THE AMERICAN SOCIETY OF Breast Surgeons

Position/Policy Report

Position Statement on Screening Mammography and Supplemental Imaging

ASBrS Breast Cancer Screening Guidelines Recommendations

1. Women age >25 should undergo formal risk assessment for breast cancer
2. Women with an average risk of breast cancer should initiate yearly screening mammography at age 40
3. Women with a higher-than-average risk of breast cancer should undergo yearly screening mammography and be offered yearly supplemental imaging; this screening should be initiated at a risk-based age
4. Screening mammography should cease when life expectancy is <10 years

Methods

A literature review inclusive of recent randomized controlled trials, prospective and retrospective cohort studies, and expert consensus guidelines pertinent to breast cancer screening was conducted. We prioritized updating data from United States Preventative Service Task Force (USPSTF, 2024), American College of Radiology (ACR, 2023), the Dense Tissue and Early Breast Neoplasm Screening (DENSE) trial, and Women Informed to Screen Depending on Measures of Risk (WISDOM) trial. Systematic reviewed and heavily weighted on randomized trials with guideline-level evidence from USPSTF and national societies such as ACR and American Cancer Society (ACS). This is not a formal systematic review but rather, a comprehensive review of recent relevant literature. The ASBrS originally developed a consensus document on screening mammography, which was reviewed and approved by the ASBrS Board of Directors in 2011. This document was updated in 2015 and 2019. In 2026, the ASBrS Critical Writing, Editing, and Review committee (CWERC) updated this resource guide based on evidence-based guidance and expert consensus, and this guide was further revised after membership comment and approved by the ASBrS Board of Directors. No external keyholder input was obtained. CWREC committee members consolidated evidence across guidelines to provide a comprehensive review and recommendations.

Table 1 – Summary of ASBrS Recommendations for Breast Cancer Screening*

Women with average risk**	• Women with non-dense breasts (A and B density)^	Annual mammography (3D preferred modality) starting at age 40, no need for supplemental imaging
	• Women with increased breast density (C density)^	Annual mammography (3D preferred modality), starting at age 40, and access to supplemental imaging
	• Women with increased breast density (D density)^	Annual mammography (3D preferred modality), starting at age 40, and access to supplemental imaging (MRI preferred modality)
Women with higher-than-average risk	• Hereditary susceptibility from high-penetrance pathogenic mutation carrier status++ • Prior chest wall radiation • age 10-30	Annual MRI starting at age 25 Annual mammography (3D preferred modality) starting at age 30
	• Predicted lifetime risk >20% by any model • Strong family history	Annual mammography (3D preferred modality) and access to annual supplemental imaging starting at 40 or 10 years prior to the youngest family member with breast cancer
	• Prior diagnosis of atypical ductal hyperplasia (ADH), atypical lobular hyperplasia (ALH) or lobular carcinoma in situ (LCIS)	Annual mammography (3D preferred modality) and access to annual supplemental imaging
Women with prior history of breast cancer age ≥50 with non-dense breasts#		Annual mammography (3D preferred modality)
Women with prior history of breast cancer at age <50, or with dense breasts#		Annual mammography (3D preferred modality) and access to annual supplemental imaging when recommended by their physician

*All women to undergo risk assessment at age 25-30 and updated at appropriate intervals using a risk calculator with a health care professional

^BI-RADS Category A or Class 1 density = fatty; BI-RADS Class B or Class 2 density = scattered fibroglandular density; BI-RADS Category C or Class 3 density = heterogeneously dense; BI-RADS Category D or Class 4 density = extremely dense

#Women with prior breast cancer with residual breast tissue

**Average risk: Women with no known pathogenic mutation associated with elevated breast cancer risk, atypia on prior breast biopsy, prior chest wall radiation, prior breast cancer diagnosis, or reproductive factors, personal history, or family history that would increase their lifetime risk of breast cancer to >20% by a validated breast cancer risk model.

++High-penetrance pathogenic mutation (BRCA1, BRCA2, PTEN, TP53, CDH1, STK11)

Introduction and Review of Guidelines

Controversy surrounding screening mammography guidelines has resulted in conflicting recommendations from physicians and uncertainty for women. The underlying evidence supporting the use of screening mammography (i.e., digital mammography) is largely derived from nine randomized trials initiated between 1963-1991, however, imaging technology since this time has evolved. These nine trials were undertaken in the United States (US), Sweden, the United Kingdom, and Canada, and recruited more than 660,000 women with average risk for breast cancer and showed mortality reduction with the implementation of screening mammography.[1-11] Several advances and paradigms have evolved in the field of breast oncology over the past several decades since these trials were completed, leading to questions regarding their 21st century relevance. For example, the technology of mammographic imaging has progressed substantially, and we have a deeper understanding of heterogeneity in breast tumor biology; both of these issues generate concerns regarding the balance between "over-diagnosis" versus the outcome benefits of early detection. Furthermore, we have refined documentation of disparities in breast cancer burden related to associations between racial/ethnic identity, age, and breast tumor subtype. These issues, as well as shifting population demographics and increasing diversity in the US, elevate the screening mammography debate in discussions of strategies to achieve health equity. Changes in our understanding of breast cancer epidemiology justify re-evaluation of these trials in the context of contemporary recommendations for mammographic screening, despite the paucity of data these trials provide regarding screen- detected tumor biology and diverse patient populations.

Current screening mammography guidelines continue to vary in recommendation to age of initiate, frequency of screening, and have changed over time. While society guidelines (ACR, ACS) currently recommend initiating screening at 40, the USPSTF has a different stance on the frequency of screening. The 2024 USPSTF recommended that women with average risk begin screening mammography at age 40, to be performed in a biennial fashion, through age 74; this was a change from recommendations starting in 2009 to initiate biennial screening at age 50.[12,13] ACS recommends that women with an average risk of breast cancer begin screening mammography starting at age 45, with women age 40-44 having the option to start annual screening, and continue yearly between ages 45 and 54.[14] Women age 55 and older are recommended by the ACS to undergo biennial screening, with an opportunity for yearly screening mammography. Further, the ACS recommends that women continue screening as long as their life expectancy was 10 years or longer. The American College of Radiology (ACR) and the Society for Breast Imaging (SBI) jointly recommend annual mammographic screening beginning at age 40 for women of average risk.[15] Furthermore, higher-than-average risk women should have access to breast MRI screening at age 25-30, with annual mammography starting between 25 and 40 depending on type of risk.[16] Despite differences regarding the preferred age for initiating mammographic screening and frequency of screening, all guidelines advocate in favor of access to screening mammography beginning at age 40 for asymptomatic, average risk, women in the US.

The goals of the current ASBrS position statement are to summarize the data and to make clear recommendations regarding breast cancer screening for both women with average and higher risk, as well as to make surveillance imaging recommendations for women with a prior history of breast cancer. In addition, the role of the various screening modalities will be delineated for these risk groups. The aim is to support practical, real-world clinical application across diverse practice settings and intend to serve as clinical practice guidance.

Risk Assessment

To determine the appropriate screening approach, the first step is risk assessment. Risk assessment can be formed in a primary care setting, breast clinic, or referred from an imaging center. In asymptomatic patients with non-palpable exam findings, we recommend that individual women undergo formal risk assessment as follows, with ages chosen where the results of the risk assessment will change management:

Age 25 or when first seen by a trained or experienced breast health care provider (age 25-30):

- Genetic risk: Assess family history of malignancies
    - Discuss genetic testing of the unaffected woman if she meets the National Comprehensive Cancer Network (NCCN) guidelines for genetic testing, https://www2.tri-kobe.org/nccn/guideline/gynecological/english/genetic_familial.pdf
- Prior pathology: Determine if the woman has a prior history of atypical ductal hyperplasia (ADH), atypical lobular hyperplasia (ALH) or lobular carcinoma in situ (LCIS)
- Radiation exposure: Determine if the woman has a prior history of chest or mantle radiation therapy between the ages of 10 and 30

If the risk assessment described above reveals a significant finding (hereditary susceptibility related to a pathogenic mutation, prior atypia and/or LCIS, or history of mantle radiation between ages 10-30), then the woman is considered to be at higher-than-average risk of breast cancer development and, with shared decision making, should follow higher-risk screening. Tailor screening plans should be made for patients based on the aforementioned factors and breast density.

Age 30 or above or when first seen by a trained or experienced breast health care provider (at age over 30):

- Assess risk factors as above, updating risk model assessment at frequent intervals
- Estimate breast cancer risk using the current Tyrer-Cuzick model or a comparable validated model including similar factors (family and personal history, including breast density and any biopsy results).
    - Note all models have variable accuracy in different ethnic and racial groups, with most having limitations in non-white populations.[17-19] Clinicals should take these factors into consideration when interpreting risk assessments.
    - Tyrer-Cuzick is available at: http://www.ems-trials.org/riskevaluator/
- Update risk assessment with a risk model as above at regular intervals
- Models incorporating polygenic risk scores (PRS), which utilize single nucleotide polymorphisms (SNPs) to estimate future risk, are currently best used in the setting of clinical trials and require additional validation prior to incorporation into clinical practice.[20] Efforts towards a risk-based screening approach over population-based screening in which PRS are incorporated are being made. The WISDOM trial, the first randomized clinical trial which compared women aged 40-74 years to undergo risk-

based screening (based on genetic assessment, PRS, and use of a breast cancer risk model) or annual mammography, demonstrated that the rate of stage ≥IIB cancers was noninferior in the risk-based screening group, but did not reduce biopsy rates.[21] The WISDOM trial strengthens evidence that risk-based screening is likely safe and feasible; however, given the low adherence to screening recommendations within the WISDOM trial, the results of additional on-going trials and future studies with improved patient adherence are necessary guide formal recommendations regarding optimal risk stratification. While these results are promising, PRS is not yet recommended for routine clinical use outside of research.

Breast Cancer Risk

Absolute risk is used to describe an individual's likelihood of developing breast cancer. It is based on the number of people who will develop breast cancer within a certain time period. Absolute risk also can be stated as a percentage. Currently, 1 in 8 women in the US, or 12%, will develop breast cancer over the course of a lifetime. The absolute risk of developing breast cancer during a particular decade of life is lower than 1 in 8. The younger you are, the lower the risk. For example, a woman at age 30 who has no other breast cancer risk factors has a 1 in 228 risk of breast cancer, or 0.44%, in the next 10 years. On the other hand, a woman at age 60 who has no other breast cancer risk factors has a 1 in 29 risk of breast cancer, or 3.49%, in the next 10 years.[22] Current screening intervals are not affected by these changes in absolute risk; although this is evolving with new risk-based screening research.

In contrast, **relative risk** is a number or percentage that compares one group's risk of developing breast cancer to another's. For example, women with ADH have 4 times the risk of breast cancer than women without. In these recommendations, women with average risk are considered to have an absolute risk comparable to the general population at any given age.

Special note: The ACS (and later, other groups generating guidelines) chose the 20% remaining lifetime risk threshold to approximate the various thresholds that had been used in the international MRI screening trials where the focus had been on women who are younger and have higher risk. However, using remaining lifetime risk is inherently problematic as the short-term incidence increases with age while remaining lifetime risk decreases. Thus, short term risk assessments may be more clinically relevant in older women. To address this in future guidelines, short-term risk calculations (5- or 10-year risks) should be included, ideally in combination with breast density, as was done in the ACRIN 6666 trial.[23] For example, a 5-year risk of breast cancer in a 70 year old woman with Category A density compared to that of a 50 year old women with Category D density is easier for clinicians to interpret and to formulate screening plans.

ASBrS Recommendations – Women with Average Risk

We recommend that asymptomatic women with average risk undergo screening mammography beginning at age 40 in the US based on expert consensus, USPSTF, and society guidelines. Such screening should continue as long as the woman remains in good health with an average life expectancy of 10 years or longer. Tomosynthesis, or three-dimensional (3D) mammography, became available in the US in 2011 and improves the sensitivity and specificity of mammography, particularly for women with nonfatty breasts and in the assessment of noncalcified lesions. Where available, 3D mammography is the preferred sole

modality for women with an average risk for breast cancer. However, 2D mammography when 3D tomosynthesis is unavailable is still acceptable.

The USPSTF recommendations were updated in 2024 to recommend screening starting at age 40 (USPSTF JAMA).[12] The changes were based on statistical model from the Cancer Intervention and Surveillance Modelling Network (CISNET), a collaborative network estimating the impact of different screening on population-level health outcomes. The "life-years-gained"-based model demonstrated survival benefits associated with screening beginning at age 40.[13,24] Updated analyses of CISNET models have continued to reaffirm estimates of greatest mortality reduction achieved with screening beginning at age 40.[25] ASBrS prioritizes clinical outcome data over modeling alone that takes into account individual risk and benefits from screening.

Biennial screening interval is recommended by the USPSTF. Modeling data suggests that it is a favorable balance between benefits and harms (i.e., life years gained, or breast cancer death averted versus false-positive result) when compared to annual screening. In premenopausal women, women diagnosed with breast cancer after biennial screening mammography were more likely to have tumors with less favorable prognostic characteristics than those from annual screening.[26] In comparison, there was no difference in tumors with less favorable prognostic characteristics between biennial and annual screening cohorts in postmenopausal women. Annual screening mammogram is associated with lower risk of late-stage cancer, and therefore overall survival.[27] This benefit was found regardless of age, race, and menopausal status. ASBrS supports the use of annual screening mammography beginning at age 40 for women with average risk.

The screening mammography debate regarding women in their 40s has heightened relevance in discussions of breast cancer disparities related to racial-ethnic identity.[28] While a comprehensive review of the multifactorial etiology of this important issue and its impact on the full spectrum of our diverse American population is beyond the scope of this ASBrS guideline, a few well-documented differences in the breast cancer burden of African American compared to White American women warrant comment. The age distribution of breast cancer is younger, and the stage distribution is more advanced in African American women. Population-based breast cancer mortality rates are higher among African American women, and population-based incidence rates of triple-negative (estrogen receptor-negative, progesterone receptor-negative, Her2neu non-amplified) breast cancer are two-fold higher among African American women.[29,30] A recent study showed a clearer benefit in starting screening mammography in African American women starting ages 40-45.[31] The benefits of early detection through screening for all breast tumor phenotypes (e.g., improved survival, reduced need for adjuvant chemotherapy) are compelling arguments in favor of mammography screening as a valuable tool in achieving health equity.[32]

ASBrS Recommendations – Women with Higher-than-Average Risk

According to the NCCN guidelines[33,34], women with higher-than-average risk for breast cancer include: 1) women with a BRCA gene mutation or other germline mutation known to predispose to a higher-than-average risk of breast cancer (or women with a very strong family history who have not undergone complete testing); 2) women with a history of chest irradiation between the ages of 10 and 30; 3) women with a greater than 20% estimated lifetime risk of breast cancer based on risk assessment models that are largely dependent on family history such as Claus, BRCAPro, and Tyrer-Cuzick; and 4) women with ADH or lobular neoplasia

(LCIS/ ALH).[35] Of note, it is unknown if these recommendations apply depending on the extend of hyperplasia (i.e., isolated foci). Additionally, patients with overlapping risk categories warrant further discussion for individualized risk assessments.

Higher-than-average risk women should have a clinical encounter every 6-12 months with annual 3D screening mammography and consideration of enhanced surveillance with annual breast MRI when indicated.[36] When breast MRI is unable to be performed, alternative supplemental screening options may be considered such as, contrast-enhanced mammography (CEM), molecular breast imaging (MBI), or whole breast ultrasound, and should be selected based on patient factors and local expertise. Again, shared decision making is important when selecting supplemental imaging, particularly in cases when breast MRI is unavailable or contraindicated.

ASBrS Recommendations – Women with Average Risk with Dense Breast Tissue

Breast density refers to the proportion of fibroglandular tissue to fatty tissue on mammogram. The ACR BI-RADS atlas categorizes breast density into 4 categories: almost entirely fatty (category A), scattered fibroglandular elements (category B), heterogeneously dense (category C), and extremely dense (category D). Women with dense breast, defined as heterogeneously or extremely dense breasts, have an increased risk factor for breast cancer and a decreased sensitivity with mammography.[37,38]

To overcome the limitations of mammography screening in women with dense breasts and improve the cancer detection rate in this subset of women, supplemental screening modalities have been studied but not shown to decrease mortality. The DENSE trial, which randomized patients with extremely dense breasts and a normal mammogram with or without supplemental breast MRI, revealed significantly fewer interval cancers with the addition of supplemental MRI screening. As such, the NCCN and ACR guidelines endorse supplemental MRI screening in women with extremely dense breast tissue who otherwise do not meet any other increased risk category.[39] However, in this Dutch study, women were receiving mammograms biennially starting at age 50, and the results therefore cannot be directly translated to the US population of women receiving annual mammogram starting at age 40.[40] Supplemental MRI has been shown to identify more cancers than mammogram alone, but long-term data on the recommendation, frequency, duration, and impact on breast cancer treatment and survival are needed. CEM, MBI, or whole breast ultrasound may be considered when a breast MRI is unable to be performed.[40]

Shared decision-making regarding use of supplemental screening is recommended in women with heterogeneously dense breasts who have an average risk of breast cancer. Adding screening breast ultrasound to dense breast tissue as a supplemental screening tool increases the cancer detection rate, however, contributes to more false-positives.[41,42] Meanwhile, breast MRI improves early cancer detection in average-risk women of all breast densities (cancer detection rate of 15.5 per 1,000), but no data exists to support the addition of breast MRI women with heterogeneously dense breast.[43] Clinicians should incorporate patient's values, anxiety, access, and false-positive risk in these recommendations.

ASBrS Recommendations - Women with Prior History of Breast Cancer

In women with prior breast cancer and intact breasts, there is a higher risk for an in-breast

tumor recurrence (IBTR) or new primary breast cancer. For women who have undergone unilateral mastectomy, the contralateral breast should be followed with yearly screening mammography, with the risk of a contralateral breast cancer at ~0.4% per year.[44] Screening imaging after mastectomy with or without reconstruction is not recommended.[45] For asymptomatic women who have undergone breast-conserving therapy, annual mammography for the cancerous breast should be performed. In addition, the ASBrS supports access to annual supplemental imaging for women with a personal history of breast cancer who have either high lifetime risk for a contralateral breast cancer, dense breast tissue, were under the age of 50 at diagnosis, prior history of presenting with mammographically occult cancers, history of invasive lobular cancer that is detected with higher level of accuracy on breast MRI, or other clinical factors if recommended by their physician.[46]

Supplemental Screening Modalities

Contrast-enhanced Breast Magnetic Resonance Imaging (MRI). Contrast-enhanced breast MRI is more sensitive than either mammography or ultrasound in high-risk populations.[47,48] For germline mutation carriers and high-risk patients, MRI is the preferred screening modality starting at age 25 (with mammography beginning at age 30). For women with a history of chest or mantle radiation therapy under age 30, the incremental cancer detection rate with the addition of MRI is approximately 4%.[48] Breast cancer risk increases substantially approximately eight years after the completion of radiation therapy. Thus, MRI surveillance should begin at that time but not before age 25.[49] Fast, or abbreviated breast MRI may also be considered for supplemental screening when accessible. If MRI is contraindicated or the woman declines it, other enhanced screening modalities can be considered.

Contrast-enhanced Mammography (CEM). CEM is an emerging breast imaging technique that uses contrast-enhanced recombined images for evaluation of neovascularity similar to MRI, but its use as a supplemental screening tool has not replaced that of breast MRI.[50] CEM is advantageous for high-risk patient who are contraindicated or cannot tolerate breast MRI. Limitations include potential contrast reactions, physician availability to evaluate and treat any potential contrast reactions, and the lack of 3-D and kinetic information provided by MRI. The use of additional ionizing radiation is less favorable than other available modalities. CEM has not gained wide adoption to date and is not widely available. However, as technology with this modality improves, implementation of CEM as a supplemental imaging modality may increase as well.

Molecular Breast Imaging (MBI). MBI is currently an investigational tool. There are currently no large trials to validate the efficacy of MBI for screening. However, several studies have demonstrated significant incremental cancer detection rates when used as a supplement to mammography.[51] Prospective trials are needed to recommend MBI as a screening tool for women with a higher-than-average risk of breast cancer.

Ultrasound. Multiple studies confirm the incremental cancer detection capabilities of whole-breast ultrasound in women with higher risk. ACRIN 6666 was a large prospective multicenter study evaluating women with higher risk and demonstrated a supplemental cancer detection rate of 4.3 per 1,000.[23] However, this supplemental detection is counter- balanced by an increase in false-positive findings and lower positive predictive value compared to mammography and MRI.[52] As supplemental ultrasound screening evolves, and automated

technology improves, some of these drawbacks may diminish. In the Japan Strategic Anti-cancer Randomized Trial (J-START), women were randomized to screening mammography alone versus screening mammography and supplemental screening ultrasound.[53] Women undergoing supplemental screening ultrasound had more cancers detected than those undergoing mammography alone [184 (0.50%) versus 117 (0.32%), p=0.0003], and those cancers were more frequently Stage 0 and Stage I.[53] Automated breast ultrasound (ABUS), although not widely available, allows for standardized image acquisition and reduction in medical time to perform and interpret images. Similar to handheld ultrasound, ABUS increases cancer detection rate and is a potential supplemental screening option.[54,55] While earlier-stage detection is improved with whole-breast screening ultrasound, longer-term survival impact remains uncertain.

ASBrS Recommendations - Populations in which Screening may be Deescalated/Unnecessary

Older Women. Prior randomized prospective trials of screening mammography exclude women older than 74. This led the USPSTF to conclude that there are no definitive data to recommend for or against screening mammography in this age group.[12] On the other hand, the American Cancer Society recommends continued screening as long as women have a life expectancy of at least 10 years.[14] We recommend that women with a life expectancy of at least 10 years with high functional status and low comorbidity burden continue yearly screening mammography. Clinicians can use validated risk calculators to assess estimating life expectancy and frailty rather than chronologic age alone. In this population, prior studies have demonstrated a survival benefit in women who do not have severe co-morbidities.[56,57] In addition, mammographic screening in an older population would be expected to have a lower rate of false-positives and unnecessary biopsies compared to a younger population. Routine screening mammography, 2D or 3D, without supplemental imaging should be sufficient for this group, even if they met higher-risk criteria at a younger age.

Younger Women with Average Risk. There are currently no data to support routine screening in women under age 40 who have average risk.

Potential Risks of Screenings

There are substantial benefits to breast cancer screening, primarily the decrease in breast cancer mortality. Some potential harms, however, should be acknowledged, including:

- Overdiagnosis: overdiagnosis from screening refers to the identification of breast cancer that would not have otherwise led to clinical consequences if left undetected in the person's lifetime. There is a high-degree of uncertainty when quantifying breast cancer overdiagnosis estimates given the variation in screening strategies, inherent uncertainty in estimating life expectancy, and differences in study methodologies.[58]
- False-positive results: Many women undergoing screening mammography will experience false-positive mammogram results that may lead to additional image or biopsies. A collaborative modeling analysis estimated that a lifetime of biennial screening from age 40 to 74 years would result in 1376 false-positive results per 1000 women screened, with an increase in false-positive recalls in annual screening.[28]
- Radiation exposure: In 2015, the USPSTF conducted a modeling analysis demonstrating that

the incidence of radiation-induced breast cancer deaths from a lifetime of screening mammography is low (16 per 100,000 women) relative to the deaths avoided.[59]

- Discomfort and emotional impact: Mammographic screening can be physically uncomfortable for a temporary amount of time. False-positive results can cause unnecessary anxiety and worry about breast cancer.

Conclusions

The ASBrS recommends that women age 25 and older undergo formal risk assessment for breast cancer including evaluation of indications for genetic testing and personal history of radiation, adding calculated lifetime risk using a validated model such a Tyrer-Cuzick at age 30 and beyond. The ASBrS recommends that women who have an average risk undergo yearly screening mammography beginning at age 40 and stop screening mammography when the woman has a life expectancy of less than 10 years. The ASBrS recommends that women with a higher risk for breast cancer undergo yearly screening mammography and yearly supplemental imaging. At this time, MRI is the favored supplemental imaging modality.

Furthermore, the ASBrS acknowledges the presence of breast cancer outcome disparities in the US. African American women, for example, face a disproportionately higher-than-average risk of breast cancer mortality, which is at least partly explained by differences in stage distribution as well as tumor biology. These screening recommendations for the overall diverse population of adult women represent an opportunity to minimize breast cancer disparities through earlier detection of disease in all women. Continued research efforts will guide future iterations of these guidelines.

This statement was developed by the panel members listed below, and on April 6, 2026, was approved by the Board of Directors. Similar Guidelines have been previously put forth from this body in 2011, 2015 and 2019.

Lead Authors: Anna C. Beck, MD; Regina Matar-Ujvary, MD; Xuanji Wang, MD

Critical Writing Editing and Research Committee: Jessica E. Maxwell, MD; Samilia Obeng-Gyasi, MD, MPH; Anna C. Beck, MD; Meghan E Garstka, MD; Cathy L. Graham, MD; Kathie-Ann P. Joseph, MD, MPH; David W. Lim, MDCM, MEd, PhD; Regina Matar-Ujvary, MD; Megan Miller, MD; Rita Adele Mukhtar, MD; Stephanie Serres, MD, PhD; Xuanji Wang, MD; Carla S. Fisher, MD, MBA

References

1. Shapiro S, Venet W, Strax P, Venet L, Roeser R. Ten- to fourteen-year effect of screening on breast cancer mortality. *J Natl Cancer Inst*. Aug 1982;69(2):349-55.
2. Miller AB, Baines CJ, To T, Wall C. Canadian National Breast Screening Study: 1. Breast cancer detection and death rates among women aged 40 to 49 years. *Cmaj*. Nov 15 1992;147(10):1459-76.
3. Miller AB, To T, Baines CJ, Wall C. The Canadian National Breast Screening Study-1: breast cancer mortality after 11 to 16 years of follow-up. A randomized screening trial of mammography in women age 40 to 49 years. *Ann Intern Med*. Sep 3 2002;137(5 Part 1):305-12. doi:10.7326/0003-4819-137-5_part_1-200209030-00005
4. Miller AB, Baines CJ, To T, Wall C. Canadian National Breast Screening Study: 2. Breast cancer detection and death rates among women aged 50 to 59 years. *Cmaj*. Nov 15 1992;147(10):1477-88.
5. Moss SM, Cuckle H, Evans A, Johns L, Waller M, Bobrow L. Effect of mammographic screening from age 40 years on breast cancer mortality at 10 years' follow-up: a randomised controlled trial. *Lancet*. Dec 9 2006;368(9552):2053-60. doi:10.1016/s0140-6736(06)69834-6
6. Miller AB, To T, Baines CJ, Wall C. Canadian National Breast Screening Study-2: 13-year results of a randomized trial in women aged 50-59 years. *J Natl Cancer Inst*. Sep 20 2000;92(18):1490-9. doi:10.1093/jnci/92.18.1490
7. Andersson I, Aspegren K, Janzon L, et al. Mammographic screening and mortality from breast cancer: the Malmö mammographic screening trial. *Bmj*. Oct 15 1988;297(6654):943-8. doi:10.1136/bmj.297.6654.943
8. Frisell J, Lidbrink E, Hellström L, Rutqvist LE. Followup after 11 years--update of mortality results in the Stockholm mammographic screening trial. *Breast Cancer Res Treat*. Sep 1997;45(3):263-70. doi:10.1023/a:1005872617944
9. Bjurstam N, Björneld L, Warwick J, et al. The Gothenburg Breast Screening Trial. *Cancer*. May 15 2003;97(10):2387-96. doi:10.1002/cncr.11361
10. Tabar L, Fagerberg G, Chen HH, et al. Efficacy of breast cancer screening by age. New results from the Swedish Two-County Trial. *Cancer*. May 15 1995;75(10):2507-17. doi:10.1002/1097-0142(19950515)75:10<2507::aid-cncr2820751017>3.0.co;2-h
11. Moss SM, Wale C, Smith R, Evans A, Cuckle H, Duffy SW. Effect of mammographic screening from age 40 years on breast cancer mortality in the UK Age trial at 17 years' follow-up: a randomised controlled trial. *Lancet Oncol*. Sep 2015;16(9):1123-1132. doi:10.1016/s1470-2045(15)00128-x
12. Nicholson WK, Silverstein M, Wong JB, et al. Screening for Breast Cancer: US Preventive Services Task Force Recommendation Statement. *Jama*. Jun 11 2024;331(22):1918-1930. doi:10.1001/jama.2024.5534
13. Siu AL. Screening for Breast Cancer: U.S. Preventive Services Task Force Recommendation Statement. *Ann Intern Med*. Feb 16 2016;164(4):279-96. doi:10.7326/m15-2886
14. Oeffinger KC, Fontham ET, Etzioni R, et al. Breast Cancer Screening for Women at Average Risk: 2015 Guideline Update From the American Cancer Society. *Jama*. Oct 20 2015;314(15):1599-614. doi:10.1001/jama.2015.12783
15. Monticciolo DL, Malak SF, Friedewald SM, et al. Breast Cancer Screening Recommendations Inclusive of All Women at Average Risk: Update from the ACR and Society of Breast Imaging. *J Am Coll Radiol*. Sep 2021;18(9):1280-1288. doi:10.1016/j.jacr.2021.04.021
16. Monticciolo DL, Newell MS, Moy L, Lee CS, Destounis SV. Breast Cancer Screening for Women at Higher-Than-Average Risk: Updated Recommendations From the ACR. *J Am Coll Radiol*. Sep 2023;20(9):902-914. doi:10.1016/j.jacr.2023.04.002
17. Adams-Campbell LL, Makambi KH, Palmer JR, Rosenberg L. Diagnostic accuracy of the Gail model in the Black Women's Health Study. *Breast J*. Jul-Aug 2007;13(4):332-6. doi:10.1111/j.1524-4741.2007.00439.x
18. Kurian AW, Hughes E, Simmons T, et al. Performance of the IBIS/Tyrer-Cuzick model of breast cancer risk by race and ethnicity in the Women's Health Initiative. *Cancer*. Oct 15 2021;127(20):3742-3750. doi:10.1002/cncr.33767
19. Porterhouse MD, Paul S, Lieberenz JL, Stempel LR, Levy MA, Alvarado R. Black Women Are Less Likely to Be Classified as High-Risk for Breast Cancer Using the Tyrer-Cuzick 8 Model. *Ann Surg Oncol*. Oct 2022;29(10):6419-6425. doi:10.1245/s10434-022-12140-9

20. Network NCC. *Breast cancer risk reduction*. 2026. Version 1.2026. Accessed January 22, 2026. https://www.nccn.org/professionals/physician_gls/pdf/breast_risk.pdf
21. Esserman LJ, Fiscalini AS, Naeim A, et al. Risk-Based vs Annual Breast Cancer Screening: The WISDOM Randomized Clinical Trial. *JAMA*. 2025;doi:10.1001/jama.2025.24784
22. Howlader N, Noone AM, Krapcho M, et al. *SEER Cancer Statistics Review, 1975-2017*. 2020. https://seer.cancer.gov/csr/1975_2017/
23. Berg WA, Blume JD, Cormack JB, et al. Combined screening with ultrasound and mammography vs mammography alone in women at elevated risk of breast cancer. *Jama*. May 14 2008;299(18):2151-63. doi:10.1001/jama.299.18.2151
24. Humphrey LL, Helfand M, Chan BK, Woolf SH. Breast cancer screening: a summary of the evidence for the U.S. Preventive Services Task Force. *Ann Intern Med*. Sep 3 2002;137(5 Part 1):347-60. doi:10.7326/0003-4819-137-5_part_1-200209030-00012
25. DeSantis CE, Fedewa SA, Goding Sauer A, Kramer JL, Smith RA, Jemal A. Breast cancer statistics, 2015: Convergence of incidence rates between black and white women. *CA Cancer J Clin*. Jan-Feb 2016;66(1):31-42. doi:10.3322/caac.21320
26. Miglioretti DL, Zhu W, Kerlikowske K, et al. Breast Tumor Prognostic Characteristics and Biennial vs Annual Mammography, Age, and Menopausal Status. *JAMA Oncol*. Nov 2015;1(8):1069-77. doi:10.1001/jamaoncol.2015.3084
27. Zuley ML, Bandos AI, Duffy SW, et al. Breast Cancer Screening Interval: Effect on Rate of Late-Stage Disease at Diagnosis and Overall Survival. *J Clin Oncol*. Nov 10 2024;42(32):3837-3846. doi:10.1200/jco.24.00285
28. Trentham-Dietz A, Chapman CH, Jayasekera J, et al. Collaborative Modeling to Compare Different Breast Cancer Screening Strategies: A Decision Analysis for the US Preventive Services Task Force. *JAMA*. 2024;331(22):1947-1960. doi:10.1001/jama.2023.24766
29. Arleo EK, Hendrick RE, Helvie MA, Sickles EA. Comparison of recommendations for screening mammography using CISNET models. *Cancer*. Oct 1 2017;123(19):3673-3680. doi:10.1002/cncr.30842
30. Kohler BA, Sherman RL, Howlader N, et al. Annual Report to the Nation on the Status of Cancer, 1975-2011, Featuring Incidence of Breast Cancer Subtypes by Race/Ethnicity, Poverty, and State. *J Natl Cancer Inst*. Jun 2015;107(6):djv048. doi:10.1093/jnci/djv048
31. Chen T, Kharazmi E, Fallah M. Race and Ethnicity–Adjusted Age Recommendation for Initiating Breast Cancer Screening. *JAMA Network Open*. 2023;6(4):e238893-e238893. doi:10.1001/jamanetworkopen.2023.8893
32. Vaz-Luis I, Ottesen RA, Hughes ME, et al. Outcomes by tumor subtype and treatment pattern in women with small, node-negative breast cancer: a multi-institutional study. *J Clin Oncol*. Jul 10 2014;32(20):2142-50. doi:10.1200/jco.2013.53.1608
33. Daly MB, Pilarski R, Berry M, et al. NCCN Guidelines Insights: Genetic/Familial High-Risk Assessment: Breast and Ovarian, Version 2.2017. *J Natl Compr Canc Netw*. Jan 2017;15(1):9-20. doi:10.6004/jnccn.2017.0003
34. Network NCC. *Guidelines for Breast Cancer Screening and Diagnosis*. 2017. http://www.NCCN.org
35. Network NCC. Breast cancer screening and diagnosis. National Comprehensive Cancer Network. Accessed January 22, 2026. https://www.nccn.org/professionals/physician_gls/pdf/breast-screening.pdf
36. Monticciolo DL, Newell MS, Moy L, Niell B, Monsees B, Sickles EA. Breast Cancer Screening in Women at Higher-Than-Average Risk: Recommendations From the ACR. *J Am Coll Radiol*. Mar 2018;15(3 Pt A):408-414. doi:10.1016/j.jacr.2017.11.034
37. McCormack VA, dos Santos Silva I. Breast density and parenchymal patterns as markers of breast cancer risk: a meta-analysis. *Cancer Epidemiol Biomarkers Prev*. Jun 2006;15(6):1159-69. doi:10.1158/1055-9965.Epi-06-0034
38. Vourtsis A, Berg WA. Breast density implications and supplemental screening. *Eur Radiol*. Apr 2019;29(4):1762-1777. doi:10.1007/s00330-018-5668-8
39. Paulis LV, Lewin AA, Weinstein SP, et al. ACR Appropriateness Criteria® Supplemental Breast Cancer Screening Based on Breast Density: 2024 Update. *J Am Coll Radiol*. May 2025;22(5s):S405-s423. doi:10.1016/j.jacr.2025.02.023
40. Bakker MF, de Lange SV, Pijnappel RM, et al. Supplemental MRI Screening for Women with Extremely Dense Breast Tissue. *N Engl J Med*. Nov 28 2019;381(22):2091-2102. doi:10.1056/NEJMoa1903986
41. Tagliafico AS, Mariscotti G, Valdora F, et al. A prospective comparative trial of adjunct screening with tomosynthesis or ultrasound in women with mammography-negative dense breasts (ASTOUND-2). *Eur J Cancer*.

Nov 2018;104:39-46. doi:10.1016/j.ejca.2018.08.029
42. Harada-Shoji N, Suzuki A, Ishida T, et al. Evaluation of Adjunctive Ultrasonography for Breast Cancer Detection Among Women Aged 40-49 Years With Varying Breast Density Undergoing Screening Mammography: A Secondary Analysis of a Randomized Clinical Trial. *JAMA Network Open*. 2021;4(8):e2121505-e2121505. doi:10.1001/jamanetworkopen.2021.21505
43. Kuhl CK, Strobel K, Bieling H, Leutner C, Schild HH, Schrading S. Supplemental Breast MR Imaging Screening of Women with Average Risk of Breast Cancer. *Radiology*. May 2017;283(2):361-370. doi:10.1148/radiol.2016161444
44. Giannakeas V, Lim DW, Narod SA. The risk of contralateral breast cancer: a SEER-based analysis. *Br J Cancer*. Aug 2021;125(4):601-610. doi:10.1038/s41416-021-01417-7
45. Heller SL, Lourenco AP, Niell BL, et al. ACR Appropriateness Criteria® Imaging After Mastectomy and Breast Reconstruction. *J Am Coll Radiol*. Nov 2020;17(11s):S403-s414. doi:10.1016/j.jacr.2020.09.009
46. Lehman CD, Lee JM, DeMartini WB, et al. Screening MRI in Women With a Personal History of Breast Cancer. *J Natl Cancer Inst*. Mar 2016;108(3)doi:10.1093/jnci/djv349
47. Kuhl CK, Schrading S, Leutner CC, et al. Mammography, breast ultrasound, and magnetic resonance imaging for surveillance of women at high familial risk for breast cancer. *J Clin Oncol*. Nov 20 2005;23(33):8469-76. doi:10.1200/jco.2004.00.4960
48. Sung JS, Lee CH, Morris EA, Oeffinger KC, Dershaw DD. Screening breast MR imaging in women with a history of chest irradiation. *Radiology*. Apr 2011;259(1):65-71. doi:10.1148/radiol.10100991
49. Tieu MT, Cigsar C, Ahmed S, et al. Breast cancer detection among young survivors of pediatric Hodgkin lymphoma with screening magnetic resonance imaging. *Cancer*. Aug 15 2014;120(16):2507-13. doi:10.1002/cncr.28747
50. Covington MF, Pizzitola VJ, Lorans R, et al. The Future of Contrast-Enhanced Mammography. *AJR Am J Roentgenol*. Feb 2018;210(2):292-300. doi:10.2214/ajr.17.18749
51. Hruska CB. Molecular Breast Imaging for Screening in Dense Breasts: State of the Art and Future Directions. *AJR Am J Roentgenol*. Feb 2017;208(2):275-283. doi:10.2214/ajr.16.17131
52. Brem RF, Tabár L, Duffy SW, et al. Assessing improvement in detection of breast cancer with three-dimensional automated breast US in women with dense breast tissue: the SomoInsight Study. *Radiology*. Mar 2015;274(3):663-73. doi:10.1148/radiol.14132832
53. Ohuchi N, Suzuki A, Sobue T, et al. Sensitivity and specificity of mammography and adjunctive ultrasonography to screen for breast cancer in the Japan Strategic Anti-cancer Randomized Trial (J-START): a randomised controlled trial. *Lancet*. Jan 23 2016;387(10016):341-348. doi:10.1016/s0140-6736(15)00774-6
54. Zanotel M, Bednarova I, Londero V, et al. Automated breast ultrasound: basic principles and emerging clinical applications. *Radiol Med*. Jan 2018;123(1):1-12. doi:10.1007/s11547-017-0805-z
55. Brem RF, Lenihan MJ, Lieberman J, Torrente J. Screening breast ultrasound: past, present, and future. *AJR Am J Roentgenol*. Feb 2015;204(2):234-40. doi:10.2214/ajr.13.12072
56. Badgwell BD, Giordano SH, Duan ZZ, et al. Mammography before diagnosis among women age 80 years and older with breast cancer. *J Clin Oncol*. May 20 2008;26(15):2482-8. doi:10.1200/jco.2007.12.8058
57. Schonberg MA, Breslau ES, McCarthy EP. Targeting of mammography screening according to life expectancy in women aged 75 and older. *J Am Geriatr Soc*. Mar 2013;61(3):388-95. doi:10.1111/jgs.12123
58. Myers ER, Moorman P, Gierisch JM, et al. Benefits and Harms of Breast Cancer Screening: A Systematic Review. *Jama*. Oct 20 2015;314(15):1615-34. doi:10.1001/jama.2015.13183
59. *Modeling report: Radiation-induced breast cancer and breast cancer death from mammography screening*. http://www.uspreventiveservicestaskforce.org/Page/Document/modeling-report-radiation-induced-breast-cancer-and-breast-c/breast-cancer-screening1

