ACR Appropriateness Criteria Breast Cancer Screening

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Abstract

Mammography is the recommended method for breast cancer screening of women in the general population. However, mammography alone does not perform as well as mammography plus supplemental screening in high-risk women. Therefore, supplemental screening with MRI or ultrasound is recommended in selected high-risk populations. Screening breast MRI is recommended in women at high risk for breast cancer on the basis of family history or genetic predisposition. Ultrasound is an option for those high-risk women who cannot undergo MRI. Recent literature also supports the use of breast MRI in some women of intermediate risk, and ultrasound may be an option for intermediate-risk women with dense breasts. There is insufficient evidence to support the use of other imaging modalities, such as thermography, breast-specific gamma imaging, positron emission mammography, and optical imaging, for breast cancer screening.

The ACR Appropriateness Criteria are evidence-based guidelines for specific clinical conditions that are reviewed every 2 years by a multidisciplinary expert panel. The guideline development and review includes an extensive analysis of current medical literature from peer-reviewed journals and the application of a well-established consensus methodology (modified Delphi) to rate the appropriateness of imaging and treatment procedures by the panel. In those instances in which evidence is lacking or not definitive, expert opinion may be used to recommend imaging or treatment.

Key Words: Appropriateness criteria, breast cancer, screening, mammography, breast MRI, breast ultrasound

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The ACR seeks and encourages collaboration with other organizations on the development of the ACR Appropriateness Criteria through society representation on expert panels. Participation by representatives from collaborating societies on the expert panel does not necessarily imply individual or society endorsement of the final document.

Dr Harvey reported that she is a shareholder in and has a research agreement with Hologic (Marlborough, Massachusetts). Dr Hayes reported that she is an international speaker for Hologic.

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SUMMARY OF LITERATURE REVIEW

Mammography

Mammography is the only method of screening for breast cancer shown to decrease mortality [1-4]. Annual screening mammography is recommended starting at (1) 40 years of age for the general population; (2) 25 to 30 years of age for carriers of the breast cancer 1 gene and untested relatives of carriers; (3) 25 to 30 years of age or 10 years earlier than the age of the affected relatives at diagnosis (whichever is later) for women with first degree relatives with premenopausal breast cancer or for women with lifetime risk for breast cancer 20% on the basis of family history; (4) 8 years after radiation therapy but not before 25 years of age for women who received mantle radiation between the ages of 10 and 30 years; and (5) any age for women with biopsy-proven lobular neoplasia, atypical ductal hyperplasia, ductal carcinoma in situ, or invasive breast cancer [5] (see Variant 1). However, mammography alone does not perform as well as mammography plus supplemental screening in certain subsets of women, particularly those with genetic predispositions to the disease and those with dense breasts [6-11]. Therefore, supplemental screening is recommended in selected high-risk populations.

MRI

Breast MRI in high-risk women has been shown to have higher sensitivity than mammography, and the combination of mammography and MRI in this population has the highest sensitivity [12-19]. In a high-risk population, MRI and mammography combined have higher sensitivity (92.7%) than ultrasound and mammography combined (52%) [6]. Therefore, in high risk women for whom supplemental screening is indicated, MRI is recommended when possible (see Variant 2).

Screening high-risk women using breast MRI is cost-effective [20,21], and the cost-effectiveness of screening MRI rises with increasing breast cancer risk. The American Cancer Society recommends screening breast MRI in certain high-risk women [22], and the ACR and the Society of Breast Imaging endorse those recommendations [5]. Screening MRI is recommended in women with breast cancer 1 gene mutations and their untested first-degree relatives as well as women with lifetime risk for breast cancer ≥20%. Also included in this high-risk group are women who received radiation therapy to the chest between the ages of 10 and 30 years as well as women with other genetic syndromes that increase the risk for breast cancer (eg, Li-Fraumeni syndrome). For other women with intermediate risk for breast cancer, such as those with lifetime risk of 15% to 20%, personal histories of breast cancer, or histories of lobular neoplasia or atypical ductal hyperplasia, the use of screening MRI is an area of ongoing investigation [5,22]. However, recent literature supports the use of screening MRI in addition to mammography in patients with personal histories of breast cancer [23] and lobular neoplasia [24] (see Variant 3).

Variant 1. Average-risk women: women with <15% lifetime risk of breast cancer, breasts not dense

Radiologic Procedure	Rating	Comments	RRL
Mammographic screening	9		☢☢
MRI breast without and with contrast	3		○
Ultrasound breast	2		○
MRI breast without contrast	1		○
FDG-PEM	1		☢☢☢☢
^{99m}Tc sestamibi BSGI	1		☢☢☢☢

Note: Rating scale: 1, 2, and 3 = usually not appropriate; 4, 5, and 6 = may be appropriate; 7, 8, and 9 = usually appropriate. BSGI = breast-specific gamma imaging; FDG = 2-[^{18}F]fluoro-2-deoxyglucose; PEM = positron emission mammography; RRL = relative radiation level.

Ultrasound

Screening ultrasound is indicated in high-risk patients who cannot tolerate MRI. Supplemental screening with ultrasound for women with intermediate risk and dense breasts is an option to increase cancer detection. However, handheld ultrasound screening by radiologists has a high false-positive rate and is time-consuming [25]. Therefore, this may not be a cost-effective practice. The balance between cancer detection and the risk of a false positive result should be considered by women and their health care providers when considering the use of screening US or other ancillary screening examinations.

Other Imaging Modalities

There is insufficient evidence to support the use of other imaging modalities, such as thermography, breast-specific gamma imaging, positron emission mammography, and optical imaging, for breast cancer screening [5]. Radiation doses from breast-specific