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Breast Cancer Screening in the Geriatric Population: Challenges and Future Considerations

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Abstract

Purpose of Review With the aging population of the USA, the role of mammographic screening over the age of 75 is controversial. This review investigates the benefits, risks, and utilization of mammography screening in the geriatric population.

Recent Findings The utilization of screening mammography in geriatric patients is variable and often not targeted to those who will receive the most benefit. Prognostic tools can help stratify those who will benefit from early detection versus those who will suffer harm from false positives and overdiagnosis. Decision aids are well received by both patient and physician and facilitate shared decision-making discussions.

Summary Future research needs to include more patients over 70 years of age to provide stronger data on the benefits and risks. The dissemination of decision-making tools can help with messaging, and further research on the implementation and reception of these tools can help with their refinement.

Keywords Breast cancer · Breast cancer screening · Geriatric oncology · Mammography · Shared decision-making

Introduction

Globally, breast cancer amounts to 2.3 million new cancer diagnoses and 685,000 deaths with projections of 3 million new cases and 1 million deaths annually by 2040 [1]. In 2022 alone, the USA had approximately 290,000 new cases of invasive breast cancer with almost 50% of breast cancer-related deaths in women 70 years and older with a median age of diagnosis of 62 years old [2]. The baby boomer generation that arrived over 70 years ago is now adding to the growing geriatric population in the American healthcare system. Life expectancy has risen over time with the US female life expectancy reaching 77 years old [3]. Although there is no set age that defines the geriatric population, ages > 65 years old are often used due to the fact that this determines Medicare eligibility. One-third of all the US healthcare spending is attributed to this group [4]. Across various consortiums and medical societies, debate exists on the role of breast cancer screening, especially in those above the age of 70. Trials commonly exclude women older than 75 years, resulting in limited evidence of the benefits and risks regarding screening mammography in this group. In this review, we summarize the evidence and current perspectives regarding the utilization of breast cancer screening in older women, to highlight knowledge gaps in this field.

Screening Mammography Utilization in Elderly Women

Multiple societies have set out guidelines to address breast cancer screening; however, there is heterogeneity among the various societies (see Table 1). The US Preventive Services Task Force (USPSTF) guidelines advise stopping biennial mammography at age 74. The American College of Obstetricians and Gynecologists recommends continuing until age 75 after which the patient and provider should discuss future need. In 2022, the American Cancer Society

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Table 1 Recommendations for breast cancer screening in average-risk women

	US Preventive Services Task Force (update in progress; May 2023)	American College of Obstetricians and Gynecologists (2017)	American Cancer Society (2022)	American Society of Breast Surgeons (2019)	National Comprehensive Cancer Network (2023)
Mammography initiation age	Age 40	Age 40, no later than 50	Offer at ages 40–45 Recommend at age 45	Age 40	Age 40
Mammography interval	Biennial	Annual or biennial	Annual for ages 40–54 Biennial with option for annual in age 55 or older	Annual	Annual
Mammography stop age	**Age 74**	**Continue until age 75, shared decision-making for discontinuation of screening based on patient preferences and overall health after age 75**	**When life expectancy < 10 years**	**When life expectancy < 10 years**	**When life expectancy < 10 years**
Clinical breast examination			Clinical breast exams are not recommended for breast cancer screening among average-risk women at any age Breast awareness encouraged	Breast awareness encouraged	Clinical breast exam/breast awareness starting at age 25 to be done every 1–3 years
Supplemental imaging studies					If dense breasts, consider MRI and/or ultrasound

released guidelines advising continuation of screening if life expectancy was > 10 years; the American Society of Breast Surgeons and the National Comprehensive Cancer Network released similar guidelines [5–9]

In the USA, 46% of women aged > 70 years diagnosed with breast cancer were found to be persistent (i.e., annual or biannual) with mammogram with resulting mammogram findings associated with earlier-stage disease [10]. According to 2019 data from the Centers for Disease Control, ~ 54% of women older than 75 years old reported mammography in the last 2 years while ~ 78% of women ages 65–74, despite the literature having inconsistent evidence on the life expectancy benefit of continued screening [5, 6]. Given the variation in recommendations, it is no surprise the utilization among older women is also variable thus highlighting the need for optimization of screening mammography strategy [11].

Benefits and Risks of Screening Mammography

The purpose of screening is to identify disease prior to symptoms or metastasis to reduce disease morbidity and prevent mortality. With the advent of mammography, the incidence of advanced-stage breast cancer has decreased; conversely, local/low-grade disease has increased. The benefits of breast cancer screening are abundantly clear as the overall breast cancer death rate has declined by 43% since 1989 which can be attributed to both improved treatments and earlier detection [2]. A systematic review from 2015 found that breast cancer screening has an approximate 20% reduction in breast cancer mortality for women of all ages. While this reduction applies broadly, it did not provide specific insights into the magnitude of benefit across different age groups, including the geriatric population. As a systematic review, this is an expected limitation given the underrepresentation of geriatric patients among their included studies. Furthermore, the review was not able to find quality evidence regarding the relationship between screening, life expectancy, and quality-adjusted life expectancy across all ages [12]. There is a need for more targeted research to understand the full spectrum of screening benefits and limitations, particularly in older age groups where the balance of benefits and harms may differ from the general population. In a SEER-Medicare dataset of patients over 70 diagnosed with breast cancer, a retrospective observational study revealed a significant association between the persistence of mammographic screening and early stages of disease when controlled for other independent variables regardless of mammographic screening frequency (annual or biennial) [10]. An examination of treatment patterns from the National Cancer Database (NCDB) for women over 80 years old demonstrated improved overall survival for all molecular subtypes of breast cancer in those who received surgery and radiation. Specifically, the median survival of those receiving surgery was 4 years longer than those who did not [13, 14•]. While the benefits of early detection are easily conceptualized, the risks of mammography must also be considered.

False Positive Rate

False positive results refer to findings on mammography that require additional imaging or procedures. From data in the Breast Cancer Surveillance Consortium (BCSC), it is estimated that the false positivity at first mammogram is 12.2–17.7% for recall and 2.3–2.5% for biopsy recommendation. Other literature estimates 55–85% of breast biopsies have benign findings. Cumulative false positive risks—the probability of having a false positive after 10 years of continued screening—decrease with a longer screening interval [15]. In other words, the risk for false positives is greatest in younger patients. Advani et al. investigated breast biopsy patterns specifically in women aged 66–94 years old. Their analysis demonstrated a 1.5% biopsy rate overall with the prevalence decreasing with age but increasing with the Charlson Comorbidity Index. The rate of biopsy was highest in those with no prior imaging, at 3.8%. Of the biopsies, 55.2% were benign. When examined by age, those 75–84 years old had an invasive cancer pathology rate of 38.6%, and those 85–84 years old were 45.9% [16•]. While they did not examine complications from the procedures or the patients' experience related to the interventions, given the majority of findings were false positives, it could be said the risk-to-benefit ratio was unfavorable in this age group. In a mixed methods study looking at the patient experience in a group of women > 65, it found that many women had greater anxiety and discomfort at time of biopsy, which diminished at the 6-month follow-up. However, they continued to have some anxiety about their next mammogram and desired more information about the method and meaning of breast biopsy to ease the negative psychological consequences of the intervention [17].

Overdiagnosis

Breast cancer overdiagnosis, referring to the detection of cancers that pose no threat to life and would never have been detected in the absence of screening, is a public health issue. There is evidence to suggest that since the implementation of screening mammography, a spike in the incidence of in situ and early-stage cancers has been observed, but a link to cancer-specific mortality reduction has not been as clear [18]. A study using data from the BCSC looked at the 10-year cumulative incidence of breast cancer, death from breast cancer and death from other causes in patients aged 66

to 94. They found the incidence of death due to breast cancer was relatively similar across various age groups; however, the cumulative incidence of other-cause death increased with increasing age and the Charlson Comorbidity Index [19•].

There are observational and randomized controlled studies that have attempted to quantify the rate of overdiagnosis with the rate varying significantly due to differences in methodologies and definitions. A recent data analysis from the USPSTF concluded that approximately 11 to 22% of all breast cancer cases (invasive plus in situ) in the USA may be overdiagnosed [20]. In relation to our population of interest, data from the SEER program estimated the rates of overdiagnosis for patients aged 70–74, 75–84, 85, and older were 31%, 47%, and 54% respectively [21]. This overdiagnosis can lead to increased healthcare resource utilization and medical waste [4]. With the increased detection of DCIS, there has been an increase in its treatment with 99.6% of women having some form of hormone therapy, surgery, and/or radiation and only 0.4% with active surveillance [22]. This risk is particularly salient in the geriatric population, as other comorbidities may have a greater impact on life expectancy than an early-stage breast cancer. Furthermore, treatment modalities of breast cancer come with their own risks, which may be less tolerated in those with comorbidities [23, 24].

Life Expectancy and Screening

The purpose of screening is to identify illness prior to causing symptoms and determining the "time to benefit" distinguishes when the benefit from the test outweighs the potential harm. Regarding breast cancer, it is estimated to take 10.7 years to prevent one breast cancer death in 1000 women screened [25]. Prior research from Schonberg et al. in 2016 shows a survival benefit for screening mammography to be strongest within 10 years [26]. Therefore, a patient needs to live longer than 10 years to achieve the advantage of screening. A study by Kotwal et al. in 2019 looked into older adults' cancer screening intentions and recalled discussions with physicians about stopping screening; 59% of women aged 75–84 with less than 10 years of life expectancy intended on having a future mammogram, and over 80% did not recall having a conversation regarding cessation. Significantly, individuals who recalled having a conversation regarding cessation were five times more likely to seek future screening, which highlights the role that clinicians have in reducing unnecessary screening when effective counseling is used [27]. However, estimating life expectancy can be a challenge to determine and can be a difficult conversation for clinicians to have with their patients. Life expectancy calculators have been created, and one that is simple but effective is the ePrognosis (eprognosis.ucsf.edu) developed at the University of California San Francisco. This tool uses various patient factors to calculate the life expectancy at 10 years and gives a graphic depiction of risks and benefits (Fig. 1) [28••]. A tool such as this can help physicians have a productive discussion about ongoing screening and has been demonstrated effective regardless of education level [29].

Patient Perspectives on Screening

Patients tend to overestimate the benefit of screening studies and are enthusiastic to continue these tests [27, 30]. A qualitative study out of NYC found that older women with a long history of screening mammography viewed the test as a necessary and routine part of their care [29, 31]. A study of utilizing decision aids in a group of African American women in Philadelphia, most often cited that "getting a mammogram may help me feel good about myself and my health" [32]. Multiple studies repeatedly show that factors associated with continued screening include education level and optimism [33, 34]. Specifically, women who believe they will live another 10–15 years are more likely to be screened [34]. Women have received the messaging from multiple national campaigns about the importance of screening mammography for living a healthy life.

In broaching the subject of mammographic cessation, concepts like time to benefit or overdiagnosis can be difficult to understand. They may give the perception of rationing and may feel pessimistic to patients. In a Texas-based study, 86% of participants would not change their decision to screen, even after being provided educational scenarios demonstrating over-detection [35]. Similarly, in a qualitative interview-based study, patients did not feel life expectancy was relevant—as physicians "cannot predict how long [someone] will live" [36••]. Interestingly and contrarily, a study looking at the impact of COVID-19 on screening in Massachusetts demonstrated that women aged 75–85 years old did not rebound to pre-pandemic screening rates as readily as the younger age groups, indicating that patients can receive the message about the greater immediate threats to their health [37].

A randomized control trial looking at the effect of a patient decision aid in women over 75 found that it was helpful in educating patients on the role of screening, and such an aid resulted in the de-escalation of screening [29]. Patients can be educated. The physician's role is to achieve patient understanding by making complex medical and statistical concepts clear. These conversations require ingenuity and take on the form of shared decision-making.

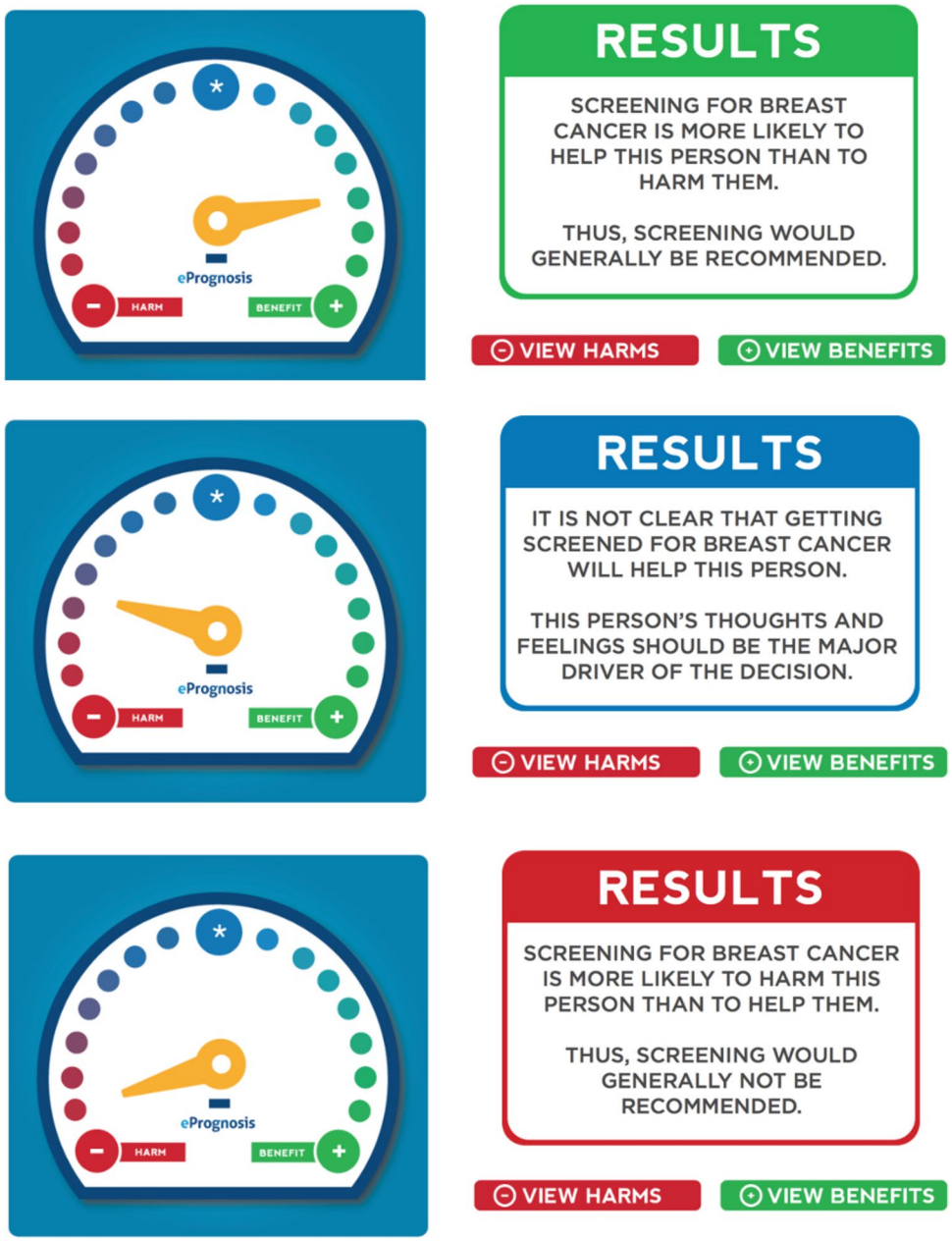

Fig. 1 ePrognosis breast cancer screening examples. The three gauges demonstrate three possible visual results from utilizing the ePrognosis tool. The results are generated using the Lee Schonberg Index which takes into account a series of patient factors, comorbidities, and activity status to calculate all causes of 10-year mortality in adults aged 50 and older. Results include screening recommendations based on calculated numbers needed to treat and harm (NNT, NNH) (https://eprognosis.ucsf.edu/cancer/partials/breast-cancer.php)

Shared Decision-making

When it comes to breast cancer screening among the elderly, shared decision-making is critical. As individuals age, the balance between the potential benefits and risks of screening becomes increasingly nuanced. Collaborative discussions between healthcare providers and elderly patients are essential to navigate this complexity. Shared decision-making allows for a personalized approach by considering an individual's life expectancy, existing health conditions, and patients' personal preferences. This approach recognizes the risk of overdiagnosis and overtreatment, respects the patient's values and quality of life, and ensures that the decision is well-informed and reflective of the patient's particular circumstances.

While shared decision-making is the ideal to strive toward, this can still pose challenges when patients have low or very high health literacy. As previously mentioned, overdiagnosis is a challenging concept. Also, in those with high health literacy, there is a lack of data to fully satisfy all potential questions [36••]. Physicians may prefer to fall back on guidelines, but as stated previously, these likely fall short. Health system factors may also limit these conversations given busy clinic days, mixed messaging from different clinicians, presence, or lack of automated reminders.

Fortunately, these challenges have been recognized, and decision aids and conversation scripts have been developed. Decision aids are plain language questionnaires that can be filled out before or during visits to solicit patients' perceptions on screening and gauge their level of health. ePrognosis has the "Should I continue having mammograms?" guide and Dana Farber's "Are Mammograms Still Right for Me?" guide, which incorporate questions about life expectancy, mammographic preferences, and even free text areas [38••].

Qualitative, interview-based studies demonstrate that patients of various demographics are capable of completing and learning through the process of decision aids [32, 36••]. In these studies, patients often cite that their providers have never discussed screening cessation or reduction [32, 39]. When providers are questioned about the topic, they cite discomfort, feeling not adequately trained with the language for these conversations, or fearing patients may feel abandoned. Decision aids are helpful because they allow the patient time for reflection prior to the meeting with the provider and frame the conversation in the patient's vernacular.

Schonberg's publication "Scripts and Strategies for Discussing Stopping Cancer Screening with Adults > 75 Years: A Qualitative Study" offers a figure with example scripts for addressing the concepts related to screening [36••]. Other publications indicate using language that emphasizes risks over benefits. Using descriptions such as "you will not live longer with this test" is better received than descriptions of overdiagnosis [27, 39]. A personal and active voice is preferable, using "you" over "one." Cultural perspective should also be accounted for in these conversations [40–42]. As with any skill, practice makes perfect. By recurrently engaging in this conversation style, providers will build confidence and comfort with their geriatric patient population. Ultimately, patients need to be aware that they have a choice to screen, but there are factors to consider in making this decision.

Imaging After Breast Cancer Diagnosis

The next consideration is how to approach the geriatric breast cancer survivor. Two-thirds of breast cancer survivors (> 2.7 million women) are aged 65 years and older, whereas only 6% are younger than 50 years. Older patients (≥ 80 years old) comprise a significant percentage (15%) of this statistic [41]. Data shows that the survival rate is increasing in breast cancer and increasing even more in patients > 65 [2]. Current survivorship guidelines do not address the relation of life expectancy in the consideration for ongoing surveillance measures. Furthermore, the risks of surveillance mirror those of initial screening; in fact, breast cancer survivors may be at more risk for false positives given their history. A survey from the National Health Interview Study demonstrated inconsistent screening strategies among patients over 65 with breast cancer history and variable utilization even when accounting for life expectancy. Specifically, 57% of patients with less than 5 years of life expectancy still received screening, but mammography was omitted in 14% of those with over 10 years of life expectancy [43]. Unfortunately, this points toward the missed opportunity to appropriately target the population most likely to benefit from ongoing surveillance.

There is a low risk of breast cancer events in older breast cancer survivors, ipsilateral events range from 1 to 15%, and contralateral events from 1 to 5% at 10 years. They are particularly low in patients with hormone receptor-positive tumors maintained on endocrine therapy. These risks stay steady over time, in contrast to higher-risk cancer, such as triple negative and HER2 positive where the risk is higher in the first 5 years and then becomes similar to the general population afterward [44••].

The International Society of Geriatric Oncology recommendations divide breast cancer survivors into two groups—those with lower-risk cancer and those with higher-risk cancer. Lower-risk cancers are those that are hormone receptor-positive and Her2 negative or stage 1—Her2 or triple-negative breast cancers. In this population, surveillance should be continued either annually or biennially if life expectancy is over 10 years up to age 85. Higher-risk cancers should continue surveillance annually if life expectancy is over 5 years up to age 85. For both risk groups, upon reaching age 85, it should be continued in only those patients who are in extraordinary health or have a strong desire to continue [44••].

Supplemental Imaging Modalities

The role of additional imaging modalities in breast cancer screening is another controversial topic. The modalities can include ultrasound, magnetic resonance imaging, and contrast-enhanced mammography. Unfortunately, no imaging test is perfect, and each comes with different false negative and false positive rates. These rates can be different for older patients due to a variety of factors, including changes in breast tissue density, the presence of underlying health conditions, and the overall prevalence of breast cancer in this age group. Breast density itself is an established risk factor for breast cancer. Studies have shown that women with higher breast density have a 4 to sixfold increase in breast cancer risk [45–47]. In the elderly population in particular, Advani SM et al. showed that breast density was associated with increased breast cancer risk among women of 65 to 74 years regardless of BMI and among women 75 and older with a BMI of 25 or higher [48•]. Currently, mammography is the preferred first-line modality for screening asymptomatic women at average risk including the

elderly population. Supplemental imaging modalities have been suggested to overcome challenges with detection in patients with dense breasts, who are at higher risk for malignancy. For example, three to four additional cancers will be detected with whole breast ultrasound and eight to 13 with breast MRI of 1000 screened [49–51]. However, as with the mammography studies, geriatric patients are excluded from most studies related to supplemental imaging, so there is no specific data regarding the outcomes in this group. The decision to incorporate additional imaging modalities in elderly patients should follow the model of shared decision-making, with an emphasis on the risk of false positives and over-detection. Additionally, contrasted techniques are contraindicated in patients with impaired renal function. Positioning, such as with MRI (prone with arms extended), may pose challenges in patients with limited mobility or range of motion. Future research is warranted to investigate the role of different modalities given the different anatomical properties as well as risk profiles in this population.

Future Innovations

It will be interesting to see how technology continues to shape this discussion. Artificial intelligence (AI) may be an opportunity to estimate future breast cancer risk in older patients and may allow us to tailor screening recommendations to the patient after a single mammogram. For example, AI-based risk models are in development. These have been generated with machine learning trained with datasets of when patients were screened versus when they were diagnosed. These risk models can incorporate cost-to-benefit data, in order to recommend a specific time to return for imaging [52]. Deep learning-generated models have demonstrated better accuracy compared to traditional risk models in terms of identifying patients at greater risk of developing cancer [53, 54]. These models will allow us to move away from purely age-based screening and show significant promise for precision medicine.

Another emerging technology is the use of laboratory studies for cancer detection. Circulating tumor DNA (ctDNA) is being utilized in "Multicancer Early Detection" liquid biopsies [55]. ctDNA refers to DNA fragments that are released into the bloodstream by both healthy and cancerous cells. These fragments can originate from normal cells undergoing natural cell turnover or from cancer cells as they divide and die. The role of ctDNA in breast cancer diagnosis involves early detection, molecular profiling, treatment monitoring, and tracking disease progression [56]. As technology advances and our understanding of the genetic basis of cancer improves, ctDNA analysis is likely to play an increasing role in personalized cancer care. However, it is not yet a standalone diagnostic tool. It is often used in conjunction with other diagnostic methods, such as imaging techniques and traditional biopsies. Research in this field is ongoing, and its clinical utility is still being refined.

Conclusions

In conclusion, the challenge with screening recommendations is that they are population-based, yet patients undergoing screening are individuals. Therefore, clinicians must take the time to consider the various patient factors in decisions about continuing screening in the geriatric patient population. As our population ages, the need for thorough discussions on the role of screening will only become ever more critical as current literature has shown a lack of consistency and patient awareness of the risks of screening.

As patients reach geriatric age, we would recommend providers outline the anticipated timeline for screening cessation. For example, "while breast cancer screening is recommended at your current age, as you reach age 75, there is a consideration to scale back." By setting the expectation, patients will not be surprised by the discussion when providers bridge the subject again upon reaching their 70 s. The patients will feel less abandoned knowing this change was anticipated. Furthermore, it allows the opportunity for patients to reflect and ask questions in subsequent visits, signifying this topic is open for discussion with their physician. It should be communicated that symptom-based care will continue and that diagnostic testing will be ordered if any new breast concerns arise.

In patients who reach age 74, we suggest offering the ePrognosis tool "Should I continue to have Mammograms" or a similar decision aid to patients prior to their visit [28••]. This will solicit patient opinion about ongoing screening, and providers can review the answers prior to initiating the visit. The provider can also enter data within the life expectancy tool of their choice. By having this information on hand, the discussion will be facilitated and hopefully expedited, allowing a shared decision-making discussion within a busy clinic schedule.

Which patients should receive screening mammography over 75 years of age? As any good test taker knows, the answer is not all. However, to uniformly exclude patients based on their number of years will miss patients who can benefit from early detection. Patients are receptive and teachable. For years, they have heard and understood the message about the importance of screening. Therefore, they can also learn about care de-escalation. It is necessary for physicians ordering breast cancer screening studies to feel comfortable about having these shared decision-making discussions with their patients. In this, we can both educate patients, optimizing prevention and healthcare utilization.

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Declarations

Competing interests The authors declare no competing interests.

Conflict of Interest The authors declare no competing interests.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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- • Of importance
- •• Of major importance

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the consideration for cessation of screening in patients with increased comorbidity.)

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