Improving breast cancer care through a regional quality collaborative

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Background. Regional collaborative organizations provide an effective structure for improving the quality of surgical care. With low complication rates and a long latency between surgical care and outcomes such as survival and local recurrence, quality measurement in breast cancer surgery is ideally suited to process measures. Diagnostic biopsy technique for breast cancer diagnosis is measurable and amenable to change at the provider level. We present initial results from our analysis of institutional variation in surgical and core needle biopsy use within a regional breast cancer quality collaborative.

Methods. Established in 2006, the Michigan Breast Oncology Quality Initiative (MiBOQI) consists of 18 hospitals collecting data on breast cancer care using the National Comprehensive Cancer Centers Network (NCCN) Oncology Outcomes Database Project platform to analyze and compare breast cancer practices and outcomes amongst member institutions. Institutional review board approval is obtained at each site. Data are submitted electronically to the NCCN and analyzed for concordance with practice guidelines. Aggregate and blinded data are shared with project directors and institutions at collaborative meetings, and ongoing practice patterns are observed for change. We analyzed variation in breast biopsy technique for initial cancer diagnosis over time and between institutions. Diagnostic biopsies were categorized as core needle, surgical excisional, surgical incisional, and other surgical biopsy.

Results. Procedural data for 8,066 patients treated for breast cancer between November 1, 2006 and December 31, 2009 were analyzed. The mean patient age was 59.5 years (range, 25.4–90.0 years). Within MiBOQI, 21% of patients underwent surgical biopsy for initial diagnosis. The percentage of patients undergoing surgical biopsy ranged from 8% to 37%, and the majority of surgical biopsies were classified as excisional biopsies. Patients with ductal carcinoma in situ were more likely to undergo surgical biopsy compared to those with invasive cancer (30.4% vs 17.8%; \( P < .001 \)). There was no association between biopsy type and patient age, race, or comorbidity. Data on biopsy technique were shared with site project directors and a target surgical biopsy rate of < 15% was chosen by consensus. Site project directors disseminated the data to their institutions and developed action plans for provider and patient education. Over the study period, the percentage of cases undergoing surgical biopsy for the entire MiBOQI collaborative decreased from 21% to 15% \( (P < .001) \).

Conclusion. The regional quality collaborative model can be used to collect, analyze, and disseminate surgical breast care quality data to organizations and treating physicians. These data can be used to describe patterns of care and make comparisons over time and between organizations. These data can also be used to set regional quality standards and provide an avenue for physician-led quality improvement. (Surgery 2011;150:635-42.)

From the Michigan Breast Oncology Quality Initiative, Ann Arbor, MI

Improving quality and controlling cost are at the center of national health care policy discussions. Despite advances in medical care and improvements in survival after treatment for breast cancer, there remains substantial variation in outcome. Efforts to understand the factors contributing to this variation have uncovered differences in the processes of care and long-term oncologic outcome at the patient, provider, regional, and institutional levels.

The University of Michigan Comprehensive Cancer Center, in collaboration with the National Comprehensive Cancer Network (NCCN) and Blue Cross Blue Shield of Michigan (BCBSM), established the Michigan Breast Oncology Quality Initiative (MiBOQI) in November of 2006. This unique partnership has a goal of monitoring and improving the quality of breast cancer care at hospitals and private practices across Michigan and extends the NCCN Breast Cancer Outcomes...
Project to the community setting. The foundation of the program is a network-based data collection, reporting, and analytic system that is designed to describe patterns of care, monitor concordance with NCCN guidelines, and evaluate outcomes. In order to promote not only quality monitoring but quality improvement, the program includes a feedback process whereby participating institutions, physicians, and guideline development panels can compare data across the network and between institutions.

The NCCN Breast Cancer Outcomes Project Database contains more than 300 data elements including data on drug/biologic and diagnostics use and trends; specific treatment indications and sequencing; toxicity and reasons for discontinuation; complications and medical events; progression-free and overall survival; comparative effectiveness and resource consumption; and payor-specific data. Analyses of this dataset have led to multiple publications describing patterns of surgical and adjuvant therapy for breast cancer1–4 and informed studies evaluating quality measurement.5,6

As a quality measure, diagnostic biopsy is measurable and potentially amenable to change through provider education and feedback. We present initial results from our analysis of institutional variation in diagnostic breast biopsy technique within a regional breast cancer quality collaborative.

**METHODS**

Established in 2006, MiBOQI is a voluntary group of hospitals and private practices that collect data on breast cancer care using the NCCN Oncology Outcomes Database Project. Institutional review board
approval is obtained at each site. There are 42 acute care (nonpsychiatric, nonrehabilitation) hospitals or programs with sufficient breast cancer volume for MiBOQI participation, and 18 centers currently participate. Data from the 14 participating hospitals with sufficient patient numbers were analyzed for this project. Each site designates a project director and a research associate. Initially, potential participating centers were invited to participate in MiBOQI by the coordinating center (UMCCC). As the program has matured, interested centers with sufficient case volume (100 breast cancer cases/year) may now apply for participation.

Funding for MiBOQI is provided by Blue Cross Blue Shield of Michigan (BCBSM), which covers 80% of the recommended full-time equivalent salary for data collection and submission. Participating sites are responsible for the remaining data collection costs, travel to meetings, and project director and administrative expenses. Data are submitted electronically to the NCCN and analyzed for concordance with practice guidelines. Data are abstracted from clinical charts 4 months after patient presentation and are available immediately to individual centers; however, an analysis of treatment-specific information requires additional measurement time for events to occur (180 days for chemotherapy and 270 days for hormone and radiotherapy). Center-specific benchmarked data are provided to project directors on a quarterly basis. Aggregate and blinded data are shared with project directors and institutions at regular collaborative meetings 3 times per year, and ongoing practice patterns are observed for change.

Criteria for inclusion in MiBOQI and the NCCN Breast Outcome Database are summarized in Table I. Only patients with at least 90 days of follow-up were included in this analysis in order to capture the diagnostic and surgical period. Data from 4 sites were not included because they had recently joined the collaborative and had low case numbers.

We analyzed breast biopsy technique for initial cancer diagnosis over time and between institutions. Diagnostic biopsies were categorized as core needle, surgical excisional, surgical incisional, and other surgical biopsy. The other surgical biopsy category included nipple or breast skin biopsies, fine needle biopsy, and axillary lymph node biopsy. The procedure resulting in the most advanced diagnosis is designated as the diagnostic procedure. Chi-squared analysis was used to compare categorical data. General linear modeling was used to test group means. To confirm accuracy, all surgical biopsy cases from a single institution were reviewed via direct chart review to confirm coding and to understand indications for surgical biopsy.

RESULTS

Procedural data for 8,066 patients treated for breast cancer at MiBOQI institutions between November 1, 2006 and December 31, 2009 were included in this analysis. Patient and tumor characteristics are summarized in Table II. The mean patient age was 59.5 years (range, 25.4–90.0 years). Twenty percent of patients had ductal carcinoma in situ (DCIS), and 80% were diagnosed with invasive breast cancer.

Over the 3-year study period, 21% of patients underwent surgical biopsy for initial diagnosis. The percentage of patients at each of the 14 institutions undergoing surgical biopsy ranged from 8% to 37% (Fig 1, A), and the majority of surgical biopsies were classified as excisional biopsies (Fig 1, B). Over time, there was a statistically significant ($P < .0001$) decrease in the percentage of patients undergoing surgical biopsy across the MiBOQI collaborative (Fig 2). Although there was a net decrease in surgical biopsy use at 11 centers, there was actually an increase at 3 centers.

Surgical biopsy use was significantly associated with a diagnosis of DCIS compared with invasive cancer (30.4% vs 17.8%; $P < .001$), and this finding was fairly consistent across the collaborative. Patients with a body mass index below 18 kg/m$^2$ or higher than 35 kg/m$^2$ were also more likely to

<table>
<thead>
<tr>
<th>Table II. Patient and tumor characteristics</th>
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<tr>
<td>Characteristic</td>
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<tr>
<td>Age (years)</td>
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<td>&lt;39</td>
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<td>40–49</td>
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<td>50–59</td>
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<td>70–79</td>
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<td>80–89</td>
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<tr>
<td>Race</td>
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<tr>
<td>Caucasian, non-Hispanic</td>
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<tr>
<td>Hispanic</td>
</tr>
<tr>
<td>African American, non-Hispanic</td>
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<tr>
<td>Asian, Pacific Islander</td>
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<tr>
<td>American Indian, non-Hispanic</td>
</tr>
<tr>
<td>Unknown/other, non-Hispanic</td>
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<td>AJCC tumor stage</td>
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AJCC, American Joint Committee on Cancer.
undergo surgical biopsy. There was no association between biopsy type and patient age, race, or patient medical comorbidity. Between 5% and 47% of surgical biopsies were performed before presentation at MiBOQI institutions.

Review of all surgical biopsy cases \( (n = 232) \) at a single participating institution revealed that 47% of the surgical biopsies were performed at referring institutions before presenting to the MiBOQI site for care. Of the surgical biopsies performed at that institution, 56% were performed because the mammographic or sonographic abnormality was not amenable to image-guided core biopsy because of lesion size, location, or patient body habitus. The reasons for the remainder of the surgical biopsies are summarized in Table III. Interestingly, 11% of the surgical biopsies (of the 123 performed at the MiBOQI institution) represented cases of DCIS diagnosed on core needle biopsy where invasive carcinoma was identified on surgical pathology from the definitive surgical resection.

Specific interventions and changes in processes of care were left to the project directors and participating centers. Examples of the strategies used included group education at hospital medical staff meetings, direct provider feedback to individual surgeons with data on surgical vs core biopsy use, and education aimed at primary care providers referring patients for biopsy. Future interventions will include ongoing project director feedback at the institution level and primary care- and surgeon-targeted education sessions on breast diagnosis at the Michigan State Medical Society annual meeting.

**DISCUSSION**

In this report, we describe institutional variation and a temporal shift in diagnostic breast biopsy practices at member institutions of a state wide breast cancer quality collaborative. This model can be used to collect, analyze, and disseminate surgical breast care quality data to organizations and treating physicians in the community setting. In addition, these data can be used to describe patterns of care, monitor changes in practice, and set quality standards.

We chose to measure core needle biopsy rates because several member institutions were interested in using these data for breast program accreditation. Core needle biopsy is accurate and recognized by many as the preferred approach for diagnosing breast cancer. Advantages of this approach compared with surgical biopsy include improved multidisciplinary treatment planning, superior breast symmetry and cosmesis, and less frequent need for surgical margin re-excision. A recent report from Gutwein et al describes the potential for substantial cost containment with
increased core needle biopsy use. We show that, over time, the use of surgical biopsy decreased and the use of core needle biopsy for breast cancer diagnosis increased.

With high-quality mammographic screening, the incidence of nonpalpable compared to palpable breast cancers has increased. The majority of these screening detected lesions, and many palpation-detected abnormalities are amenable to core needle biopsy. However, there are several reasonable indications for performing surgical biopsy. These indications include atypical or other high-risk lesions diagnosed with core needle biopsy, small breast size, obesity, unfavorable lesion location close to skin, chest wall, or breast implant. Some patients may decline core needle biopsy because of anxiety, difficulty tolerating the prone position required for stereotactically guided biopsies, or personal preference. Small suspicious palpable but radiographically occult lesions may be most appropriately diagnosed with surgical biopsy to avoid a nondiagnostic biopsy.

We found that half of the surgical biopsies reviewed from 1 participating center in this cohort were performed before presentation to a MiBOQI institution. While practice patterns at nonparticipating institutions may not be directly amenable to change at the surgeon or institution level, education targeting primary care providers and patients may ultimately influence referral patterns. Of the surgical biopsies performed at that MiBOQI institution, 52% were performed because the lesion was not considered amenable to image guided core needle biopsy because of imaging or patient limitations.

An unexpected finding from the individual center audit was the discovery that 10% of the cases categorized as having undergone surgical excisional biopsy were actually DCIS cases diagnosed via core needle biopsy where invasive carcinoma was identified on surgical excision. These cases were correctly coded in the database according to NCCN protocol, which specifies that the procedure associated with the most advanced diagnosis is designated as the diagnostic procedure. Although the surgical biopsy cases at the other participating centers were not reviewed for this analysis, this finding highlights the importance of auditing when using registry data for accreditation.

The primary strength of this study is that the information is obtained from a rich dataset in which data are entered prospectively and uniformly across institutions. Although data are only shared between MiBOQI institutions, data management and analysis are supported by the NCCN, which has more than 10 years of experience collecting and analyzing these data. We observed a change in diagnostic biopsy practice associated with regular data review and feedback to member institutions. The mechanism for the observed change in surgical practice is likely multifactorial, including project director education, improved access to image-guided biopsy procedures, institutional pressure to conform to national guidelines, and the Hawthorne effect, whereby behavior changes in response to observation rather than experimental manipulation.

This study has several important limitations. First, participating hospitals do so voluntarily and have institutional support for improving breast cancer care, indicating a baseline motivation for quality improvement. This study may underrepresent variation in biopsy practice patterns because only a small percentage of Michigan hospitals participate in the program. Second, NCCN and MiBOQI only collect data on biopsy-confirmed breast cancer cases and not benign biopsies; no

<table>
<thead>
<tr>
<th>Biopsy location</th>
<th>No.</th>
<th>Percent</th>
<th>Reason</th>
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<tr>
<td>Referring institution</td>
<td>109/232</td>
<td>47%</td>
<td>—</td>
</tr>
<tr>
<td>MiBOQI institution</td>
<td>123/232</td>
<td>53%</td>
<td>—</td>
</tr>
<tr>
<td>Single institution</td>
<td>68/123</td>
<td>56%</td>
<td>Unfavorable lesion location, size, patient body habitus</td>
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<td>audit results</td>
<td>17/123</td>
<td>14%</td>
<td>Atypical ductal hyperplasia or other high-risk pathology from core biopsy</td>
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<tr>
<td></td>
<td>14/123</td>
<td>11%</td>
<td>Ductal carcinoma in situ on initial core, invasive carcinoma identified on subsequent operation</td>
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<td></td>
<td>13/123</td>
<td>10%</td>
<td>Skin punch or incisional biopsy for locally advanced breast cancer or mammary paget</td>
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<tr>
<td></td>
<td>11/123</td>
<td>9%</td>
<td>Other*</td>
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*Other includes patient preference, diagnosis via fine needle biopsy of primary tumor and metastatic lymph node, or previous nondiagnostic biopsy attempt.

MiBOQI, Michigan Breast Oncology Quality Initiative.
conclusions can be made about statewide biopsy practice patterns for Michigan patients presenting with palpable or image detected abnormalities. However, other population based studies show a decrease in the use of surgical biopsy, indicating that this trend may represent a more general change in practice.9,15

MiBOQI represents a unique partnership between a payer—BCBSM, a professional organization—the NCCN, and academic and community hospitals across Michigan with a common goal of improving breast cancer care across the state. One of the primary strengths of the MiBOQI program is the opportunity for community breast cancer programs, where the majority of breast cancer care occurs, to collect and analyze treatment data and target and implement quality improvement programs. Quality improvement benchmarks are informed by NCCN guidelines, National Quality Forum, and the American Society of Clinical Oncology,16 and when no specific benchmark exists, the group determines the benchmark through literature review, discussion, and consensus.

REFERENCES


DISCUSSION

Dr Tina Yen (Milwaukee, WI): Dr Breslin shows nicely that the percent of breast cancer cases undergoing diagnostic surgical biopsy has decreased over time. My first line of questions deals with the MiBOQI process. What percent of hospitals in Michigan are MiBOQI hospitals, and how does a hospital become a MiBOQI hospital? Besides having at least 100 breast cancer cases annually, what other requirements and costs are associated with being a member? And what is the lag time between data acquisition and availability of these results for review by the institution?

The next set of questions deals with potential additional predictors of having a core biopsy performed. Do you have information related to tumor size or whether lesion was palpable or not? And then, from a provider standpoint, do you have information on hospital characteristics, such as academic affiliation, payor status, urbanicity, hospital size, number of breast cancer cases performed annually at the hospital, or whether biopsy decisions are driven largely by surgeons or radiologists?

And then, at the surgeon level, do you have information on whether surgeons performing these breast
cancer cases specialize in breast care, or are they surgeons who have a very mixed practice?

The evaluation of these types of factors might help explain the 30% interhospital variation in core biopsy rates.

Lastly, you show an overall decrease in the diagnostic surgical biopsy rates over the 3-year study period. Do all 14 hospitals each show a decrease in diagnostic surgical biopsy rates over time? Furthermore, do you have information on surgical biopsy rates over this same time period for non-MiBOQI hospitals?

Dr Tara Breslin (Ann Arbor, MI): The primary criteria for participating in MiBOQI is breast cancer treatment volume. There are 42 institutions in Michigan with sufficient breast cancer treatment volume for participation, and 18 hospitals participate. The program is supported by Blue Cross Blue Shield of Michigan. Each institution has a research associate who is responsible for data entry and a project director responsible for data review and dissemination. The data are reported to us quarterly, so there are a couple of months of lag time.

You asked about additional predictors including tumor size. The main additional predictor of core biopsy use was a diagnosis of ductal carcinoma in situ vs an invasive cancer. It is difficult to tell whether or not the patients had a truly palpable tumor vs a tumor which showed up both on imaging and on palpation in the cases that were diagnosed outside. So we have no information about those patients.

You asked about surgeon specialty and specialization in breast cancer care. The majority of the surgeons providing care are general surgeons.

You asked, “Do we have information about use of diagnostic surgical biopsy within the state of Michigan?” I do not have access to those data specifically, although we do not have access to those data specifically, although we

Dr Tina Yen (Milwaukee, WI) for Dr Anees Chagpar (New Haven, CT): Dr Chagpar was unable to attend. I will read her discussion.

I would like to thank the Central Surgical for the opportunity to discuss this innovative paper by Breslin et al from the University of Michigan, which evaluates the impact of regional collaborative organizations on improving quality of surgical care. Increasingly, there is a mandate for both transparency and improvement of quality of care. And this study shows that simply by monitoring outcomes and sharing data amongst institutions, quality can be improved.

I have several questions for the authors: first, you show that surgical biopsy rates decreased over time. Presumably, some of this was related to the MiBOQI initiative. But do we have any data on other changes that occurred over this period of time that could also account for some of these differences? For example, perhaps new, minimally invasive biopsy equipment was purchased, more radiologists were hired, or surgeons obtained training in ultrasound or stereotactic biopsy. Do you have any data on this?

Second, did you notice any differences in rate of reduction of surgical biopsy in terms of institutional characteristics? Were academic institutions more likely to improve? What about larger hospitals vs smaller ones?

And finally, some of the patients of the patients who were classified as having an excisional biopsy did so for completely justifiable reasons; for example, following a core needle biopsy per atypical ductal hyperplasia. Do you have any way to discern whether the reduction you noted in surgical biopsies was in these justifiable cases or in patients in whom an excisional biopsy was being done as an initial surgical procedure?

Dr Tara Breslin (Ann Arbor, MI): In response to the first question, there are certainly national trends and changes in radiology practice indicating an increased availability and use of image guided core needle biopsy. I would assume that those practice changes are also being seen in Michigan. There was no real difference in academic vs community practices. In fact, in our academic practice, we had a very high surgical biopsy rate because many of our patients were referred from other institutions.

You asked about the justifiable biopsy rate by institution. And that would be interesting to look at, although only one institution underwent a thorough chart audit. So that would be up to the other participating institutions.

Dr Michael Edwards (Cincinnati, OH): I am intrigued by the topic. You start off looking at a dataset and you are interested in quality. So how did you come to choose surgical biopsy vs incisional biopsy with a canula or with a needle in terms of quality?

Are you suggesting that there is some superior diagnostic efficacy? Or are you suggesting that it is less costly? Are you suggesting that it is associated with less cosmetic deformity? I would ask you to consider the regionalization of care and to look at the more rural cases and think about the skill that’s required to do stereotactic biopsy. And those resources may not actually be available in institutions that practice with lower volumes than you see and I see. So I would not be surprised to see a gravitation to more conventional needle localization, surgical excisional biopsy.

But the question is: they seem to have similar diagnostic efficacy, so are we really talking about cost and cosmesis? And let us not forget that we are stimulated to do needle core biopsies by industry, by radiologists, and by others who have other biased motives in terms of encouraging that direction.

Dr Tara Breslin (Ann Arbor, MI): I agree that diagnostic breast biopsy technique does not qualify as a quality metric as it cannot be directly linked to an outcome such as survival or local recurrence. However, as a process measure, diagnostic biopsy technique may reflect an institution’s approach to the continuum of breast cancer diagnosis and care. As you mentioned, core needle biopsy has been associated with improved cosmesis and may be associated with a cost-containment advantage. And I would
also agree that certain institutions with lower volumes or perhaps less radiology support may be unable to perform core needle biopsy in all cases.

On the other hand, there are advantages for surgeons to refer more of their patients for core needle biopsy or personally perform core needle biopsies. And that is that operating room time is precious. From a practice efficiency standpoint, it makes sense to reserve expensive and scarce operating room time for therapeutic procedures when possible.