Screening Mammography
Recommendations and Controversies

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KEYWORDS

• Mammogram (MMG) • Screening • Analog • Digital

KEY POINTS

- The focus of screening mammography remains to prevent breast cancer death through early detection and treatment with the goal of increased survival.
- Screening mammography does have associated risks and potential harms.
- Although one perspective is that the value of even one life outweighs anxiety caused by false positives or health care costs, this may not be the perspective of every patient.

INTRODUCTION
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Over the past several years, there have been numerous changes in the guidelines for screening mammography. Additionally, different societies have released guidelines with variance in the recommendations. The importance of screening mammography in decreasing breast cancer, however, remains clear. The current recommendations as well as the importance of screening mammography in the disease process, early detection, and survival are discussed.

Breast cancer is a common disease, and the survival has been greatly improved in recent years. Overall, in the United States, the risk of developing breast cancer is 1 in 8 (12%). There are an estimated 252,710 new cases of breast cancer resulting in 40,610 deaths estimated in the United States in 2017. In addition, there are an estimated 63,410 new cases of ductal carcinoma in situ (DCIS). Mortality rates for breast cancer have decreased over the past 50 years. The current 5-year survival rate is now 95% compared with 75% in 1975.[1] Before the mid-1980s the death rate from breast cancer had not changed in more than 4 decades. Since 1990, the death rate has steadily declined by at least 38% through 2014.[2] In addition to improvements in screening, there have also been advances in treatment. However, screening has a greater

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reduction in mortality.[3] The improvement in survival has been in large part due to improvements in screening leading to early detection and improved breast cancer treatment (**Table 1**). There are an estimated 3.5 million women in the United States living with breast cancer. The main risk factors for breast cancer include female sex and advancing age.[1]

The history of mammography helps understand its current state and underscores the importance of screening mammography. Reports of radiographs of the breast date back to 1929 in the United States, noting the roentgenographic appearance of tumors and the accuracy of diagnosis. In 1960, Robert Egan[4] published a statistical analysis showing that soft-tissue roentgenography of the breast can provide definitive diagnosis of malignant, benign, and normal conditions of the breast. The article evaluated 1000 consecutive images with an error rate of less than 1%. It also noted the inaccuracy of palpation in detecting breast lesions.[4] Breast cancer is the most common cancer in women other than skin cancer and the second most common cause of cancer death in women. Screening mammography has reduced mortality rates at least 30% for breast cancer through the detection of earlier breast cancer leading to improved survival. Additionally, when breast cancer is diagnosed at the earliest stages, the survival rate is greater than 95%.

There have been significant advancements in the quality of mammographic images. The imaging used for mammography has evolved from analog to digital.[5] In addition to higher-quality imaging with digital mammography, interpretation times are improved, shown through comparison of full-field digital mammography (FFDM) compared with FFDM using analog from priors. The use of FFDM also significantly increased the referral rate as well as the cancer detection rate. However, there is a lower positive predictive value of referral and biopsy. The additional tumors detected by FFDM were mainly low- to intermediate-grade DCIS, smaller invasive tumors, and overall more favorable tumor characteristics.[6] Digital breast tomosynthesis (DBT) creates a 3-dimensional image of the breast and was approved by the Food and Drug Administration in 2011 for breast cancer screening. Studies have shown increased detection rates with DBT with dense breasts as well as a higher average true-positive rate compared with 2-dimensional mammography. The sensitivity and specificity are higher, and the overall recall rate has been shown to be lower. Additionally, there was a higher detection of Breast Imaging Reporting and Data System 5 lesions; however, there was no difference between the detection of benign lesions.[7] The

Table 1
Benefits of recommended screening strategies

Screening Strategy	Examinations per 1000 Women	Percentage Mortality Reduction	Breast Cancer Deaths Averted per 1000 Women	Life Years Gained per 1000 Women Screened	Number Needed to Screen per Death Averted
Annual 40–84 y old	36,550	39.6	11.9	189	84
Annual 45–54 y old, biennial 55–79 y old	19,846	30.8	9.25	149	108
Biennial 50–74 y old	11,066	23.2	6.95	110	144

Data from Monticciolo DL, Newell MS, Hendrick RE, et al. Breast cancer screening for average-risk women: recommendations from the ACR commission on breast imaging. J Am Coll Radiol 2017;14(9):1137–43; and Arleo EK, Hendrick RE, Helvie MA, et al. Comparison of recommendations for screening mammography using CISNET models. Cancer 2017;123(19):3673–80.