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Surgeon Attitudes and Use of MRI in Patients Newly Diagnosed With Breast Cancer

Monica Morrow, MD[1], **Sarah T. Hawley, PhD, MPH**[2,3,4], **M. Chandler McLeod, PhD, MS**[5], **Ann S. Hamilton, PhD**[6], **Kevin C. Ward, PhD**[7], **Steven J. Katz, MD, MPH**[2,3,*], and **Reshma Jagsi, MD, DPhil**[8,*]

[1]Breast Service, Department of Surgery, Memorial Sloan Kettering Cancer Center, New York, NY

[2]Department of Internal Medicine, School of Medicine, University of Michigan, Ann Arbor, MI

[3]Department of Health Management and Policy, School of Public Health, University of Michigan, Ann Arbor, MI

[4]Veterans Administration Center for Clinical Management Research, Ann Arbor VA Health Care System, Ann Arbor, MI

[5]Department of Biostatistics, School of Public Health, University of Michigan, Ann Arbor, MI

[6]Department of Preventive Medicine, Keck School of Medicine, University of Southern California, Los Angeles, CA

[7]Department of Epidemiology, Rollins School of Public Health, Emory University, Atlanta, GA

[8]Department of Radiation Oncology, School of Medicine, University of Michigan, Ann Arbor, MI

Abstract

Background—Usage of magnetic resonance imaging (MRI) in newly diagnosed breast cancer patients is increasing, despite scant evidence that it improves outcomes. Little is known about the knowledge, perspectives, and clinical characteristics of surgeons associated with MRI use.

Methods—Women with early-stage breast cancer undergoing definitive surgery between 7/2013–8/2015 were identified from the Los Angeles and Georgia Surveillance, Epidemiology and End Results (SEER) registries, and asked to name their attending surgeons. The 489 surgeons were sent a questionnaire; 77% (n=377) responded. Questions addressing the likelihood of ordering an MRI in different scenarios were used to create a scale measuring surgeon propensity for MRI use. Knowledge and practice characteristics were also assessed.

Results—Mean surgeon age was 54 years, 25% were female, and median number of years in practice was 21. Wide MRI use variation was observed, with 26% obtaining MRI for a clinical stage I screen-detected breast cancer and 72% for infiltrating lobular cancer. High users of MRI were significantly more likely to be higher-volume surgeons (p<.001) and to have misconceptions

Corresponding author: Monica Morrow, MD, Breast Service, Department of Surgery, Memorial Sloan Kettering Cancer Center, 300 East 66th Street, New York, NY 10065, (T) 646 888 5350, (F) 646 888 5365, morrowm@mskcc.org.

*Drs. Jagsi and Katz shared equally in this work

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about MRI benefits (p<.001). Of surgeons who felt they used MRI more often, 60% were high MRI users; only 6% were low MRI users.

Conclusions—Our findings suggest relatively frequent use of MRI, even in uncomplicated clinical scenarios, in the absence of evidence of benefit, and use was more common among high-volume surgeons. A substantial number of surgeons who are high MRI users harbor misconceptions about MRI benefit, suggesting an opportunity for education and consensus building regarding appropriate use.

Keywords

magnetic resonance imaging; surgeons; breast cancer

INTRODUCTION

The use of magnetic resonance imaging (MRI) in newly diagnosed breast cancer patients has increased dramatically since 2003[1,2] in spite of a lack of evidence that it improves patient outcomes.[3] Although MRI finds cancer which is not detected by mammography or ultrasound, 2 prospective randomized trials failed to demonstrate a decrease in the use of additional surgeries after initial lumpectomy in patients selected for breast-conserving surgery (BCS) with MRI[4,5], and an individual patient-level metaanalysis showed no impact of MRI use on rates of local recurrence in patients having BCS.[6] The downsides of MRI are well documented and include an increased number of benign biopsies and a higher mastectomy rate, as well as increased costs.[3,7,8] Despite this, guidelines reference MRI as an optional part of the workup of operable breast cancer[9], and it remains a commonly used test. Little is known about the attributes and perspectives of surgeons who do and do not obtain preoperative MRI in newly diagnosed breast cancer patients. The purpose of this study was to examine surgeon perspectives regarding clinical circumstances in which MRI is beneficial, characteristics of surgeons associated with MRI use, their knowledge regarding benefits and harms of MRI, and the influence of patients on the decision to obtain an MRI.

METHODS

Sampling and data collection

The Individualized Cancer Care (iCanCare) study is a population-based survey study of early-stage breast cancer patients and their clinicians. Women 20–79 years of age diagnosed with ductal carcinoma in situ and stage I and II breast cancer, and undergoing definitive surgical therapy were identified using rapid case ascertainment from the Georgia and Los Angeles County Surveillance, Epidemiology End Results (SEER) registries between July 2013 and August 2015. Of the initial 7810 women selected, 7303 were eligible and 5080 patients responded (70% of those eligible). Virtually all patient respondents (96%) named their attending surgeon: 489 surgeons were sent surveys toward the end of the patient data collection period, and 377 (77%) responded.

The surgeon questionnaire content was extensively piloted, as done in prior clinician surveys conducted by our team[10] and included: 1) demographic and practice information; 2)

scenario-based queries of attitudes about testing and treatment strategies; and 3) attitudes about patient communication and decision making.

Measures

The dependent variable measuring surgeon acceptance of the use of MRI was derived from five short clinical scenarios that were presented to surveyed surgeons. Item responses were fit with a graded item response model to create a latent scale measuring surgeon perspective toward preoperative MRI use.[11] The 5 items contributing to the scale were surgeon responses to the questions "In general, do you obtain pre-operative MRI for newly diagnosed breast cancer patients…" 1) with a cT1N0 mammographically detected mass; 2) who are ≤ 45 years of age; 3) with a biopsy showing infiltrating lobular cancer; 4) with estrogen receptor negative, progesterone receptor negative, HER2 negative (triple-negative) cancers; and 5) who are ≥ 70 years of age. Item responses to each question included "definitely yes", "probably yes", "probably no", and "definitely no". The composite MRI propensity scores were normally distributed and were divided into high (n = 93), selective (n = 180), and low (n = 86) MRI usage groups using the outer quartiles of the score distribution. Scores were calculated for 359 of the 377 responding surgeons; 17 surgeons did not respond to any of the MRI items and 1 surgeon responded uniquely such that a score could not be calculated.

The relationship between surgeon MRI propensity and SEER site, number of years in practice, breast cancer patient volume, and MRI misconceptions held by the surgeon was examined. Surgeon knowledge regarding the clinical utility of MRI was assessed by asking: 1) If preoperative MRI decreases the need for re-excision in patients having BCS; 2) If preoperative MRI reduces the risk of local recurrence in patients having BCS; and 3) If preoperative MRI increases the likelihood of having a mastectomy (Table 1). Answering "definitely yes" or "probably yes" to either of the first 2 questions was scored as a misconception based on published literature[5–7,12], while responding "definitely no" or "probably no" to the mastectomy question was scored as a misconception.[5,7] Wrong answers were aggregated to determine the total number of misconceptions held by a surgeon.

We examined the role of patients in MRI decision making by asking surgeons how often their patients initiated a request for MRI and how often the surgeon involved patients in the decision about whether to order an MRI. Responses for these items were "never", "rarely", "sometimes", "often" and "always". Surgeons were also asked whether they thought they used MRI less often, about the same as, or more often than other surgeons treating breast cancer in their community.

Statistical Methods

We first described surgeon demographic and practice factors of interest (Table 2). We then examined surgeon report of their use of MRI for each clinical scenario. We evaluated the relationship between annual breast cancer patient volume for surgeon respondents, propensity for MRI, and MRI misconceptions. A proportional odds logistic regression was used to model the relationship between surgeon MRI propensity (low/selective/high MRI utilization) and surgeon characteristics of site, number of years in practice, and breast cancer

patient volume. The score test did not reject the assumption of proportional odds. Finally, we examined the interplay between the MRI propensity groups and surgeons report of their use of MRI relative to surgeons in the community. All analyses were conducted using SAS Version 9.4 (Cary, NC, USA). PROC LOGISTIC was used for ordinal logistic regression.

RESULTS

The characteristics of the 377 responding surgeons are summarized in Table 2. The mean surgeon age was 54 years (range 31–80) and 25% were female. The median number of years in practice was 21. Of responding surgeons, 84% reported that they devoted more than 40 hours per week to clinical patient care, and 23% of the new patients seen by the surgeon sample had breast cancer. Practice volume was varied, with 39% of surgeons seeing 20 or fewer new breast cancers annually, and 30% seeing 51 or more. Differences in practice volume on the basis of gender were also observed. Although female surgeons made up only 25% of the study participants, they accounted for 52% of the high-volume surgeons. Practice setting was also varied, with 51% of respondents seeing patients in more than 1 hospital, and 30% having residents or fellows in their primary practice.

There was substantial variation in surgeon report of their use of MRI for different clinical scenarios (Fig. 1). One quarter (26%) of surgeons would definitely or probably order an MRI for a clinical stage I screen-detected breast cancer. In contrast, 54% to 72% of surgeons would order an MRI for a woman age ≤ 45 years with breast cancer or one with lobular carcinoma or triplenegative breast cancer. The scenario least frequently associated with MRI use (10%) was women 70 years of age or older. Over half (51%) of surgeons reported that their patients never or rarely initiated a request for an MRI, and only 9% reported that patients often or always requested the test. Thirty percent of surgeons indicated that they never or rarely involved patients in the decision about whether to order an MRI, 32% shared the decision sometimes, and 38% often or always sought patient involvement.

As shown in Fig. 2, high-volume surgeons were substantially more likely to be high users of MRI than their lower-volume counterparts when using ordinal logistic regression to adjust for site, years in practice, and gender. After marginal standardization[13], 35% of surgeons treating more than 50 breast cancer patients annually were high MRI users, while only 18% of surgeons seeing 20 or fewer breast cancer patients were high MRI users. Conversely, high-volume surgeons were much less likely to be low MRI users, while no relationship between volume of breast cancer cases and selective use of MRI was observed. Regression results indicate that surgeons seeing more than 50 breast cancer patients annually were 2.6 times (95% confidence interval [CI] 1.5–4.5) more likely than those seeing less than 20 breast cancer patients to be in the high MRI-use group. Similarly, females were 2.7 times (95% CI 1.5–4.8) more likely than males to be in the high MRI-use group. Lastly, for every 10 additional years in practice, a surgeon was 1.2 times (95% CI OR 1.0–1.5) more likely to be in the high MRI-use category.

Of the 343 surgeons who answered all 3 questions about the utility of MRI, 76% (n = 259) incorrectly answered 0 or 1 out of 3 questions (misconception count of 0 or 1), 58 (17%) had a misconception count of 2, and 19 (6%) had a misconception count of 3. The questions

regarding MRI impact on re-excision, local recurrence, and mastectomy were answered incorrectly by 29%, 18%, and 41% of responding surgeons, respectively. MRI use was also associated with misconceptions about the test. As the tendency to use MRI increased from low to high, the proportion of surgeons with 2 or 3 misconceptions increased from 8% to 40% (Fig. 3, $p < 0.001$). Interestingly, surgeons had a high level of awareness regarding how their use of MRI compared with that of their peers: high-use surgeons comprised 60% of the group who responded that they ordered MRI more frequently than their peers, versus 6% of low-use surgeons (Fig. 4, $p < 001$), and only 4% of high MRI use surgeons felt that they ordered MRI less often than their peers.

DISCUSSION

Our results suggest that the decision to obtain an MRI in newly diagnosed breast cancer patients is surgeon driven, as fewer than 10% of surgeons indicated that their patients often initiate a request for the study. In this heterogeneous surgeon sample, the propensity to order MRI in different clinical scenarios varied widely, ranging from 10% to 72%. This likely reflects the general lack of consensus among surgeons surrounding the benefit of preoperative MRI. Two prospective randomized trials have failed to demonstrate a reduction in the number of additional surgeries after initial lumpectomy in patients selected with MRI[4,5], while a third showed a decrease in re-excision rate which was balanced by an increase of the same magnitude in initial mastectomies.[14] Single-institution retrospective studies[12,15] and an individual patient level meta-analysis[6] show no decrease in locoregional recurrence in patients having preoperative MRI. In spite of this, guidelines promulgated by breast imaging societies continue to endorse MRI for preoperative staging of the ipsilateral and contralateral breast[16], although radiologists acknowledge that the level of consensus on its use in patients with infiltrating ductal carcinoma undergoing surgery as the initial step in treatment is low.[17] The lack of consensus on the benefit of routine preoperative MRI is also evident among the surgeons in our study, with 26% endorsing MRI for preoperative evaluation of a patient with an uncomplicated clinical stage I screen-detected cancer. A substantially greater proportion, 72%, favored MRI in patients with infiltrating lobular cancer, an entity known to be underestimated by mammography, and the clinical scenario with the greatest number of studies suggesting benefit for preoperative MRI.[7,18,19] The enthusiasm for MRI in younger women and those with triple-negative breast cancer is somewhat more difficult to justify based on data. While these patients are known to have higher rates of local recurrence after breast-conserving therapy than their older, or non-triple negative counterparts, they also have an increased incidence of local recurrence after mastectomy, suggesting that recurrence is due to aggressive tumor biology.[20–22] In the setting of increased local recurrence after both breast-conserving surgery and mastectomy, MRI detection of subclinical disease is unlikely to alter outcomes.

When all clinical scenarios were grouped together, we identified a strong relationship between practice volume and the tendency to order MRI after adjusting for site, years in practice, and gender, whereby surgeons treating a higher volume of breast cancer cases would be more likely to obtain an MRI. This may reflect greater access to MRI in higher-volume practices, something we did not assess in this survey. A recommendation for an MRI is often provided by the radiologist interpreting the patients' mammograms, and it is likely

that radiologists practicing in higher-volume centers with MRI capability would be more likely to recommend the test than those in lower-volume practices. We also identified misconceptions regarding the benefits of MRI in a significant number of surgeons, and these misconceptions were much more common among surgeons with a greater propensity to order MRI. This may reflect doctors adjusting their attitudes about the benefits of a test in the context of a practice factor that favors it use.

Our study has a number of strengths. We surveyed a diverse sample of surgeons treating a population-based cohort of breast cancer patients in a very recent time period. The response rate to our survey was extremely high, and we were able to examine both practice attributes and surgeon attitudes. However, there were weaknesses. We relied upon surgeon report of when they would order an MRI and did not have actual utilization data. Some surgeons might disagree with our classification of misconceptions. However, randomized trials and meta-analyses support these as being misconceptions, and incorrect answers were distributed across all 3 statements.

Our findings have important implications for patient care and policy. Breast MRI has been reimbursed by Medicare and other payers for patients with newly diagnosed breast cancer since 1991, but its clinical use has only become widespread in the past 10 years.[1,2,23] In addition to the cost of the MRI itself, its use may generate additional costs due to biopsies[24], short interval follow-up examinations, and patient preference for mastectomy rather than breast-conserving therapy.[25] Our finding that over a quarter of surgeons would definitely or probably order an MRI for a clinical stage I screen-detected breast cancer suggests relatively frequent indiscriminate use of this procedure, and, alarmingly, that those who favor this approach are those surgeons who themselves see the largest volume of breast cancer patients. Misconceptions regarding test benefits tend to be more common among low-volume practitioners who lack experience in a subspecialty; the frequency with which we observe misconceptions in high-MRI users is particularly concerning. Our findings suggest an opportunity to educate individual surgeons to reduce the use of MRI, as even many high-volume breast specialists appear to harbor misconceptions about the benefits of testing when evidence is clearly lacking. These surgeons tend to be breast specialists at higher-volume centers and appear to be aware of their higher test use relative to others in the community. These surgeons may be more easily identified through their specialty societies to engage them in building consensus about the role of MRI after diagnosis of breast cancer.

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Synopsis

In the setting of newly diagnosed breast cancer patients, wide variation in MRI use was observed. High users were significantly more likely to be high-volume surgeons and to have misconceptions about MRI benefits.

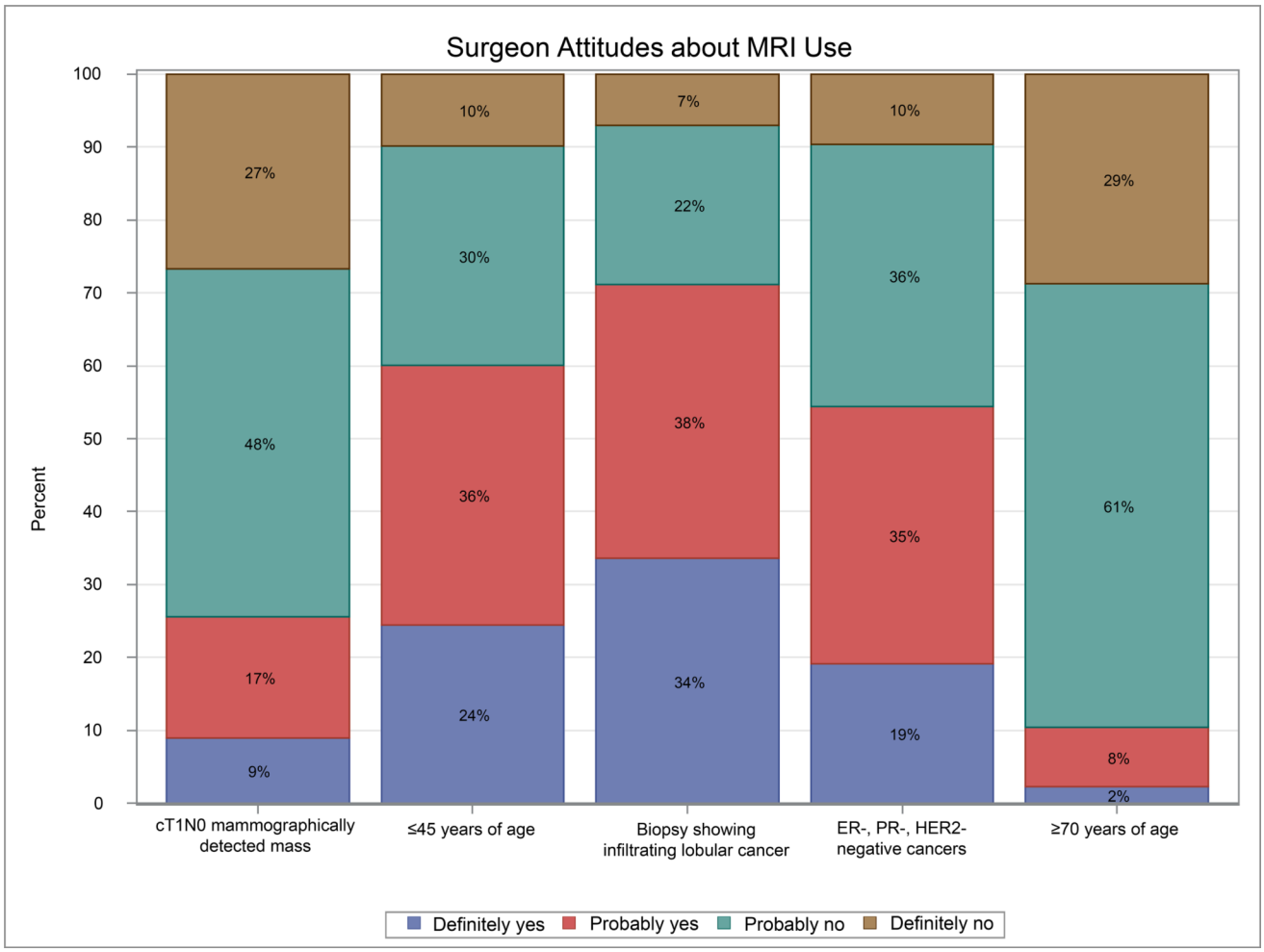

Fig. 1.

Surgeon attitudes about MRI use as indicated by surgeon response to 5 MRI scenarios. All indicated scenarios were prefaced with “In general, do you obtain pre-op MRI for newly diagnosed breast cancer patients…with/who are”. Allowable responses to each scenario were “definitely yes”, “probably yes”, “probably no”, or “definitely no”

cT1N0, clinical stage I; ER, estrogen receptor; PR, progesterone receptor

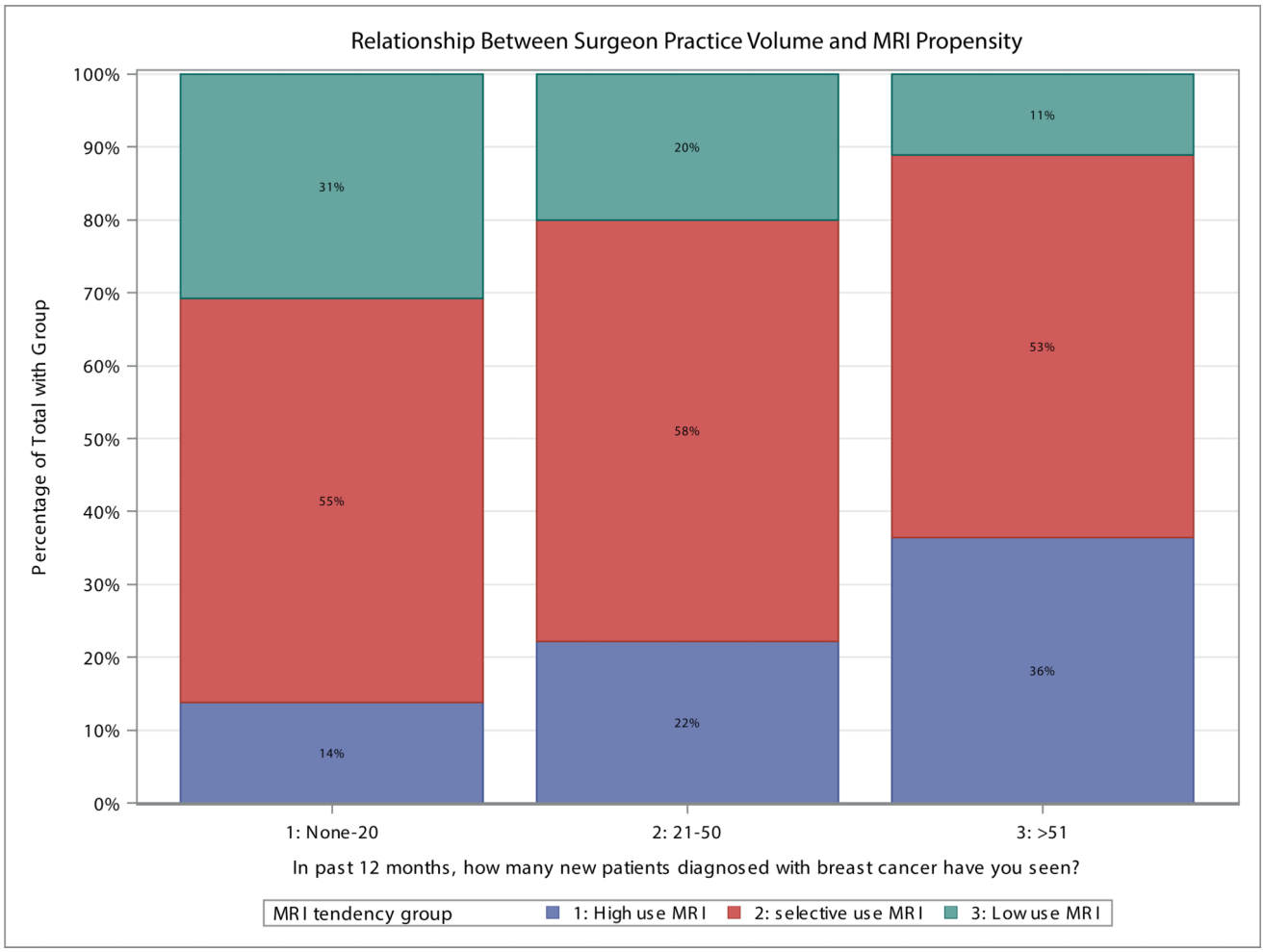

Fig. 2.

Distribution of surgeon MRI propensity (high, selective, or low) by surgeon volume, adjusted for gender, years in practice, and SEER site. Surgeon volume was reported as the number of new patients seen in the past 12 months who were diagnosed with breast cancer

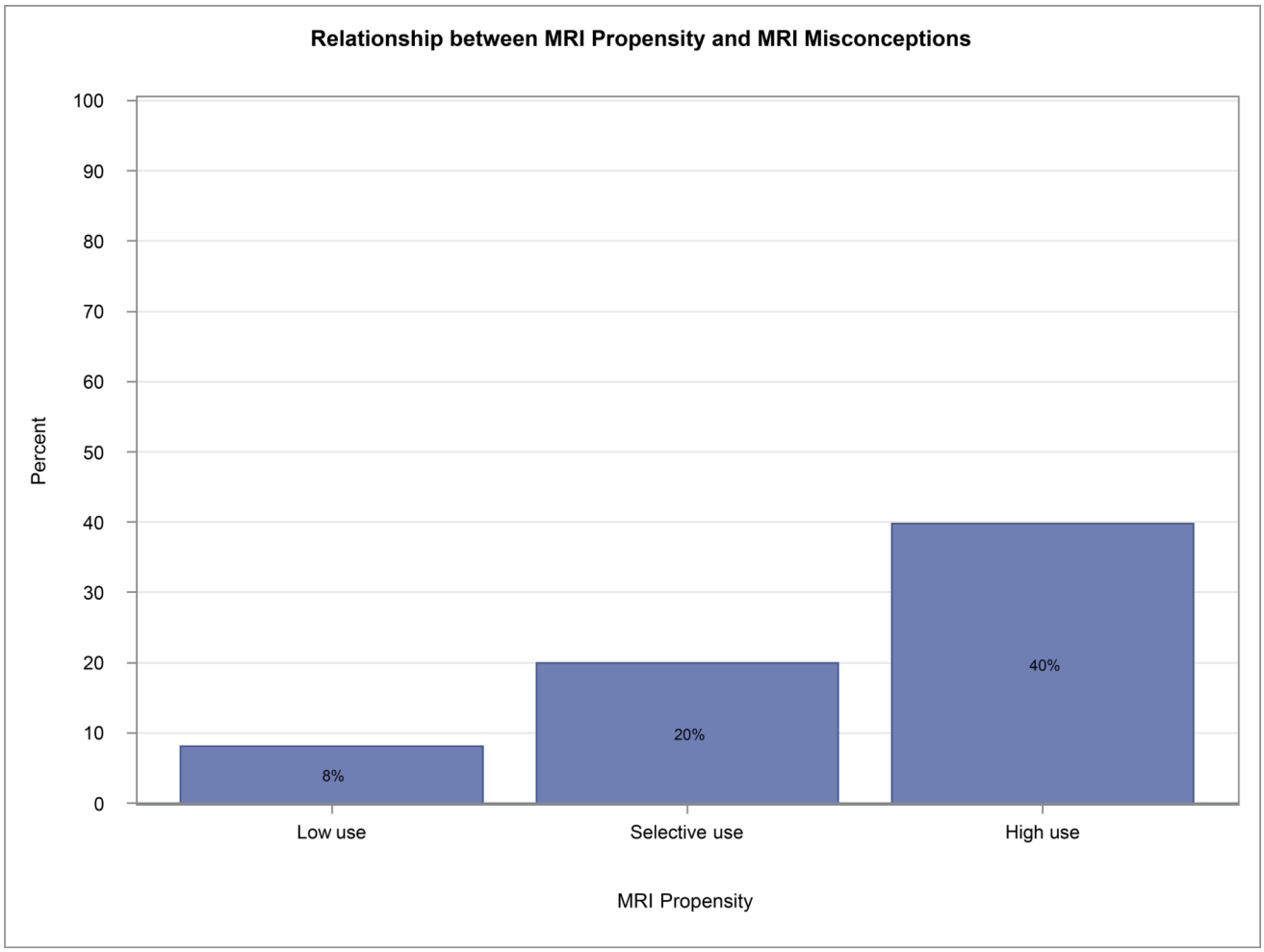

Fig. 3.

Relationship of MRI misconceptions to surgeon MRI propensity (high, selective, or low). Physicians who incorrectly answered 2 or more of 3 MRI-use questions were classified as having MRI misconceptions

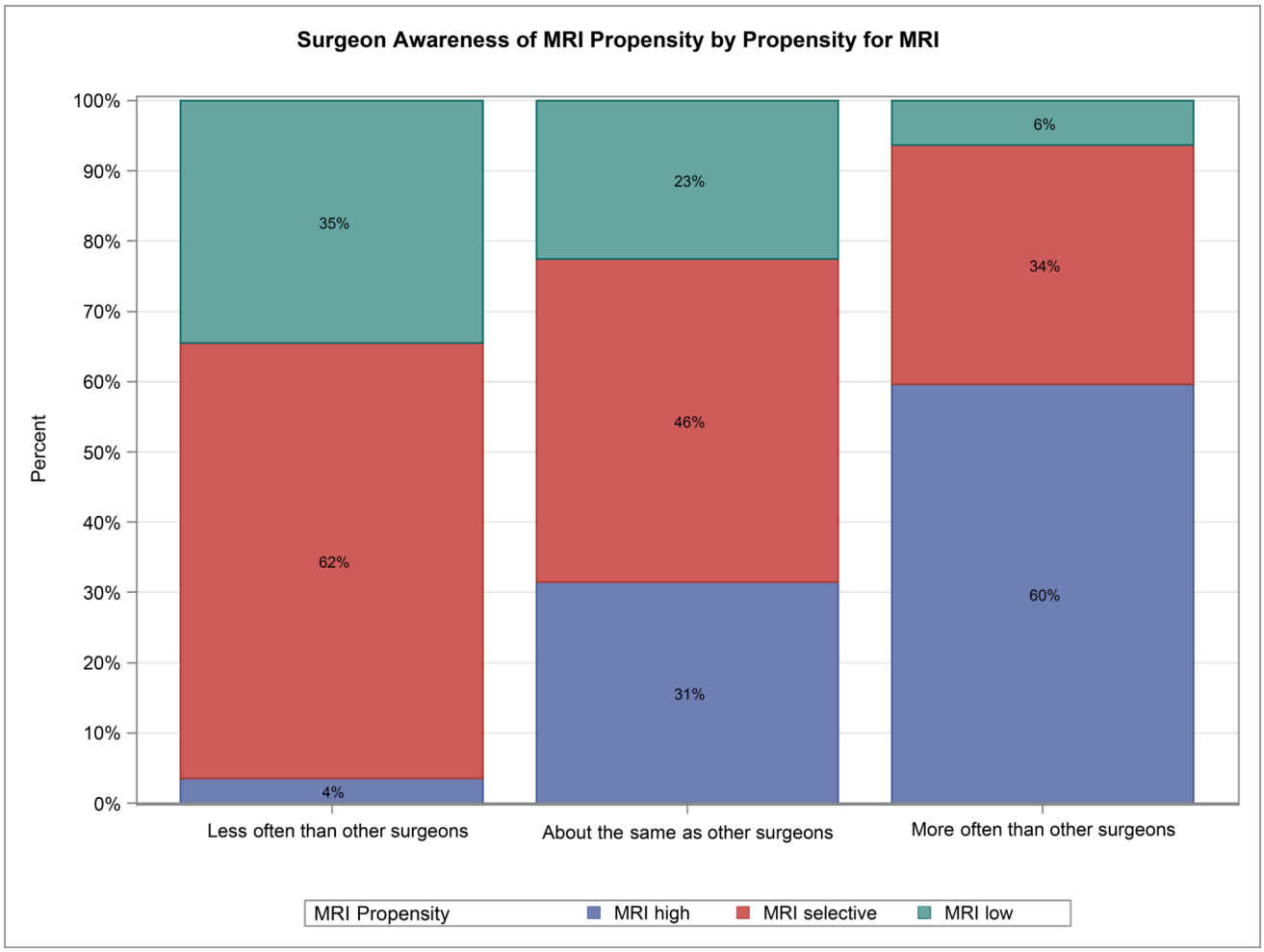

Fig. 4.

Relationship of surgeon MRI propensity (high, selective, or low) to their perceived MRI usage (less often, about the same, more often) relative to other breast surgeons in the community

Table 1

MRI Knowledge Questions

1. Pre-op MRI decreases the need for re-excision in patients undergoing breast-conserving surgery (BCS).
2. Patients selected for BCS with MRI have a lower rate of local recurrence at 5 years than those selected with mammography +/− ultrasound.
3. The likelihood of having a mastectomy is significantly increased in women having pre-op MRI compared to those who do not.

Table 2

Surgeon sample characteristics (n = 377)

Characteristic	Percent or Mean (range)
Age at survey administration (n = 360)	53.7 years (31–80)
Gender	
Female	24.4%
Missing	1.9%
SEER site	
Los Angeles County	50.1%
Georgia	49.9%
Surgeon volume (Breast cancer patients in prior 12 months)	
0–20	37.7%
21–50	29.7%
> 50	28.9%
Missing	3.7%
Surgeon years in practice (n = 372)	20.8 (0–45)
Number of hospitals seeing patients	
1	47.5%
2	31.0%
3 or more	18.6%
Missing	2.9%
Working with Resident or Fellows	
Yes	29.2%
Missing	1.9%