did not have details on some practice factors that might have influenced patients' desire for CPM, such as information about breast reconstruction options and their availability. However, we did control for clustering by surgeon and geographic location. Finally, associations observed in the study are not necessarily causal.

Implications

Our results have important implications for patient-clinician communication supporting individualized treatment decision making. Many more patients consider CPM, even in the absence of the potential for a survival benefit, in comparison with those who actually undergo the procedure. Assessing the decision styles and values of patients at or before the initial treatment encounter could provide an opportunity for improving deliberation by tailoring discussions about treatment options to embrace the patient's own style and values. There is a need to better educate patients about misperceptions associated with their values; for instance, it should be ensured that they understand the actual risk of recurrence because that value is associated with the consideration of more extensive treatment. Our results suggest that these are key areas for intervention, even in the context of quality improvement or other initiatives to ensure the appropriate use of treatments. These assessments can further help physicians to tailor communications to better target patients who may not wish to defer to physicians and/or those who are engaged in more intuitive decision processes than rational ones.

FUNDING SUPPORT

This work was funded by a grant from the National Cancer Institute (P01 CA163233) to the University of Michigan. Support was also provided by the Biostatistics, Analytics and Bioinformatics shared resource from the University of Michigan Cancer Center Support grant (5 P30 CA46592). The collection of Los Angeles County cancer incidence data used in this study was supported by the following: the California Department of Public Health pursuant to California Health and Safety Code Section 103885; the National Program of Cancer Registries (Centers for Disease Control and Prevention) under cooperative agreement 5NU58DP003862-04/DP003862; and the National Cancer Institute's Surveillance, Epidemiology, and End Results Program under contract HHSN261201000140C awarded to the Cancer Prevention Institute of California, under contract HHSN261201000035C awarded to the University of Southern California, and under contract HHSN261201000034C awarded to the Public Health Institute. The collection of cancer incidence data in Georgia was supported by contract HHSN261201300015I (task order HHSN26100006)

from the National Cancer Institute and by cooperative agreement 5NU58DP003875-04-00 from the Centers for Disease Control and Prevention. The ideas and opinions expressed herein are those of the authors, and endorsement by the states of California and Georgia, the Department of Public Health, the National Cancer Institute, and the Centers for Disease Control and Prevention or their contractors and subcontractors is not intended nor should be inferred.

CONFLICT OF INTEREST DISCLOSURES

Reshma Jagsi reports grants from the National Institutes of Health, the Doris Duke Foundation, and the Greenwall Foundation outside the submitted work.

AUTHOR CONTRIBUTIONS

Sarah T. Hawley: Conceptualization, methodology, investigation, writing—original draft, writing—review and editing, visualization, and funding acquisition. **Kent A. Griffith:** Methodology, investigation, software, formal analysis, writing—original draft, writing—review and editing, and visualization. **Ann S. Hamilton:** Conceptualization, methodology, investigation, writing—original draft, writing—review and editing, and project administration. **Kevin C. Ward:** Conceptualization, methodology, investigation, writing—original draft, writing—review and editing, and project administration. **Monica Morrow:** Conceptualization, methodology, investigation, writing—original draft, and writing—review and editing. **Nancy K. Janz:** Conceptualization, methodology, investigation, writing—original draft, and writing—review and editing. **Steven J. Katz:** Conceptualization, methodology, investigation, writing—original draft, writing—review and editing, visualization, project administration, and funding acquisition. **Reshma Jagsi:** Conceptualization, methodology, investigation, writing—original draft, writing—review and editing, visualization, and funding acquisition.

REFERENCES

- Nash R, Goodman M, Lin CC, et al. State variation in the receipt of a contralateral prophylactic mastectomy among women who received a diagnosis of invasive unilateral early-stage breast cancer in the United States, 2004-2012. *JAMA Surg.* 2017;152:648-657.
- Jagsi R, Hawley ST, Griffith KA, et al. Contralateral prophylactic mastectomy decisions in a population-based sample of patients with early-stage breast cancer. *JAMA Surg.* 2017;152:274-282.
- Kurian AW, Griffith KA, Hamilton AS, et al. Genetic testing and counseling among patients with newly diagnosed breast cancer. *JAMA.* 2017;317:531-534.
- Hawley ST, Jagsi R, Morrow M, et al. Social and clinical determinants of contralateral prophylactic mastectomy. *JAMA Surg.* 2014;149:582-589.
- Rosenberg SM, Tracy MS, Meyer ME, et al. Perceptions, knowledge, and satisfaction with contralateral prophylactic mastectomy among young women with breast cancer: a cross-sectional survey. *Ann Intern Med.* 2013;159:373-381.
- 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;25:5203-5209.
- Tuttle TM, Jarosek S, Habermann EB, et al. Increasing rates of contralateral prophylactic mastectomy among patients with ductal carcinoma in situ. *J Clin Oncol.* 2009;27:1362-1367.
- 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;18:2022-2029.
- Dillman D, Smyth J, Christian L. Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method. 3rd ed. Hoboken, NY: John Wiley & Sons Inc; 2009.
- Katz SJ, Lantz PM, Janz NK, et al. Patient involvement in surgery treatment decisions for breast cancer. *J Clin Oncol.* 2005;23:5526-5533.
- Hawley ST, Griggs JJ, Hamilton AS, et al. Decision involvement and receipt of mastectomy among racially and ethnically diverse breast cancer patients. *J Natl Cancer Inst.* 2009;101:1337-1347.
- Shumway D, Griffith KA, Jagsi R, Gabram SG, Williams GC, Resnicow K. Psychometric properties of a brief measure of autonomy support in breast cancer patients. *BMC Med Inform Decis Mak.* 2015;15:51.
- Evans JS, Stanovich KE. Dual-process theories of higher cognition: advancing the debate. *Perspect Psychol Sci.* 2013;8:223-241.
- Martinez KA, Resnicow K, Williams GC, et al. Does physician communication style impact patient report of decision quality for breast cancer treatment? *Patient Educ Couns.* 2016;99:1947-1954.
- Greenberg CC, Lipsitz SR, Hughes ME, et al. Institutional variation in the surgical treatment of breast cancer: a study of the NCCN. *Ann Surg.* 2011;254:339-345.
- Hawley ST, Hofer TP, Janz NK, et al. Correlates of between-surgeon variation in breast cancer treatments. *Med Care.* 2006;44:609-616.
- Katz SJ, Hawley ST, Abrahamse P, et al. Does it matter where you go for breast surgery?: attending surgeon's influence on variation in receipt of mastectomy for breast cancer. *Med Care.* 2010;48:892-899.
- Raghunathan TE, Lepkowski JM, Van Hoewyk J, Solenberger P. A multivariate technique for multiply imputing missing values using a sequence of regression models. *Surv Methodol.* 2001;27:85-96.
- Rubin DB. Multiple Imputation for Nonresponse in Surveys. Hoboken, NY: John Wiley & Sons Inc; 1987.
- Katz SJ, Hawley S. The value of sharing treatment decision making with patients: expecting too much? *JAMA.* 2013;310:1559-1560.
- Janssen E, van Osch L, Lechner L, Candel M, de Vries H. Thinking versus feeling: differentiating between cognitive and affective components of perceived cancer risk. *Psychol Health.* 2012;27:767-783.
- Schwarz N. Emotion, cognition, and decision making. *Cogn Emotion.* 2000;14:433-440.
- Kahneman D. Thinking, Fast and Slow. New York, NY: Farrar Straus and Giroux; 2011.
- Lerner JS, Li Y, Valdesolo P, Kassam KS. Emotion and decision making. *Ann Rev Psychol.* 2015;66:799-823.
- Hawley ST, Janz NK, Griffith KA, et al. Recurrence risk perception and quality of life following treatment of breast cancer. *Breast Cancer Res Treat.* 2017;161:557-565.
- Wong SM, Freedman RA, Sagara Y, Aydogan F, Barry WT, Golshan M. Growing use of contralateral prophylactic mastectomy despite no improvement in long-term survival for invasive breast cancer. *Ann Surg.* 2017;265:581-589.
- Lostumbo L, Carbine NE, Wallace J. Prophylactic mastectomy for the prevention of breast cancer. *Cochrane Database Syst Rev.* 2010;11:CD002748.
- Nichols HB, Berrington de Gonzalez A, Lacey JV Jr, Rosenberg PS, Anderson WF. Declining incidence of contralateral breast cancer in the United States from 1975 to 2006. *J Clin Oncol.* 2011;29:1564-1569.