Ann Surg Oncol (2019) 26:3224–3231
https://doi.org/10.1245/s10434-019-07561-y

Annals of
SURGICAL ONCOLOGY
OFFICIAL JOURNAL OF THE SOCIETY OF SURGICAL ONCOLOGY

ORIGINAL ARTICLE – BREAST ONCOLOGY

Exploring Surgeon Variability in Recommendations for Contralateral Prophylactic Mastectomy: What Matters Most?

Mark A. Taylor, MD[1], Chelsea McCarty Allen, PhD[2], Angela P. Presson, PhD[2], Morgan M. Millar, PhD[2], Rudi Zurbuchen, BS[3], and Cindy B. Matsen, MD, MSCI, FACS[1]

[1]Department of Surgery, Huntsman Cancer Institute, University of Utah, Salt Lake City, UT; [2]Division of Epidemiology, University of Utah School of Medicine, Salt Lake City, UT; [3]University of Utah School of Medicine, Salt Lake City, UT

ABSTRACT

Background. American Society of Breast Surgeons (ASBrS) guidelines state that it is the responsibility of the surgeon to discuss the risks/benefits of and give a recommendation regarding contralateral prophylactic mastectomy (CPM). We conducted a survey of ASBrS members to evaluate the factors that affect this recommendation, confidence in this recommendation, and awareness/adoption of the guidelines.

Methods. A survey was sent to the ASBrS membership. Vignettes with the following variables about breast cancer patient were randomly included: age, disease stage, receptor status, family history (FH) of breast cancer, and patient preference for CPM. Respondents were asked to estimate the patient's chance of developing contralateral cancer, whether they would recommend CPM, and their confidence in this recommendation, and about their familiarity with and use of the guidelines.

Results. 536 members (21.9%) responded. The odds of recommending CPM and confidence in recommendation were higher in a younger patient, higher-stage disease, triple-negative and human epidermal growth factor receptor (HER)2+ relative to estrogen receptor (ER)+, and in women with FH. Of surgeons, 51% were familiar or very familiar with the guidelines and 38% used the guidelines most or all of the time. Surgeons who used the guidelines were not less likely to recommend CPM.

Conclusions. While surgeons generally agree on the factors that are important in making a recommendation on CPM, there is variability in how strongly the different factors influence the recommendation and their confidence in that recommendation. In addition, while most surgeons were at least a little familiar with the ASBrS guidelines, the vast majority do not routinely use them.

First Received: 22 April 2019;
Published Online: 24 July 2019

C. B. Matsen, MD, MSCI, FACS
e-mail: Cindy.Matsen@hsc.utah.edu

Rates of contralateral prophylactic mastectomy (CPM) are increasing,[1,2] despite the lack of survival benefit.[3] There are many known factors that influence patient choice for CPM.[2–7] Prior studies have shown that the decision for this procedure is largely driven by patient preference and that, when the surgeon primarily makes the decision, the rates of CPM are lower,[8–10] but having surgeons make the decision would seem to contradict patient-centered care, where patient autonomy and involvement in decision-making are highly valued.[9,11] On the other hand, provider participation is necessary for true shared decision-making to take place.[12–14] The surgeon plays a crucial role in providing information about the procedure and the disease factors that might be important in the decision. Oftentimes, the patient is looking to the physician to make a recommendation on the role of CPM in her specific case.

How surgeons make recommendations for CPM is less well studied. Past studies have shown that surgeons are more comfortable recommending CPM when there is a high-risk mutation and less comfortable recommending it for average-risk patients.[15,16] How these recommendations are approached can also affect patient satisfaction.[17]

Current guidelines from the American Society of Breast Surgeons (ASBrS) summarize data about CPM[18] and state that it is the responsibility of the surgeon to discuss the risks and benefits as they relate to the individual patient and

to give a recommendation regarding CPM.[19] Little is known about surgeon awareness of these guidelines, the patient factors that play a role in surgeon recommendations for CPM, and how surgeons integrate these guidelines into their own practice. To better understand these issues, we conducted a survey of ASBrS members.

METHODS

Participants

The survey was approved by the Research Committee of ASBrS. The ASBrS e-mailed the survey to all member surgeons in February 2018. All survey responses, including incomplete surveys, were included in data analysis. A cover letter was included, explaining the survey and that participation implied informed consent. This study was deemed exempt from full board review by the University of Utah IRB.

Survey Structure

Demographic variables including age, gender, years in practice, number of breast cancer patients seen annually, and practice setting were collected.

Six of a possible 48 vignettes were randomly included in each survey. Variables included patient age, breast cancer stage, receptor status, FH of breast cancer, and patient preference for CPM. Each vignette had the following structure with the possible variables in brackets:

> "A [35/65] year old woman with clinical [stage I/stage III] [ER+/triple negative/HER2 positive] invasive cancer with [no FH/FH of breast cancer in her mother at age 48]. Genetic testing is negative for any deleterious mutations. Imaging is negative for the contralateral breast. She is planning to have a mastectomy and [prefers/isn't sure about] contralateral prophylactic mastectomy."

Respondents were asked to assume that all appropriate adjuvant therapies would be given. They were then asked to estimate the patient's chance of developing contralateral breast cancer (CBC) in 10 years and in her lifetime for each of the vignettes and to rate their confidence in these estimates on a five-point Likert scale from "not at all confident" to "completely confident." We then asked whether they would recommend CPM or not and how confident they were in this recommendation on a similar five-point Likert scale.

We then asked about their familiarity with the 2016 ASBrS guidelines on CPM discussions and their use of these guidelines. Last, respondents were asked to rank the top 3 factors that affect their recommendation of CPM from a list of 11 possible factors (Fig. 2), derived from factors included in the ASBrS guidelines and from those found to be most important to patients in prior studies.

Data Analysis

Survey respondent characteristics were summarized, for categorical variables, by number and percent in each category or, for numeric variables, by mean and standard deviation (SD).

Summaries by patient factors were calculated and differences assessed. Numeric variables, summarized with mean and SD, were compared using *t*-tests or analysis of variance (ANOVA). Ranking variables, summarized with median and interquartile range (IQR), were compared using the Wilcoxon rank-sum test or Kruskal–Wallis test. Number recommending mastectomy, summarized with percent, was compared using the Chi-square test.

Logistic models of recommendation of CPM were created using generalized estimating equations (GEE), and estimates are given for odds ratio (OR) and 95% confidence interval (CI). Separate models were calculated for the effect of familiarity with guidelines and use of guidelines, both adjusted for patient factors. Recommendation was also modeled using survey respondent characteristics and additionally using patient factors and interactions selected using the Wald test.

Ordinal regression models of confidence in recommendation are also given. Confidence in recommendation, initially rated from 1 to 5, was collapsed because of ranks 1 and 2 having a low amount of responses; the categories used for this modeling were 1–3, 4, and 5. Using generalized estimating equations, estimates were calculated for OR and 95% CI. Separate models were calculated for the effect of familiarity with guidelines and use of guidelines, both adjusted for patient factors. Recommendation was also modeled using patient factors and interactions selected using the Wald test. Statistical significance was assessed at the 0.05 level using two-tailed tests. Analyses were conducted in R v.3.5.

RESULTS

Effect of Surgeon Variables (Fig. 1a)

A total of 536 surgeons responded to the survey. Demographics of the respondents are presented in Table 1. Respondents were mostly female, with an average of 20 years in practice; they predominantly practiced in a community setting, and most treated more than 100 breast cancer patients per year. All six of the survey vignettes were completed by 71%.

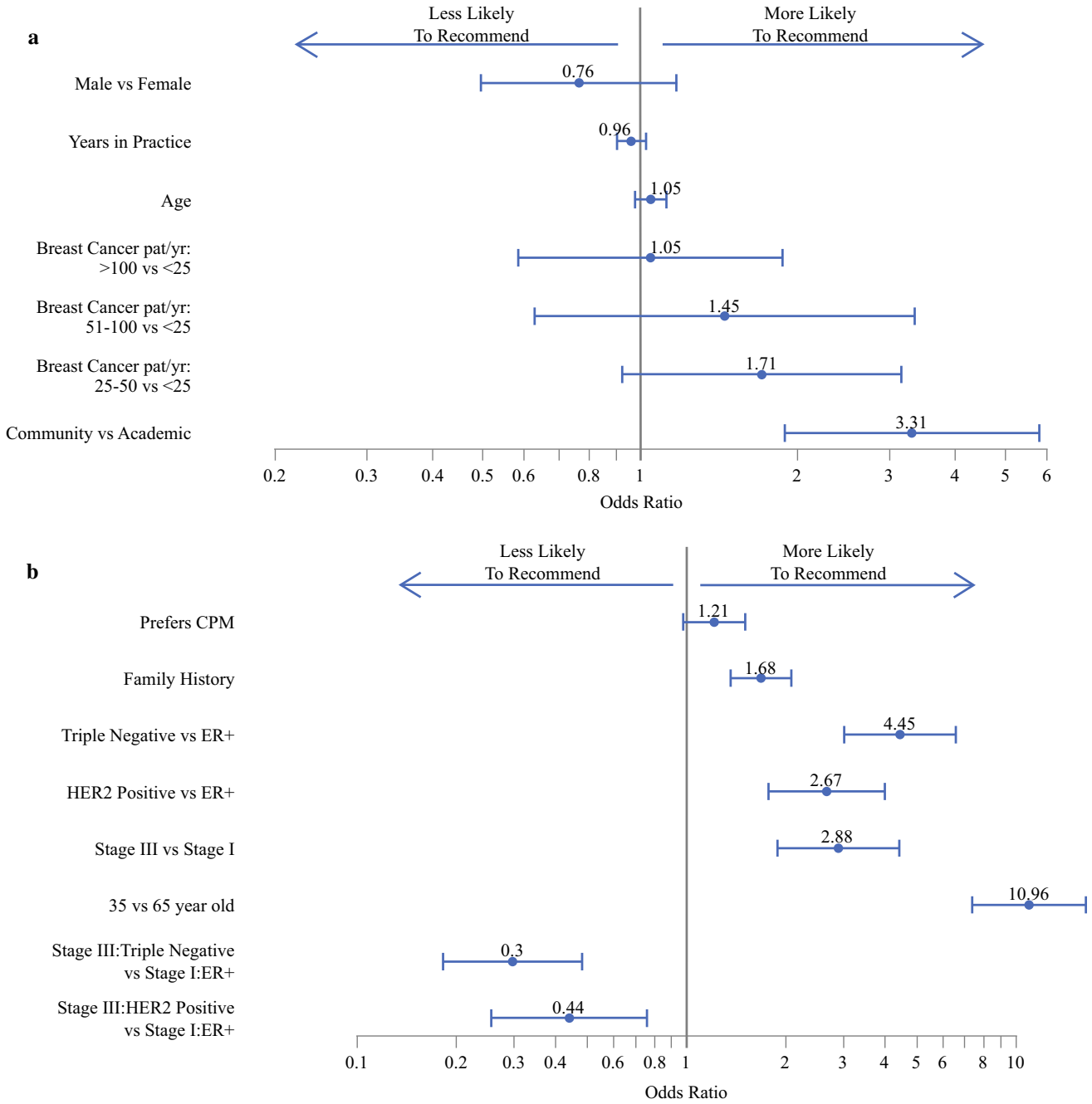

FIG. 1 Forest plots showing odds of recommending CPM based on survey respondents' characteristics (**a**) and patient factors (**b**). Odd ratios calculated using multivariate GEE logistic model and variable selection of interactions

Practice setting had a significant effect on likelihood of recommending CPM, with the odds of recommending CPM being 3.3 times higher (OR 3.31; 95% CI 1.89, 5.81) for surgeons in a community setting relative to surgeons in an academic setting. There was no difference in the confidence in this recommendation between settings.

There was no difference in odds or confidence of recommendation based on gender, years in practice, age, or number of breast cancer patients seen per year.

Effect of Patient Variables (Table 2; Fig. 1b)

Patient Age Respondents' estimated decade and lifetime probability of CBC were both higher in 35-year-old women compared with 65-year-old women. The confidence in the estimate was significantly higher if the patient was older. CPM was recommended in 25% of 35-year-old patients across all vignettes compared with 3% of 65-year-old patients. The confidence in recommendation was higher in

TABLE 1 Characteristics of survey respondents

N (response rate)	536 (21.9%)
Breast cancer patients/year, *n* (%)	
Fewer than 25	54 (10.1)
25–50	123 (22.9)
51–100	17 (3.2)
More than 100	342 (63.8)
Practice setting, *n* (%)	
Academic	132 (24.6)
Community	404 (75.4)
Age, mean (SD), years	52.5 (10.2)
Gender, *n* (%)	
Female	222 (63.2)
Male	129 (36.8)
Years in practice, mean (SD)	20 (10.6)

65-year-old patients. The odds of recommending CPM for a 35-year-old patient was 11 times greater (OR 10.96; 95% CI 7.37, 16.29; $p < 0.001$) when taking into account the other variables in regression analysis. The odds of increased confidence in this recommendation was 2.3 times higher (OR 3.33; 95% CI 2.59, 4.28; $p < 0.001$) in younger, stage I, ER+ with no FH.

Disease Stage Estimated decade probability of CBC was higher in stage III breast cancer relative to stage I, but this difference was not seen in estimated lifetime probability. There was no significant difference in the confidence of the estimated probability of CBC in the next decade, but the confidence in the estimated lifetime probability of CBC was higher in stage I. Respondents recommended CPM in 16% of stage III compared with 12% of stage I. The confidence in this recommendation was higher in stage I. On regression analysis, the odds of recommending CPM was 2.9 times higher (OR 2.88; 95% CI 1.89, 4.41; $p < 0.001$) for stage III relative to stage I. The confidence in this recommendation was also higher in stage III. The odds of increased confidence in this recommendation was 2.5 times higher (OR 2.54; 95% CI 2.06, 3.12; $p < 0.001$) in stage III, among ER positive, 65-year-old patients.

Receptor Status Estimated decade and lifetime probability of CBC differed across receptor status. For both estimates, triple negative was estimated to have the highest risk, followed by HER2+ and then ER+ with the lowest risk. Respondents recommended CPM in 14% of HER2+ and 19% of triple negative compared with 10% in ER+ disease. Odds of recommending CPM was 4.5 times higher (OR 4.45; 95% CI 3.01, 6.56; $p < 0.001$) in triple negative compared with ER+; the odds were 2.7 times higher (OR 2.67; 95% CI 1.77, 4.01; $p < 0.001$) for HER2+ than ER positive. In comparison with ER+, odds of increasing confidence in recommendation were 2.8 times higher (OR 2.80; 95% CI 2.24, 3.50; $p < 0.001$) for HER2+ and 3.2 times higher (OR 3.18; 95% CI 2.54, 3.98; $p < 0.001$) for triple negative, among stage I patients.

Family History Estimated decade and lifetime probability of CBC were both higher in patients with FH of breast cancer as compared with those without. In addition, the confidence in this estimate was higher for those without FH of breast cancer. Respondents recommended CPM in 17% of patients with FH of breast cancer as compared with 11% in those without. The confidence in this recommendation was higher for those without FH of breast cancer. On regression analysis, the odds of a respondent recommending CPM was 1.7 times higher (OR 1.68; 95% CI 1.36, 2.08; $p < 0.001$) in women with FH of breast cancer relative to those without one.

Patient Preference for CPM There was no difference in the estimated decade and lifetime probability or the confidence in this estimate between patients who prefer CPM and those who are not sure about their preference. There was also no difference in the likelihood of recommending CPM on regression analysis of patient preference. With no FH of breast cancer, the odds of increased confidence in this recommendation was 1.5 times lower (OR 0.66; 95% CI 0.57, 0.77; $p < 0.001$) if the patient expressed a preference for CPM.

Interactions in Patient Factors For recommendation of CPM, there was an interaction between stage and receptor status in addition to the linear terms. The odds of recommending CPM was 2.9 times higher (OR 2.88; 95% CI 1.89, 4.41; $p < 0.001$) for stage III relative to stage I for ER+ patients. For triple negative, this difference was reduced by 3.3 times (OR 0.30; 95% CI 0.18, 0.48; $p < 0.001$), and for HER2+ the difference was reduced by 2.3 times (OR 0.44; 95% CI 0.26, 0.76; $p < 0.001$).

The odds of increased confidence in CPM recommendation showed several interactions. The odds were 3.3 times higher (OR 3.33; 95% CI 2.59, 4.28; $p < 0.001$) in younger, stage I, ER+, or triple negative with no FH, but this difference in odds was reduced by 1.4 times (OR 0.73; 95% CI 0.60, 0.88; $p = 0.001$) for stage III, 1.4 times (OR 0.77; 95% CI 0.61, 0.97; $p = 0.025$) for HER2+, 1.4 times (OR 0.74; 95% CI 0.59, 0.93; $p = 0.009$) for triple negative, and 1.3 times (OR 0.78; 95% CI 0.65, 0.94; $p = 0.009$) for those with FH of breast cancer.

The odds of increased confidence in recommendation was 2.5 times higher (OR 2.54; 95% CI 2.06, 3.12; $p < 0.001$) in stage III than stage I among ER+, but was

TABLE 2 Univariate analysis of the effect of patient factors on estimated risk of contralateral breast cancer (CBC) in next decade and in the patient's lifetime, confidence in these estimates, recommendation of CPM, and confidence in this recommendation

Age	65-Year-old	35-Year-old	*p* value
Estimated risk of CBC in next decade, mean (SD)	7.4 (6.6)	9.5 (8.1)	< 0.001
Decade estimate confidence, median (IQR)	4 (3, 4)	4 (3, 4)	< 0.001
Estimated risk of CBC in lifetime, mean (SD)	12.7 (7.9)	21.8 (11.5)	< 0.001
Lifetime estimate confidence, median (IQR)	4 (3, 4)	4 (3, 4)	< 0.001
Recommend CPM (%)	3.2	25.2	< 0.001
Confidence in recommendation	5 (4, 5)	4 (4, 5)	< 0.001
Stage	**Stage I**	**Stage III**	***p* value**
Estimated risk of CBC in next decade, mean (SD)	8 (7.4)	8.8 (7.4)	0.004
Decade estimate confidence, median (IQR)	4 (3, 4)	4 (3, 4)	0.26
Estimated risk of CBC in lifetime, mean (SD)	16.7 (10.4)	17.5 (11.2)	0.059
Lifetime estimate confidence, median (IQR)	4 (3, 4)	4 (3, 4)	0.030
Recommend CPM (%)	12.3	15.6	0.013
Confidence in recommendation	4 (4, 5)	4 (4, 5)	< 0.001
Receptor status	**ER positive**	**HER2 positive**	**Triple negative**	***p* value**
Estimated risk of CBC in next decade, mean (SD)	7.7 (6.9)	8.3 (7.1)	9.3 (8.2)	< 0.001
Decade estimate confidence, median (IQR)	4 (3, 4)	4 (3, 4)	4 (3, 4)	< 0.001
Estimated risk of CBC in lifetime, mean (SD)	15.8 (9.9)	16.8 (10.3)	18.9 (11.9)	< 0.001
Lifetime estimate confidence, median (IQR)	4 (3, 4)	4 (3, 4)	4 (3, 4)	< 0.001
Recommend CPM (%)	9.6	13.8	19	< 0.001
Confidence in recommendation	5 (4, 5)	4 (4, 5)	4 (4, 5)	< 0.001
Family history of breast cancer	**No**	**Yes**	***p* value**
Estimated risk of CBC in next decade, mean (SD)	8 (7.3)	8.9 (7.5)	0.001
Decade estimate confidence, median (IQR)	4 (3, 4)	4 (3, 4)	0.018
Estimated risk of CBC in lifetime, mean (SD)	16.3 (10.5)	18 (11.1)	< 0.001
Lifetime estimate confidence, median (IQR)	4 (3, 4)	4 (3, 4)	0.014
Recommend CPM (%)	11.3	16.5	< 0.001
Confidence in recommendation	4 (4, 5)	4 (4, 5)	< 0.001
CPM preference	**Is not sure**	**Prefers CPM**	***p* value**
Estimated risk of CBC in next decade, mean (SD)	8.4 (7.3)	8.5 (7.5)	0.75
Decade estimate confidence, median (IQR)	4 (3, 4)	4 (3, 4)	0.85
Estimated risk of CBC in lifetime, mean (SD)	17.3 (10.9)	16.9 (10.7)	0.29
Lifetime estimate confidence, median (IQR)	4 (3, 4)	4 (3, 4)	0.31
Recommend CPM (%)	12.7	14.9	0.10
Confidence in recommendation	4 (4, 5)	4 (4, 5)	0.003

reduced by 2 times (OR 0.51; 95% CI 0.41, 0.63; $p = 0.009$) for HER2+ and 2.2 times (OR 0.46; 95% CI 0.36, 0.59; $p < 0.001$) for triple negative. The confidence in CPM recommendation increased by 1.4 times (OR 1.35; 95% CI 1.16, 1.56; $p < 0.001$) with FH of breast cancer. If the patient (with FH of breast cancer) also preferred CPM, then the odds were further increased by 1.4 times (OR 1.37; 95% CI 1.15, 1.64; $p < 0.001$).

Perceived Risk of CBC

There was a significant increase in the probability of recommending CPM as the estimated probability of CBC in the next decade and the patient's lifetime increased. The odds of a surgeon recommending CPM increased by 1.1 times (OR 1.13; 95% CI 1.11, 1.15; $p < 0.001$) for each

percentage increase in the estimated probability of CBC in the patient's lifetime.

The confidence in recommendation for CPM increased by 6% (OR 1.06; 95% CI 1.04, 1.09; $p < 0.001$) and 5% (OR 1.05; 95% CI 1.04, 1.06; $p < 0.001$) for each percentage increase in the estimated decade and lifetime probability of CBC, respectively.

Familiarity with and Use of ASBrS Guidelines (Table 3)

Of the 71% ($N = 381$) of surgeons who responded to the question, 8.6% were not familiar at all with the ASBrS guidelines on CPM recommendation, 34.6% were a little bit familiar, 5.7% were somewhat familiar, 31.8% were familiar, and 19% were very familiar. Of sampled surgeons, 12.3% never used the guidelines, 42.5% used them not very often, 7.3% used them sometimes, 12.1% used them most of the time, and 25.7% always used them.

The surgeon's familiarity with and use of the ASBrS guidelines had no effect on the odds of recommending CPM. However, surgeons who were very familiar with the guidelines were less confident in their recommendation as compared with those who were not familiar at all (OR 0.32; 95% CI 0.17, 0.60; $p < 0.001$). This difference was not apparent in those who rated their familiarity with the guidelines in the other categories. The confidence in recommendation for CPM was higher in those surgeons who rated their use of the guidelines as "not very often," "sometimes," and "always" as compared with those who rated it as "never." This difference was not significant in those surgeons who rated their use as "most of the time."

Other Important Factors (Fig. 2)

The factors rated as the most important in the decision to recommend CPM were a lack of survival benefit from CPM and genetic testing results. The least important factors were possibly improved symmetry and possible increased number of future operations.

DISCUSSION

While patient preferences contribute to the increase in rates of CPM, provider recommendations also play a role. We found that younger age, FH of breast cancer, breast cancer subtype, and higher disease stage were all associated with increased perception of future risk of contralateral cancer and recommendation for CPM. It is not surprising that increased risk perception increases recommendations for CPM, but accurate risk estimation can be difficult. Risk assessment models for CBC have been developed and may be useful for providers to more accurately assess future risk.[20] The increase in perception of risk and recommendation for CPM with younger age and FH of breast cancer was expected and is warranted given the breadth of data that support higher future risk of CBC in these patients.

Breast cancer subtype is more complicated. The largest studies show an increased risk of future CBC in women with hormone receptor-negative disease.[21–23] Long-term studies on risk of future CBC in those with HER2+ disease are fewer, but they do indicate that this subtype of cancer is associated with higher risk of contralateral events.[22] Thus, surgeon estimates of higher risk of CBC in patients with triple-negative or HER2+ disease may be warranted.

TABLE 3 Respondents' familiarity with and use of the 2016 ASBrS guidelines on recommendation of CPM

	N (%)	Recommendation of CPM		Confidence in recommendation	
		OR (95% CI)	*p* value	OR (95% CI)	*p* value
Familiarity with guidelines					
Not at all familiar	33 (8.6)	Reference		Reference	
A little bit familiar	132 (34.6)	0.55 (0.26, 1.14)	0.11	0.70 (0.39, 1.25)	0.23
Somewhat familiar	22 (5.7)	1.31 (0.47, 3.68)	0.60	2.27 (0.98, 5.28)	0.057
Familiar	121 (31.8)	0.57 (0.27, 1.17)	0.13	1.22 (0.68, 2.21)	0.50
Very familiar	73 (19.2)	0.46 (0.20, 1.09)	0.077	0.32 (0.17, 0.60)	< 0.001
Use of guidelines					
Never	47 (12.3)	Reference		Reference	
Not very often	162 (42.5)	0.83 (0.42, 1.64)	0.60	1.85 (1.09, 3.13)	0.023
Sometimes	28 (7.3)	1.86 (0.67, 5.18)	0.24	3.66 (1.70, 7.89)	< 0.001
Most of the time	46 (12.1)	1.24 (0.57, 2.68)	0.59	1.89 (0.97, 3.67)	0.061
Always	98 (25.7)	1.49 (0.74, 3.01)	0.26	3.63 (2.10, 6.27)	< 0.001

Odds ratios of the effect of this familiarity with and use of the guidelines on odds of recommending CPM and confidence in this recommendation. All estimates are also adjusted for patient factors

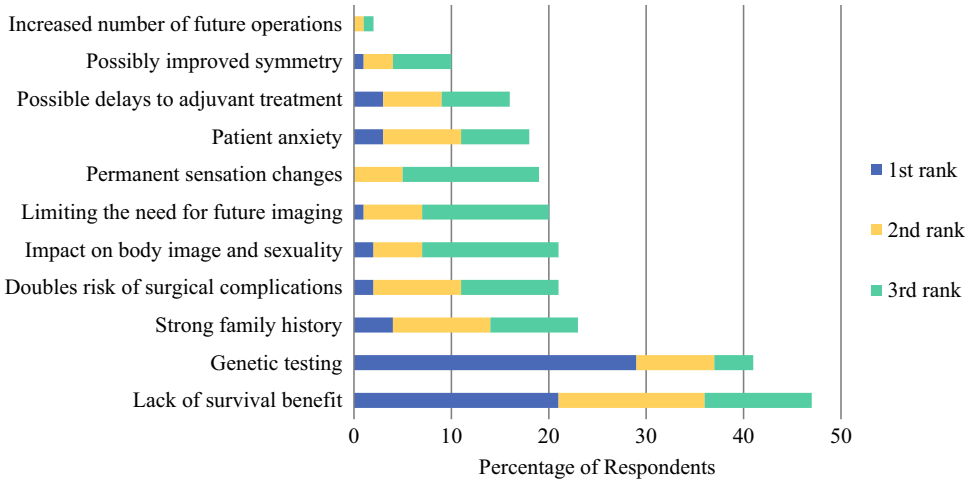

FIG. 2 Survey respondents ranked the 3 most important factors they consider when making recommendations for CPM from a list of 11 possible factors. Results are shown for each factor with how often that factor was ranked first, second, or third most important

Whether the level of risk rises to the threshold to recommend CPM can certainly be questioned and should be studied further.[22,23]

It is interesting that we found an increase in risk perception and recommendation for CPM with higher stage. Given the increased risk of death with higher stage, we would expect an inverse *decrease* in recommendations for a procedure such as CPM that only impacts future risk. Despite the increased risk of mortality in these patients, CPM rates in locally advanced cancers are increasing.[24,25] This is not intuitive, and we would advocate for more open, routine discussion of this concept with patients and better education of providers around this paradox.

While multiple studies have shown patient preference to be strongly associated with having a CPM, surgeons did not report a strong influence of patient preference on their recommendations. We would suggest that surgeons' responses on the survey about the influence of patient preference may not reflect the reality of what happens in the clinic. It is known that many surgeons believe that, if they do not acquiesce to requests for CPM, the patient will seek another surgeon, although patient surveys call this into question.[17] This belief may cause the surgeon to downplay their recommendations when they conflict with the patient's preference. It is understandable that it can be uncomfortable to make strong recommendations against CPM when talking with patients who strongly prefer it. We would argue that incorporating patient preferences into recommendations is an important part of shared decision-making and surgeons should be encouraged to ask about their patients' preferences and incorporate them into their recommendations, but still be honest about what they recommend.[26,27]

Last, it appears that the ASBrS guidelines for discussions about CPM are not widely known nor implemented. Use of the guidelines did not influence whether recommendation for CPM was given but, interestingly, appeared to be associated with the confidence that surgeons have in the recommendation, where greater familiarity with the guidelines was associated with *less* confidence in recommendations. In contrast, patient and disease factors that increased risk of CBC were associated with increased recommendation for CPM *and* greater confidence in the recommendation. This makes sense when thinking about absolute risk reduction and the greater impact that risk reduction would have in higher-risk patients and, therefore, higher levels of confidence in making a recommendation. Why less confidence in the recommendation would be associated with use of the guidelines is harder to explain and speaks to the complex and poorly understood psychology around recommendation giving. It may be that surgeons who use the guidelines are less comfortable (i.e., less confident) making recommendations for CPM and are more likely to look for outside support (for example professional society guidelines) to justify their recommendations.[28,29] Further, it is not clear if or how surgeon confidence in recommendations influences how these recommendations are given or the ultimate decision made. This should be explored further in future studies.

There are several limitations to this study. First, the scenarios are hypothetical and responses may not be reflective of actual practice. Second, though the demographics of the respondents appear to reflect the larger breast surgeon population, those who did not respond may be different in important, but unknown, ways. Third, while the response rate was acceptable for an electronic survey, it still represents only a small portion of breast surgeons, and this limits the generalizability. Fourth, we did not explore how breast surgeons who report using the ASBrS guidelines implement them in practice nor the reasons why many surgeons do not use the guidelines.

CONCLUSIONS

There are many patient and disease factors that can influence surgeon perceptions of risk of CBC and the recommendations for CPM. Further education is needed to help surgeons better estimate and interpret risk, especially in patients with locally advanced disease. While knowledge and use of professional society guidelines did not affect the recommendation, we believe that further study is needed to understand how guidelines impact care delivery and what decision support mechanisms may help surgeons to more accurately assess risk and be more confident in their recommendations.

ACKNOWLEDGMENT A 2017 American Society of Breast Surgeons Foundation Grant funded this work.

REFERENCES

1. 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):5203–9
2. Soran A, Kamali Polat A, Johnson R, McGuire KP. Increasing trend of contralateral prophylactic mastectomy: what are the factors behind this phenomenon? *Surgeon.* 2014;12(6):316–22
3. Burke EE, Portschy PR, Tuttle TM. Prophylactic mastectomy: who needs it, when and why. *J Surg Oncol.* 2015;111(1):91–5
4. Dragun AE, Pan J, Riley EC, et al. Increasing use of elective mastectomy and contralateral prophylactic surgery among breast conservation candidates: a 14-year report from a comprehensive cancer center. *Am J Clin Oncol.* 2013;36(4):375–80
5. Buchanan PJ, Abdulghani M, Waljee JF, et al. An analysis of the decisions made for contralateral prophylactic mastectomy and breast reconstruction. *Plast Reconstr Surg.* 2016;138(1):29–40
6. Angelos P, Bedrosian I, Euhus DM, Herrmann VM, Katz SJ, Pusic A. Contralateral prophylactic mastectomy: challenging considerations for the surgeon. *Ann Surg Oncol.* 2015;22(10):3208–12
7. Yao K, Stewart AK, Winchester DJ, Winchester DP. Trends in contralateral prophylactic mastectomy for unilateral cancer: a report from the National Cancer Data Base, 1998–2007. *Ann Surg Oncol.* 2010;17(10):2554–62
8. Morrow M, Jagsi R, Alderman AK, et al. Surgeon recommendations and receipt of mastectomy for treatment of breast cancer. *JAMA.* 2009;302(14):1551–6
9. Baker SK, Mayer DK, Esposito N. The contralateral prophylactic mastectomy decision-making process. *Plast Surg Nurs.* 2013;33(1):11–21; quiz 22–13
10. Hawley ST, Lantz PM, Janz NK, et al. Factors associated with patient involvement in surgical treatment decision making for breast cancer. *Patient Educ Couns.* 2007;65(3):387–95
11. de Haes H. Dilemmas in patient centeredness and shared decision making: a case for vulnerability. *Patient Educ Couns.* 2006;62(3):291–98
12. Charles C, Gafni A, Whelan T. Shared decision-making in the medical encounter: what does it mean? (or it takes at least two to tango). *Social Sci Med (1982).* 1997;44
13. Rosenberg SM, Partridge AH. Contralateral prophylactic mastectomy: an opportunity for shared decision making. *JAMA Surg.* 2014;149(6):589–90
14. Elwyn G, Frosch D, Thomson R, Joseph-Williams N, Lloyd A, Kinnersley P. Shared decision making: a model for clinical practice. *J Gen Intern Med.* 2012;27
15. Bellavance E, Peppercorn J, Kronsberg S, et al. Surgeons' perspectives of contralateral prophylactic mastectomy. *Ann Surg Oncol.* 2016;23(9):2779–87
16. Arrington AK, Jarosek SL, Virnig BA, Habermann EB, Tuttle TM. Patient and surgeon characteristics associated with increased use of contralateral prophylactic mastectomy in patients with breast cancer. *Ann Surg Oncol.* 2009;16(10):2697–704
17. Katz SJ, Janz NK, Abrahamse P, et al. Patient reactions to surgeon recommendations about contralateral prophylactic mastectomy for treatment of breast cancer. *JAMA Surg.* 2017;152(7):658–64
18. Boughey JC, Attai DJ, Chen SL, et al. Contralateral prophylactic mastectomy (CPM) consensus statement from the American Society of Breast Surgeons: data on CPM outcomes and risks. *Ann Surg Oncol.* 2016;23(10):3100–5
19. Boughey JC, Attai DJ, Chen SL, et al. Contralateral prophylactic mastectomy consensus statement from the American Society of Breast Surgeons: additional considerations and a framework for shared decision making. *Ann Surg Oncol.* 2016;23(10):3106–11
20. Chowdhury M, Euhus D, Onega T, Biswas S, Choudhary PK. A model for individualized risk prediction of contralateral breast cancer. *Breast Cancer Res Treat.* 2017;161(1):153–60
21. Rusner C, Wolf K, Bandemer-Greulich U, et al. Risk of contralateral second primary breast cancer according to hormone receptor status in Germany. *Breast Cancer Res.* 2014;16(5):452
22. Saltzman BS, Malone KE, McDougall JA, Daling JR, Li CI. Estrogen receptor, progesterone receptor, and HER2-neu expression in first primary breast cancers and risk of second primary contralateral breast cancer. *Breast Cancer Res Treat.* 2012;135(3):849–55
23. Reiner AS, Lynch CF, Sisti JS, et al. Hormone receptor status of a first primary breast cancer predicts contralateral breast cancer risk in the WECARE study population. *Breast Cancer Res.* 2017;19(1):83
24. Murphy BL, Hoskin TL, Boughey JC, Degnim AC, Glazebrook KN, Hieken TJ. Contralateral prophylactic mastectomy for women with T4 locally advanced breast cancer. *Ann Surg Oncol.* 2016;23(10):3365–70
25. Panchal H, Pilewskie ML, Sheckter CC, et al. National trends in contralateral prophylactic mastectomy in women with locally advanced breast cancer. *J Surg Oncol.* 2019;119(1):79–87
26. Elwyn G, Cochran N, Pignone M. Shared decision making-the importance of diagnosing preferences. *JAMA Intern Med.* 2017;177(9):1239–40
27. Nass SJ, Nekhlyudov L. Commentary on the consensus statement of the American Society of Breast Surgeons on contralateral prophylactic mastectomy. *Ann Surg Oncol.* 2017;24(3):611–3
28. Politi MC, Street RL, Jr. The importance of communication in collaborative decision making: facilitating shared mind and the management of uncertainty. *J Eval Clin Pract.* 2011;17(4):579–84
29. Politi MC, Legare F. Physicians' reactions to uncertainty in the context of shared decision making. *Patient Educ Couns.* 2010;80(2):155–7