Quality and safety considerations in breast cancer screening

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Keywords: Breast cancer screening, mammography, digital mammography, digital breast tomosynthesis, 2D mammography, digital breast tomosynthesis (DBT), breast magnetic resonance imaging

Abstract

Breast cancer is a leading cause of premature mortality among United States women. Early detection has been shown to reduce breast cancer morbidity, mortality and cost of treatment. The relative safety of breast cancer screening has been viewed in terms of benefits and harms. The quality and safety of breast cancer screening depends on both technical and human factors. Focusing on quality and safety considerations, we review two imaging modalities recommended for primary breast cancer screening: mammography and magnetic resonance imaging, and the use of ultrasound (US) for supplemental breast cancer screening.

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Introduction

Breast cancer is a leading cause of premature mortality among U.S. women. Early detection has been shown to reduce breast cancer morbidity, mortality and cost of treatment.¹-⁶ The relative safety of breast cancer screening has been viewed in terms of benefits and harms.⁷ Varying judgments regarding the appropriate balance between the benefits and harms of screening have resulted in differences among recommendation guidelines for breast cancer screening (Table 1).⁸-¹¹ In 2014, The American Cancer Society (ACS) commissioned the Duke Evidence Group to conduct a systematic review of cancer screening literature for updating their breast cancer screening guidelines.¹⁰,¹²

The quality and safety of breast cancer screening depends on both technical and human factors. The two primary imaging modalities used for primary breast cancer screening are mammography and magnetic resonance imaging (MRI). Nearly all mammograms in the U.S. are currently performed with digital technology, either as 2D mammography or DBT (digital breast tomosynthesis, a “pseudo-3D mammogram”), and frequently as combined 2D/DBT examinations. Though ultrasound is used as a...
supplemental breast cancer screening modality in some clinics, it is not universally employed or accepted at this point in time. We will briefly discuss its use as a supplemental screening modality to conventional mammography screening. However, in this paper, we focus primarily on the quality and safety considerations for the primary imaging modalities used for breast cancer screening: x-ray based digital mammography (2D or DBT) for average risk populations and MRI for high risk populations.

### TABLE 1. Breast Cancer Screening Guidelines – Average Risk Women

<table>
<thead>
<tr>
<th>Source</th>
<th>Guidelines</th>
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<tbody>
<tr>
<td>American College of Obstetricians and Gynecologists 8,9</td>
<td>Women at average risk of breast cancer should be offered screening mammography starting at age 40 years. If they have not initiated screening in their 40s, they should begin screening mammography by no later than age 50 years. The decision about the age to begin mammography screening should be made through a shared decision-making process. This discussion should include information about the potential benefits and harms. Women at average risk of breast cancer should have screening mammography every one or two years based on an informed, shared decision-making process that includes a discussion of the benefits and harms of annual and biennial screening and incorporates patient values and preferences. Women at average risk of breast cancer should continue screening mammography until at least 75 years. Beyond age 75 years, the decision to discontinue screening mammography should be based on a shared decision making process informed by the woman’s health status and longevity.</td>
</tr>
<tr>
<td>American Cancer Society, 2015 10</td>
<td>Women ages 40 to 44 should have the choice to start annual breast cancer screening with mammograms, if they wish to do so. Women age 45 to 54 should get mammograms every year. Women 55 and older can switch to mammograms every 2 years, or can continue yearly screening. Screening should continue as long as a woman is in good health and is expected to live 10 more years or longer.</td>
</tr>
<tr>
<td>American College of Radiology / Society of Breast Imaging 11</td>
<td>Annual mammographic screening beginning at age 40. The age to stop should be based on each woman’s health status rather than an age-based determination. Women should be helped to understand the risks of screening; weighing benefits and risks should be done by women, not for women.</td>
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The Mammography Quality Standards Act (MQSA)

The standards for mammography quality and safety were largely established by the MQSA. In 1992, Congress enacted the law with the aim of ensuring quality and uniformity through federal regulation of mammography and other breast procedures involving ionizing radiation (i.e., X-rays). By 1994, FDA Interim Rules required all mammography facilities in the United States to be accredited, certified and inspected. The MQSA law established mandatory testing of equipment by physicists, specific training and experience criteria for radiologists and technologists (baseline training, continuing medical education hours, and number of mammograms a technologist should perform and a radiologist should read over 2-year time periods), and quantitative evaluation of image quality by ratings of phantom and clinical images. Throughout the 1990’s, emphasis focused on inadequate equipment, radiation safety and improving the interpretation of mammographic images by radiologists. Under the MQSA law, FDA-approved accrediting bodies review clinical and phantom images from every facility once every 3 years to monitor compliance with quality standards and ensure patient safety.

Over the last 20 years, several amendments to the MQSA legislation have been made. For example, a modification was designed to ensure that women with abnormal mammograms were not lost to follow-up by requiring that mammography centers send women a copy of their mammogram report in lay language. In addition, although not required by the MQSA at this point in time, many states now require that mammography reports also inform women of their breast density. Now enacted in over 30 states, breast density notification laws vary widely but are intended to inform women who have undergone mammography about the risks posed by their breast density and to encourage discussions with their primary care providers about the need for supplemental screening. One very helpful website, created by the California Breast Density Information Group (CBDIG), includes educational materials for women and for health care providers. Most recently, on February 15, 2019, Congress passed a new federal law mandating that the FDA develop breast density reporting language that must be included in patient letters and healthcare provider reports. The exact language and effective date are still under development as proposed changes to the FDA/MQSA requirements.

Radiation Safety

An important safety concern regarding the equipment used to acquire mammograms during the initial 10 years of the MQSA was radiation dose. Because women undergoing screening mammography are healthy (i.e., without breast symptoms), the initial MQSA regulations included requirements that specified a radiation dose limit for each of the four breast images acquired for a screening mammogram. Per exposure, the average x-ray dose is limited to no greater than 3 milligray (mGy) to a specialized mammography quality control phantom that simulates a...
compressed breast thickness of 4.2 cm and a breast composition of 50% adipose and 50% glandular tissue. A specialized phantom is used to measure radiation dose for 2D and DBT mammography as well as certain other aspects of image quality. Systems exceeding the allowed dose may not be used for patient imaging. Over time, the number of facilities failing to meet dose limits or other mammography system requirements dramatically declined, in part due to the transition from film-based to digital mammography.\textsuperscript{18,19} In the current era of mammography technology, most systems operate well below the allowed dose. In fact, all contemporary systems are capable of obtaining both a 2D and DBT mammogram exposure within the dose limits for a single view.

**Mammography Reporting and Interpretation Quality**

An early screening mammography quality issue was the variability and ambiguity of mammography reports.\textsuperscript{20-25} In the late 1980’s, an expert panel for the American College of Radiology studied the lack of standardization and uniformity in mammography practice reporting and instituted the Breast Imaging Reporting and Data System, also known as BI-RADS.\textsuperscript{26} A critical component of the system was a data-driven lexicon of descriptors for specific imaging findings predictive of benign and malignant disease. Now in its 5\textsuperscript{th} edition, the BI-RADS mammography practice management system\textsuperscript{27} includes (1) a lexicon of descriptors, (2) a recommended reporting structure including final assessment categories with accompanying management recommendations, and (3) a framework for data collection and auditing.\textsuperscript{28} BI-RADS reporting enables radiologists to organize their reports to communicate clear and consistent results and specific management recommendations to referring healthcare providers. A summary of the BI-RADS categories, management recommendations, and likelihood of malignancy is provided in Table 2.

Another interpretation quality concern is the variability in radiologists’ recommendations for recall for additional work-up and/or biopsy after a screening mammogram.\textsuperscript{20,21,23-25,29} Recognized interventions shown to improve radiologists’ mammographic interpretations include: fellowship training in breast imaging,\textsuperscript{30} double reading and interpreting an adequate volume of screening mammograms,\textsuperscript{22,31,32} ensuring that prior examinations are available to compare with the current exam\textsuperscript{33} and technical tools such as computer-assisted detection (CAD) software programs that highlight imaging findings to assist recognition by the radiologist.\textsuperscript{32,34,35} It should be noted that a recent publication found CAD not to be as useful for digital mammography.\textsuperscript{36} The number of screening mammograms for which a radiologist recommends additional diagnostic imaging, commonly referred to as the “callback rate” or “recall rate”, which do not result in a diagnosis of breast cancer (i.e., false positive mammography interpretations) is considered one of the “harms” of mammography. Similarly, recommendations for breast biopsy with negative, non-cancer pathology (i.e., false positive recommendation for biopsy) are also considered “harms”.

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*Quality and safety in breast cancer screening*
For screening mammography, false positive rates tend to be considerably higher than false negative rates. Each is addressed by performing periodic practice audits that track recall rates for individual radiologists within breast imaging practices, allowing the radiologist to focus additional education on areas of concern.\textsuperscript{28} The mammography practice audit is a quality assurance tool that allows facilities and practitioners to recognize areas of strength, as well as those areas that may need improvement. Acceptable interpretive performance criteria, derived by Carney et al.\textsuperscript{37} in 2010, include: (1) recall rate 5% - 12%; (2) positive predictive value for abnormal interpretations on screening mammograms 3% - 8%; (3) positive predictive value for biopsy recommendation 20%-40%; and (4) cancer detection rate >2.5 per 1000 mammograms interpreted.

### TABLE 2. BI-RADS Final Assessment Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Management</th>
<th>Likelihood of cancer</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>Needs additional imaging and/or prior examinations</td>
<td>Recall for additional imaging and/or await prior examinations</td>
</tr>
<tr>
<td>1</td>
<td>Negative</td>
<td>Routine screening</td>
</tr>
<tr>
<td>2</td>
<td>Benign</td>
<td>Routine screening</td>
</tr>
<tr>
<td>3</td>
<td>Probably benign</td>
<td>Short interval follow-up (usually 6 months)</td>
</tr>
<tr>
<td>4</td>
<td>4a. Low suspicion for malignancy</td>
<td>Tissue diagnosis</td>
</tr>
<tr>
<td></td>
<td>4b. Moderate suspicion for malignancy</td>
<td>Tissue diagnosis</td>
</tr>
<tr>
<td></td>
<td>4c. High suspicion for malignancy</td>
<td>Tissue diagnosis</td>
</tr>
<tr>
<td>5</td>
<td>Highly suggestive of malignancy</td>
<td>Tissue diagnosis</td>
</tr>
<tr>
<td>6</td>
<td>Known biopsy-proven</td>
<td>Surgical excision when clinically appropriate</td>
</tr>
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</table>

Population-based screening mammography data collected by the National Cancer Institute (NCI) Breast Cancer Surveillance Consortium (BCSC)\textsuperscript{38} has enabled performance benchmarking for screening mammography.\textsuperscript{39,40} Regional registries within the BCSC link mammography data to a state tumor or Surveillance, Epidemiology and End Results (SEER) registry, and data are pooled at a central statistical coordinating center.\textsuperscript{38} In 2006, Rosenberg et al.\textsuperscript{39} analyzed data from 6 BSCS registries and found the following performance outcomes for U.S. mammography practices: (1) recall rate = 9.4%; (2) positive predictive value for abnormal interpretations on screening mammograms = 4.8%; (3) positive predictive value for biopsy recommendation = 25.0%; and (4) positive predictive value for biopsies
performed = 32.6%. Cancer detection rate (mean cancer detection rate per 1000 mammograms) was 4.6 and the percentage of all cancers diagnosed as ductal carcinoma in situ (DCIS) was 21.6%. A follow-up analysis of BCSC data by Lehman et al. in 2017 found the following: (1) recall rate = 11.6%; (2) positive predictive value for abnormal interpretations on screening mammograms = 4.4%; (3) positive predictive value for biopsy recommendation = 25.1%; (4) positive predictive value for biopsies performed = 31.8%; (5) cancer detection rate = 5.1 per 1000 mammograms; and, (6) percentage of all cancers diagnosed as ductal carcinoma in situ (DCIS) = 31.0%. These authors found the sensitivity of screening mammography increased from 78.7% to 86.9% between 1996 and 2008, and that more than 92% of radiologists achieve the recommended cancer detection rate of 2.5 per 1000 women screened. However, they found that 40% of radiologists had higher recall rates than the recommended upper range of 12% by Carney et al. Overall, the majority of radiologists surpassed performance recommendations by the ACR, with the exception of recall rate. Excessively high recall rates are associated with unnecessary additional imaging and/or biopsy, increased costs, and patient anxiety. Lehman et al. recommended that practices establish quality improvement programs based on their audit data. For example, mammograms recalled by radiologists with high recall rates were second reviewed by radiologists with documented high performance for both recall and cancer detection rates. Overall, the tradeoff between recall rate and high cancer detection rate must be balanced to achieve success in breast cancer screening.

The Most Widespread Quality and Patient Safety Concern of Present-Day Breast Screening Programs

Currently, the most common quality concern and the most frequent cause of mammography facility accreditation failures is inadequate positioning of the breast by the technologist when acquiring the images. In 2015, the American College of Radiology, the largest FDA-approved accreditation body, found that of all clinical images that were deficient on the first attempt at accreditation, 92% were deficient in positioning and that 79% of all unit failures that year were due to inadequate positioning. Poor positioning poses a significant risk to an individual woman because cancers present in any portion of the breast not imaged on the mammogram cannot be detected. Maintaining proper positioning requires that the interpreting radiologist communicate regularly with the technologist to provide feedback on the adequacy of positioning and initiate corrective actions when problems are identified. In 2017, the EQUIP initiative (Enhancing Quality Using the Inspection Program) was instituted under the MQSA. The aims of EQUIP are to ensure each facility has procedures for corrective action when clinical images are of poor quality, including mechanisms to provide ongoing feedback to mammography technologists and to document the corrective actions taken. To ensure compliance with clinical image quality standards for accreditation, a sample of mammograms performed by each
A technologist is reviewed regularly by the supervising radiologist. During each annual inspection, facilities must present documentation of their clinical image reviews since their last inspection.

**Supplemental Screening with Breast MRI for High-Risk Women**

While screening mammography has been shown to reduce breast cancer mortality by more than 40% in women aged 40 years and older, some women of higher-than-average risk should begin screening at an earlier age and possibly using a multimodality approach. In this section, the quality and safety concerns of breast MRI will be discussed.

Women undergoing screening who are identified with potentially increased risk of breast cancer should have further risk assessment. Validated assessment tools include Gail, BRCAPRO, Tyrer-Cuzick, or the Claus models. Based on the risk assessment, women may benefit from genetic counseling, enhanced screening such as MRI, more frequent clinical breast exams, or risk-reduction strategies.50-53 Recommendations for high risk screening from the American College of Obstetricians and Gynecologists,50,51 the American Cancer Society,52 and the American College of Radiology/Society of Breast Imaging53 are summarized in Table 3.

Compared with the general population, women with higher risk are more likely to be diagnosed with larger, node-positive malignancies on screening examinations, and also experience higher interval cancer rates.53 One of the ancillary studies that may be performed on these higher-risk women is breast MRI. Contrast-enhanced breast MRI increases cancer detection in higher-risk women and is more sensitive than either mammography or ultrasound. Breast MRI can significantly improve detection of cancer that is otherwise clinically, mammographically, and sonographically occult. While routine screening breast MRI currently is not recommended for asymptomatic, average-risk women, breast MRI is recommended as a high-risk screening exam for women with a calculated risk of 20% or more of developing breast cancer in her lifetime, in addition to mammography.50-53 Examples include women with genetic predisposition, as determined by gene testing or family pedigree, and women who received chest radiation therapy before age 30. For these high-risk women, screening breast MRI should be performed annually beginning at age 25 to 30. After age 30, both MRI and mammography are recommended; many women prefer to alternate the screening tests so that either MRI or mammography is performed every 6 months.

**Assuring Patient Safety for Breast MRI**

Women should be interviewed and screened for possible contraindications for MRI. Possible contraindications include presence of most cardiac pacemakers, ferromagnetic intracranial aneurysm clips, certain neurostimulators, and cochlear implants. In addition, patients suffering from anxiety or claustrophobia may require sedation or additional assistance.
### TABLE 3. Breast Cancer Screening Guidelines – High Risk Women

<table>
<thead>
<tr>
<th>American College of Obstetricians and Gynecologists&lt;sup&gt;49,50&lt;/sup&gt;</th>
<th>CBE every 6-12 months and annual breast MRI, ages 25-29; for ages&gt;29, CBE every 6-12 months, annual mammography and breast MRI (may alternate tests every six months) for women who:</th>
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<tbody>
<tr>
<td></td>
<td>• are estimated to have a lifetime risk of breast cancer of 20% or greater, based on risk models that rely largely on family history, but who are either untested or test negative for BRCA gene mutations</td>
</tr>
<tr>
<td></td>
<td>• test positive for BRCA1 or BRCA2 mutations</td>
</tr>
<tr>
<td></td>
<td>• have first-degree relatives with these mutations but who are untested are generally managed as if they carry these mutations until their BRCA status is known</td>
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<tr>
<td></td>
<td>• have a personal history of high-risk breast biopsy results, including atypical hyperplasia and lobular carcinoma in situ</td>
</tr>
<tr>
<td>American Cancer Society&lt;sup&gt;51&lt;/sup&gt;</td>
<td>Women who are at high risk for breast cancer should have an MRI and a mammogram every year, typically starting at age 30. This includes women who have a lifetime risk of breast cancer of ≥20% or greater, according to risk assessment tools that are based mainly on family history, including women who:</td>
</tr>
<tr>
<td></td>
<td>• Have a known BRCA1 or BRCA2 gene mutation</td>
</tr>
<tr>
<td></td>
<td>• Have a first-degree relative (parent, brother, sister, or child) with a BRCA1 or BRCA2 gene mutation, and have not had genetic testing themselves</td>
</tr>
<tr>
<td></td>
<td>• Had radiation therapy to the chest when they were between the ages of 10 and 30 years</td>
</tr>
<tr>
<td></td>
<td>• Have Li-Fraumeni syndrome, Cowden syndrome, or Bannayan-Riley-Ruvalcaba syndrome, or have first-degree relatives with one of these syndromes</td>
</tr>
<tr>
<td>The American Cancer Society recommends against MRI screening for women whose lifetime risk of breast cancer is less than 15%.</td>
<td></td>
</tr>
<tr>
<td>American College of Radiology / Society of Breast Imaging&lt;sup&gt;52&lt;/sup&gt;</td>
<td>Same as ACS for ≥20% risk PLUS:</td>
</tr>
<tr>
<td></td>
<td>Breast MRI is recommended for women with personal histories of breast cancer and dense tissue, or those diagnosed by age 50.</td>
</tr>
<tr>
<td></td>
<td>All women, especially black women and those of Ashkenazi Jewish decent, should be evaluated for breast cancer risk no later than age 30 so that the need for supplemental screening in those of higher risk can be identified.</td>
</tr>
</tbody>
</table>

Increased parenchymal enhancement on screening breast MRI has been observed.
observed during the secretory phase of the menstrual cycle. This normal enhancement may give rise to false positive and false negative MRI scans. It is recommended that breast MRI scans be performed during the second week of the menstrual cycle for patients undergoing screening examinations in order to reduce the background enhancement.

Gadolinium contrast enhancement is required for the evaluation of breast parenchyma, as this contrast agent increases the conspicuity of diseased tissues. Gadolinium-based contrast agents (GBCAs) are not administered to patients with acute kidney injury and/or severe chronic kidney disease because of the increased risk of nephrogenic systemic fibrosis. In terms of adverse reactions, GBCAs are extremely well tolerated by most patients, and acute adverse reaction events are low ranging from 0.07% to 2.4%. Nevertheless, appropriate emergency equipment with medications should be immediately available to treat adverse reactions associated with administered medications.

Recently, residual gadolinium deposits have been found within the brain tissue of patients who received multiple doses of GBCAs over their lifetimes, most notably in the dentate nuclei and globus pallidus. The gadolinium deposition in the brain may be dose dependent and can occur in patients with no clinically evident kidney or liver disease. To date, however, no adverse health effects have been uncovered, but the radiology community continues investigations in the area to explore the mechanisms of gadolinium deposition as well as its clinical and biological significance.

Accreditation and Documentation

Unlike mammography, breast MRI accreditation is voluntary. However, in order to achieve Breast Imaging Center of Excellence (BICOE – see below) status, breast MRI accreditation is necessary. Through the American College of Radiology (ACR), the Breast MRI Accreditation Program provides facilities performing breast MRI procedures with peer review and constructive feedback on staff qualifications, equipment, quality control, quality assurance, MR safety policies, and image quality.

Documentation and reporting of screening breast MR examinations are standardized in accordance with ACR BI-RADS lexicon for Breast MRI, including BI-RADS final assessment codes and terminology for reporting and tracking outcomes. Examinations are systematically reviewed and evaluated as part of the overall quality improvement program at the facility. Evaluation includes technical adequacy of the examination, as well as accuracy of interpretation and appropriateness of indications for the examinations. Each facility should also establish and maintain a medical outcome audit program to follow up positive assessments and to correlate radiology and pathology outcomes for concordance.

Pitfalls and Other Considerations with Breast MRI

As with screening mammography, false-positive results occur with breast MRI. These non-malignant abnormalities detected on breast MRI may result in follow-up examinations or
recommendations for biopsy, resulting in patient anxiety or post-biopsy complication such as hematoma – which is more common following MRI-guided biopsy than stereotactic or ultrasound-guided breast biopsies. In addition, currently used imaging protocols for screening breast MRI are time-consuming and expensive. There are studies evaluating abbreviated (fast) MRI protocols, which would make contrast-enhanced MRI a more cost-effective screening tool. Preliminary studies have reported these abbreviated MRI protocols to have similar sensitivities and specificities compared to full MRI protocol.57-59

Supplemental Screening with Ultrasound for Women with Dense Breast Tissue

With many states enacting legislation requiring that the screening mammography report to patients and their healthcare providers include information on the woman’s breast density, many screening centers now offer supplemental breast ultrasound (US) screening examination to women with dense breasts or at elevated risk for developing breast cancer. Screening US examinations are performed by either a technologist or a radiologist using a standard hand-held ultrasound probe to scan the entirety of both breasts or using an automated system to perform the examination in a standardized fashion. In the majority of cases screening US is performed in conjunction with screening 2D mammography or DBT. The most noted U.S. prospective clinical trial evaluating this approach was the ACRIN 6666 Trial.60 In this study, 2,809 women at elevated risk for breast cancer, with heterogeneous or extreme density breast tissue in at least one quadrant were evaluated with both mammography and screening US, in randomized order. 41 breast cancers were diagnosed: 8 suspicious on both US and mammography, 12 on US alone, 12 on mammography alone, and 9 were interval cancers. The diagnostic accuracy for mammography was 7.6 cancers/1000 screened and increased to 11.8/1000 when combined with supplemental ultrasound. DCIS were only seen by mammography. The false positive rate for mammography alone was 4.4%, for US alone was 8.1% and for combined mammography plus US was 10.4%. Thus, if a higher false positive rate is acceptable for women with dense breasts, combined mammography plus US screening will diagnose more cancers in this population.

In the same study, when Berg et al. compared the value of supplemental US vs supplemental breast MRI to screening mammography, both US and MRI increased the yield of breast cancers diagnosed (US: 3.7 cancers/1000 screened; MRI: 14.7/1000 screened), but both were associated with increases in false-positive findings in terms of increased recall rates and increased recommendations for biopsies that were found not to be cancer.61

In addition to concerns about high recall and false positive biopsy recommendation when ultrasound is used in conjunction with screening mammography, variation in the performance and interpretation of the exams has been a concern. In two other studies that evaluated interobserver variation in the interpretation of
automated whole breast screening ultrasound, agreement between radiologists was found to be moderate (lesion detection) to good (lesion characterization).62,63

Assuring Patient Safety for Screening Ultrasound

Because US does not use ionizing radiation or require intravenous contrast, it is a safe technology for breast cancer screening. However, its high recall and false positive biopsy recommendation rates are areas of focus for improving its performance. When a potential lesion identified on a screening exam is performed by an automated system, an additional “diagnostic” study, using a hand-held transducer is performed to characterize the lesion, which adds complexity to the overall screening process.

Accreditation and Documentation

Like breast MRI, breast ultrasound accreditation is voluntary, but required for BICOE certification.55 The ACR Ultrasound Accreditation Program provides facilities performing breast ultrasound and ultrasound-guided breast biopsies peer review and constructive feedback on staff qualifications, equipment, quality control, quality assurance, accuracy of needle placement and image quality.64 The program accredits facilities providing services by radiologists, breast surgeons and other practitioners meeting the program’s qualifications.

To ensure uniformity in describing lesions evaluated by ultrasound, the ACR BI-RADS Atlas has a section devoted to ultrasound image acquisition, image quality, transducer frequency, labeling and correct lesion measurement. Standardized terminology for describing lesions and wording reports and providing a final assessment with management recommendations is also provided.65 The Atlas focuses on ultrasound characterization of mammographic and palpable abnormalities and does not address screening ultrasound. Though the ACR has developed practice parameters for the performance of a diagnostic breast ultrasound examination, the document does not address ultrasound examinations performed as supplemental screening for breast cancer detection.66

Breast Imaging Centers of Excellence

Centralized breast cancer screening programs with extensive quality assurance activities are currently operated by national health care systems in several countries outside of the U.S. While adapting such programs to the diverse and somewhat fragmented U.S. health care delivery systems may not be fully feasible, programs like the NCI BCSC have shown the value of and improvements realized by quality and safety mandates, data registries and performance benchmarks. Similarly, interdisciplinary breast centers of excellence can optimize the broad range of techniques, therapies and management practices to address breast cancer screening, diagnosis and treatment. The ACR Breast Imaging Center of Excellence (BICOE) accreditation program55 and the American College of Surgeons National Accreditation Program for
Breast Centers (NAPBC)\textsuperscript{67} are two recognized national programs that accredit centers of excellence. To receive designation as an ACR Breast Imaging Center of Excellence, a mammography facility must be fully accredited by the ACR in mammography, stereotactic breast biopsy, breast ultrasound, ultrasound-guided breast biopsy and breast MRI. ACR BICOE accreditation is voluntary and renewable every three years.

Summary

Mammography has been the primary breast cancer screening modality for more than five decades. The quality and safety of screening mammography has been improved by requiring specific training and continuing experience and education for radiologists and technologists; standardizing the terms and descriptors used in reporting findings; providing women with their mammography results and follow-up recommendations; tracking performance and outcomes through practice audits; ensuring compliance with accreditation requirements; and performing periodic facility inspections. The future of breast cancer screening will entail tools providing a more personalized understanding of cancer risk to better guide the type and frequency of screening test performed for an individual woman. Programs and practices must be cognizant that the majority of women undergoing screening will never develop breast cancer and that patient safety, quality assurance and benchmarks for performance outcomes remain vital to the success of breast cancer screening.

References


