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Decision making around mammography screening for older women

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Abstract

The population is aging and breast cancer incidence increases with age peaking between ages 75–79. However, it is not known if mammography screening helps women 75 years live longer since

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none of these women were included in randomized controlled trials evaluating mammography screening. Guidelines recommend that older women with <10-year life expectancy not be screened since it takes approximately 10 years before a screen-detected breast cancer may impact an older woman's survival. For women 75 years with 10 year life expectancy, guidelines recommend that clinicians discuss the benefits and risks of screening with older women to help these women elicit their values and preferences. It is estimated that 2 out of 1,000 women that continue to be screened biennially from ages 70–79 may avoid breast cancer death. However, 12–27% of these women will experience a false positive test and 10–20% of women that experience a false positive test undergo a benign breast biopsy. In addition, approximately 30% of screen-detected cancers would not otherwise have shown up in an older woman's lifetime. Yet nearly all older women undergo treatment for these breast cancers and the risks of treatment increase with age. To inform decision-making, tools are available to estimate patient life expectancy and to educate older women about the benefits and harms of mammography screening. In addition, guides are available to help clinicians discuss stopping screening with older women with <10 year life expectancy. Ideally, screening decisions would consider an older woman's life expectancy, breast cancer risk, and her values and preferences.

As an internal medicine resident from 1999–2002, I was taught to recommend mammography screening to all women 40 years every year. However, there were times when this did not make sense. For example, an 80 year old woman with chronic medical problems would come in and ask me for a mammogram or my preceptor would ask if I ordered her a mammogram and it was not clear to me how finding a slow growing, early stage, clinically undetectable breast cancer would help this woman live longer or better. So I started to read everything I could about mammography screening and I learned that the data did not support the level of enthusiasm that existed about its practice. Also, none of the eight randomized controlled trials (RCTs) evaluating mammography screening included women 75 years and only two trials, the Swedish Two-County Trial and Malmo I trial, included women 70–74 but too few of these women participated to draw any conclusions about mammography's effect.¹ I concluded that the best thing for women's health would be for women to be informed of the potential benefits and harms of mammography screening to allow for women to decide for themselves whether or not to get screened based on their values and preferences.

Brief History of Mammography

To understand the enthusiasm surrounding mammography screening, particularly during the time period of my residency, it is important to understand its history.² In 1895 the x-ray was developed and by 1913 surgeons were using x-rays to visualize the breast. From the 1920s to the 1950s mammography's technology improved such that by 1960 mammography was designated a subspecialty within radiology and in 1963 Dr. Philip Strax, a radiologist in New York, initiated the first RCT of mammography screening. This trial, published in JAMA in 1971, randomized approximately 61,000 women 40–64 years to receive an annual mammogram and a clinical breast exam for 4 years versus usual care and found that mammography was associated with around a 30% reduction in breast cancer mortality among women 50–64 years.³ Excited by these results, the American Cancer Society (ACS)

and the National Cancer Institute initiated the Breast Cancer Detection Demonstration Project (BCDDP) in 1973 to show that it was feasible to screen thousands of US women ages 35–74 for breast cancer every year. However, it was not until 1974 that many women began to participate.² Because in 1974, Betty Ford and Happy Rockefeller (the first and second lady of the US) both announced that they had breast cancer and women were told that there was now something they could do to lower their chance of dying from breast cancer – get a mammogram.

In 1991, Medicare began covering mammograms biennially for women 65 years and in the 1980s and 90s, data became available from the other RCTs of mammography screening, conducted in Europe and Canada. Reviewing data from these trials, a 1997 NIH consensus conference recommended regular screening for women 50 years. However, these recommendations were controversial because they did not include women in their 40s. Following the NIH's recommendations, the ACS revised their guidelines and recommended annual mammograms for all women 40 years and to continue screening as long as women were in good health. In 1998, Medicare expanded coverage to cover annual mammograms for all women 65 years regardless of their health or life expectancy and in 2002 the US Preventive Services Task Force (USPSTF) revised their guidelines to recommend mammography screening for all women 40 years every 1–2 years as long as a woman's life expectancy was not compromised by comorbid disease.⁴

However, in 2009, the USPSTF re-reviewed data from the screening trials and evaluated new analyses from simulation models and changed their guidelines to only recommend biennial screening for women 50–74 years. The USPSTF stated that there were insufficient data to recommend mammography screening for women 75 years. In 2016, the USPSTF reviewed mammography data again but did not change their guidelines.⁵ Congress, however, still refers to the USPSTF's 2002 guidelines to justify coverage of annual mammograms for all women 40 years in the Affordable Care Act. In 2015, the ACS also revised their guidelines to recommend annual screening for women 45–54 years and biennial screening for women 55 years who have 10 year life expectancy. Both USPSTF and ACS recommend that women 75 years be informed of the benefits and risks of mammography before being screened.⁶ In addition, in 2013, the Choosing Wisely Campaign began recommending clinicians not screen women with <10 year life expectancy.⁷ Table 1 summarizes the current mammography screening guidelines from these organizations.

Receipt of mammography among older women

Despite guidelines recommending clinicians not screen older women with short life expectancy and limited data on outcomes of mammography screening among older women, in 2010, 56% of US women 75 years reported being screened in the past 2 years, including 36% of women with 5 year life expectancy.⁸ Reasons that so many older women are screened include habit, societal norms and pressure from family, perceived risk, need for reassurance, and easy access.^{9,10} In fact, in the setting of ubiquitous pro-screening public health messages and campaigns about mammography (e.g., pink ribbon campaigns), older women consider it a moral obligation to be screened.¹⁰ In addition, few clinicians discuss harms of screening with older women because they find these discussions challenging.⁹

Possibly as a result, 70% to 86% of primary care physicians (PCPs) report that they recommend mammography to healthy women aged 80 years old¹¹ and screening rates are higher among older women who frequently see their PCPs.¹²

Benefits and risks of mammography among older women (Summarized in Table 2)

The benefit of mammography screening is finding breast cancer at an early, asymptomatic stage when treatment may be more effective in reducing breast cancer mortality than if treatment began when the cancer presented symptomatically. While mammography screening has been shown to reduce breast cancer mortality by 19% among women 40–69 years (15% reduction among women in their 40s compared to 32% among women in their 60s),¹³ whether mammography screening reduces breast cancer mortality for older women is not certain due to the lack of clinical trial data. There are reasons; however, to hypothesize that mammography screening may benefit older women. First, breast cancer incidence increases with age and screening tests tend to be more beneficial in a population where the condition is prevalent. Second, the sensitivity of mammography screening improves with age. The sensitivity of digital mammography is 86–88% among women in their 70s compared to 81% among women in their 50s; its specificity is 93% among women in their 70s and 91% among women in their 50s.^{14,15} In addition, improvements in breast cancer survival seen since 1980 have lagged behind for older women. Between 1980 to 1997 the adjusted risk of breast cancer death in newly diagnosed women decreased by 3.6% per year among women <75 years but only by 1.3% among women ≥75;¹⁶ lower use of mammography among women ≥75 years may partially explain this finding. In addition, these findings occurred despite the fact that older women tend to have more favorable tumor characteristics; 85% of women ≥75 years diagnosed with invasive breast cancer are diagnosed with stage I/II breast cancer (compared to around 78% of women in their 50s)^{17,18}, 85% are estrogen receptor positive (compared to around 75% among women in their 50s),¹⁹ and 90% are HER2- (compared to around 85% among women in their 50s).^{17,20} Simulation model data suggest that 2 of out 1000 women aged 70 in good health that continue getting mammograms for 10 years may avoid breast cancer death.^{21,22} Also, older women that are screened are less likely to be diagnosed with late stage breast cancers.²³

Potential harms of mammography screening; however, include anxiety resulting from false positive tests, false reassurance from an erroneously negative test, diagnosis of tumors that otherwise would not have shown up in an older woman's lifetime (overdiagnosis), and complications from work-up and/or treatment of cancer.²² Among women ≥75 years who undergo biennial screening the cumulative probability of a false-positive mammogram over 10 years ranges from 12–27%.^{22,24,25} While follow-up tests such as diagnostic mammograms and breast ultrasounds are generally low-risk procedures, approximately 10–20% of older women that experience a false positive mammogram will undergo a benign breast biopsy.^{22,24,25} Meanwhile, among 94 women ≥65 years that experienced a benign breast biopsy, 76% (71/94) reported a negative psychological consequence (e.g., lack of sleep) at the time of breast biopsy and 39% (37/94) reported that they were still experiencing a negative psychological consequence six months later.²⁶ A stereotactic breast biopsy may

be particularly burdensome to older women, especially those with osteoarthritis, due the amount of time required and the positioning on the biopsy table.²⁶

Overdiagnosis is a particularly concerning harm of cancer screening since it leads to diagnosis and treatment of tumors that otherwise would never have caused problems in an older woman's lifetime. A breast cancer diagnosis may be particularly burdensome to an older woman due to increasing comorbidity, frailty, declining social networks, and less access to medical information. Quantifying overdiagnosis, however, remains challenging and estimates vary from 0 to 50% of screen-detected breast cancers.²⁷ When comparing breast cancer incidence before and after screening was implemented in the US, overdiagnosis is estimated to be 22–31% of all breast cancers diagnosed.²⁸ However, since older women tend to have more indolent tumors and more competing mortality risks,¹⁷ overdiagnosis is thought to increase with age. Simulation models estimating overdiagnosis by age have found that 5–37% of women 50–74 years that undergo biennial screening are overdiagnosed, compared to 14–37% of women at age 80, and 28–41% of women at age 90.^{21,29} Detection of ductal carcinoma in situ (DCIS), a non-invasive form of breast cancer, among older women likely represents overdiagnosis since only about a third of cases of DCIS are thought to develop into invasive cancer but only after 10–15 years follow-up.³⁰ Together, studies suggest that around 30% of breast cancer diagnosed by screening mammography among older women are overdiagnosed which is concerning since nearly all older women undergo treatment for breast cancer and the harms of treatment increase with age.¹⁷

Decision-making around mammography screening

While it is uncertain that mammography screening decreases breast cancer mortality among older women; data from women 40–74 years suggest that it takes on average 10 years before mammography screening affects breast cancer survival.³¹ Meaning that older women that have <10 year life expectancy are very unlikely to benefit from screening. However, the harms of screening occur immediately. Therefore, high quality decision-making around mammography screening for older women should consider a woman's *breast cancer risk, life expectancy, and values and preferences.*

Risk of breast cancer

While breast cancer risk increases with age, peaking between ages 75–79, there are few tools available to help inform older women of their individualized risk. The Breast Cancer Risk Assessment Tool (BCRAT), also known as the Gail model, is the most commonly used breast cancer prediction model in primary care settings.³² The model considers age, race/ethnicity, age at menarche, age at first birth, history of a first degree female relative with breast cancer, history of breast biopsy, and history of atypical hyperplasia. However, some of the risk factors included in BCRAT, e.g., age at menarche, may be less predictive of breast cancer as women age.^{22,33} Also, BCRAT does not include breast density even though 28% of women >75 years have high breast density (compared to 46% of women 50–54)³⁴ and high breast density is associated with increased breast cancer risk regardless of women's age.³⁵ In a validation study, BCRAT provided accurate estimates for the probability of breast cancer within 5 years among post-menopausal women in good health that were recently

screened with mammography,³³ but overestimated risk among women 75 years especially those with comorbidity. Also, BCRAT did not discriminate well which women were more or less likely to develop breast cancer.³³ New breast cancer risk models that consider factors associated with late-life breast cancer risk (e.g., obesity) and the impact of comorbidities on the likelihood of an older woman being diagnosed with breast cancer are needed to better inform screening decisions.³⁵ Meanwhile, older women should consider their age-based risk and slightly adjust this risk based on their family history of breast cancer, history of benign breast disease, obesity, breast density, and competing mortality risks.

Life expectancy

Since the lag-time to benefitting from mammography screening among older women is at least 10 years,³¹ several tools are now available to help primary care physicians (PCPs) estimate patient 10-year life expectancy. The Lee-Schonberg index (available at www.ePrognosis.org) considers a patient's age, sex, body mass index, function, mobility, history of cancer, diabetes, emphysema, heart failure and smoking, number of hospitalizations in the past year, and perceived health.³⁶⁻³⁸ Adults with >50% risk of mortality within 10 years based on their score on this index are considered to have an estimated life expectancy <10 years. Walter and Covinsky using data from 1997 US life tables (and recently updated using 2008 data) calculated the upper, middle and lower quartiles of life expectancy for US adults 70 year stratified by sex and age.^{22,39} They recommend that clinicians estimate whether a patient is in the top, middle, or lower quartile of health for his/her age group and then refer to the stratified life tables to estimate patient life expectancy. Others have examined the impact of specific comorbid diseases on older women's life expectancy.^{40,41} For example, Cho et al. found that a 75 year old woman with diabetes has a life expectancy of 11.4 years, while a 75 year old woman with congestive heart failure (CHF) has a life expectancy of 7.0 years.⁴¹ Using any of these tools combined with clinical judgement may help clinicians estimate patient expectancy to better inform cancer screening decisions.

Preferences and Values

To help older women understand and weigh the benefits and risks of mammography when deciding on screening, Schonberg et al. developed a decision aid on mammography screening for women 75 years.⁴² The decision aid includes information on an older woman's breast cancer risk, life expectancy, likely outcomes if screened or not screened for breast cancer, competing mortality risks, breast cancer treatment, and a values clarification exercise. In a pretest-posttest trial of 45 women 75 years who received primary care at an academic medical center in Boston, the decision aid was found to increase older women's knowledge of mammography's benefits and risks, clarify their values, and led to fewer women intending to be screened, especially those with <10 year life expectancy.⁴²

Recommendations for Discussing Stopping Mammography Screening

In an era of pay for performance and population management, PCPs must increasingly meet higher and higher targets for age-appropriate mammography screening to achieve payment

incentives. As a result, healthcare systems are implementing programs to make getting screened for breast cancer as easy as possible (e.g., walk-in mammograms). Therefore, to prevent older women with <10 year life expectancy from being screened, PCPs must talk to older women about the need to stop being screened. However, these conversations are notoriously difficult because they require consideration and often discussion of patient life expectancy. Possibly as a result, few (<5%) older adults report that they have discussed stopping screening with their physicians.^{43,9,10}

As a guide for discussing stopping mammography screening with older women, I recommend (Box 1) that clinicians: 1) initiate and re-initiate discussions about stopping screening even years before they plan to recommend stopping to prepare older women; 2) estimate patient life expectancy to individualize the benefits and risks of screening; 3) inform older women of the benefits and risks and clarify patients' values about the potential outcomes; 4) encourage patients to utilize health promotion measures more likely to help them during their lifespan (e.g., exercise); and 5) reassure older women that they would still evaluate concerning breast symptoms with a mammogram.²²

Describing how the harms of cancer screening increase with rising age and worsening health while the benefits of screening are uncertain has been found to be an acceptable approach to discussing stopping screening with older adults.^{10,22} Therefore, for women with 10 year life expectancy, physicians should explain that 1–2 women out of 1000 women aged 75 or older who choose to be screened may avoid breast cancer death in 10 years. However, the harms of mammography screening occur immediately and include experiencing a false alarm (about 200/1000 women screened over years) or being diagnosed and treated for a breast cancer that otherwise would not have caused problems in one's lifetime (about 13/1000 women screened over 10 years).²² For women with <10 year life expectancy, physicians need to emphasize that the harms of mammography screening greatly outweigh any chance of benefit.

Discussing Prognosis

Even with this guide clinicians may still avoid talking to older women about stopping screening because the conversation could lead to discussions about older women's overall prognosis. While there are few data to help PCPs talk to older women about their prognosis, there are several approaches available in the oncology literature. When discussing prognosis, oncologists are encouraged to establish what the patient (and family) knows about their prognosis, determine how information is to be handled (e.g., how much the patient wants to know about their prognosis and readiness to engage in the discussion), deliver the information clearly, respond to emotion, establish goals of care, and establish a plan.^{44,45} These same principles may be useful to PCPs when discussing prognosis when recommending stopping cancer screening. ePrognosis.org also provides example videos on talking to older adults about their overall prognosis.

In summary, older women need to be given the opportunity to make an informed decision about whether or not to be screened with mammography. To highlight the importance of this issue, I would like to share the story of my own grandmother who at age 79 underwent a

screening mammogram based on her PCP's recommendation and was diagnosed with a stage I, ER+, HER2- breast cancer. At that time I estimated her life expectancy to be about 10 years; she was a smoker and had been diagnosed with COPD. Although my grandmother was not highly educated, we thoughtfully discussed her treatment options and she chose to have a lumpectomy, forgo radiotherapy, and to start anastrozole. Unfortunately the anastrozole caused her a lot of pain and she switched to Tamoxifen. Tamoxifen caused her a lot of fatigue and like the majority of older women she chose to stop taking endocrine therapy. At 85, my grandmother experienced a local recurrence of her breast cancer and although a mastectomy was recommended she chose to have another lumpectomy. Last year, at 88, before my grandmother passed away from her COPD, she told me "I wish I never had that mammogram." In my grandmother's life, early detection of breast cancer was a distraction that reduced her quality of life but was very unlikely to help her live longer or better.

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Box

Guide for Discussing Stopping Mammography Screening with Older women

Initiate and reinitiate discussions around stopping screening

Estimate patient life expectancy

Summarize the benefits and risks of screening based on patient life expectancy (using decision aids may help)

Clarify patient's values about the benefits and risks of screening

As an alternative, discuss preventive measures that may help older women in a shorter time frame (e.g., exercise)

Inform women that they may still undergo mammography if they develop a breast symptom or problem

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Table 1

Current Guidelines on mammography screening for older women

Guideline	Year	Recommendations
United States Preventive Services Task Force ⁵	2016	-Biennial screening mammography for women 50–74 years. -The current evidence is insufficient to assess the balance of benefits and harms of screening mammography in women > 75 years.
American Cancer Society ⁶	2015	-Women at average risk should undergo regular screening mammography starting at 45 years. -Women 45–54 years should be screened annually -Women 55 years and older in good overall health and with life expectancy > 10 years should be screened biennially -Patient preferences should be considered for all women > 40 years -Decision aids may improve decision-making.
American Geriatrics Society-Choosing Wisely ⁷	2013	Don't recommend screening for breast cancer without considering life expectancy and the risks of testing, overdiagnosis, and overtreatment.
Society of General Internal Medicine-Choosing Wisely ⁷	2013	Don't recommend cancer screening in adults with life expectancy of less than 10 years.

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Table 2

Summary of Reasons to Screen and not to Screen Older Women for Breast Cancer

Reasons to Screen Older Women	Reasons Not to Screen Older Women
Breast cancer incidence increases with age	Anxiety related to false positive tests (approximately 20% of older women screened over 10 years experience a false positive)
Mammography is a more sensitive test among older women	Complications and anxiety from a benign breast biopsy (approximately 2% of older women screened over 10 years experience a benign breast biopsy)
Reassurance from a truly negative test	False reassurance from an erroneously negative test
Detect breast cancer at an early stage when less aggressive treatment may be recommended	Overdiagnosis-diagnosis of breast cancers that otherwise would not have caused problems or symptoms in an older woman's lifetime (approximately 30% of screen detected tumors among older women). Older women have increased risk of complications from treatment (surgery, radiation, endocrine therapy, chemotherapy)
May reduce breast cancer mortality 1–2 older women out of 1000 may avoid breast cancer death after 10 years	Women with <10 year life expectancy very unlikely to benefit and may only experience harm