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Cancer Screening in the Elderly: A Review of Breast, Colorectal, Lung, and Prostate Cancer Screening

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Abstract

There is relatively limited data on outcomes of screening older adults for cancer; therefore, the decision to screen older adults requires balancing the potential harms of screening and follow-up diagnostic tests with the possibility of benefit. Harms of screening can be amplified in older and frail adults, and include discomfort from undergoing the test itself, anxiety, potential complications from diagnostic procedures resulting from a false-positive test, false reassurance from a false-negative test, and overdiagnosis of tumors that are of no threat and may result in overtreatment. In this paper, we review the evidence and guidelines on breast, colorectal, lung and prostate cancer as applied to older adults. We also provide a general framework for approaching cancer screening in older adults by incorporating evidence-based guidelines, patient preferences, and patient life expectancy estimates into shared screening decisions.

Keywords

Older adults; Aging; Geriatrics; Life expectancy; Cancer Screening

Introduction

Cancer screening is often considered a standard of preventive medical care; however, the decision to screen is less straight forward in older adults. The beneficial effects are less clear since randomized controlled trials of screening rarely include older age groups.[1] Meanwhile, the harms of screening may be amplified in older and more frail adults.[2] Screening in those with comorbid illness, poor functional status, or with short life expectancy may lead to overdiagnosis and treatment of cancers that otherwise would not have caused symptoms during a patient's lifetime.[3, 4] Cognitive impairment or poor education can create barriers to informed consent and distress with the subsequent "diagnostic cascade" after a positive test.[5] Moreover, screening may distract from discussions on issues with more evidence of benefit such as reducing polypharmacy, healthy behavior counseling, or fall prevention.[1, 2] On the other hand, there is no evidence that the benefits of screening stop at a particular age.[4] To the

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contrary, screening detects cancer more frequently and at more advanced stages at older ages, and older adults may benefit from early treatment of localized cancer compared with advanced stages.[4] Consequently, guidelines strictly based on age may underemphasize the beneficial effects of screening in a healthy 80 year old, and overemphasize these effects in an unhealthy 60 year old. Many older adults may also have strong preferences to continue screening despite risks.[6–8] In summary, an ongoing challenge in deciding to screen older adults is how to balance the long-term benefits of these interventions with significant, often short-term, harms.

High quality cancer screening decisions for older adults requires individualizing the benefits and risks of these tests. Ideally, cancer screening decisions for older adults would consider their health, life expectancy, cognition, risk of disease and preferences.[3, 9, 10] Simple and objective tools to estimate life expectancy that include patient age, functional status, and comorbidities are available in published literature and online (see: eprognosis.ucsf.edu).[11–13] Clinicians may use such tools to determine if a patient has a lower life expectancy than the estimated lag-time to benefit from a screening intervention and therefore should not be screened.[14] The lag-time to benefitting from a screening test is derived from randomized controlled trial data and represents the amount of time between when participants received a screening test and when a mortality reduction was seen for at least one in 1000 screening arm participants. Using this approach, the lag-time to benefitting from mammography and colorectal cancer screening is estimated to be approximately 10 years.[15] Therefore, adults with <10 years are unlikely to live longer as a result of undergoing screening.[16] Similarly, on average adults with dementia have <10 year life expectancy and would be unlikely to live longer as a result of being screened. Life expectancy estimates combined with personalized cancer risk profiles may be used to help individualize the benefits and risks of different cancer screening tests for older adults.

In this article we review national guidelines on screening older adults for colorectal, breast, prostate, and lung cancer and summarize data on the benefits and harms of screening older adults for these cancers. We also discuss approaches for discussing stopping cancer screening with older adults when appropriate, and areas of needed research.

Colorectal cancer screening

Colorectal cancer (CRC) is the third most common cancer in adults over age 70 and the second leading cause of cancer death in older adults.[17] The prevalence of adenomatous polyps increases with age from 20–25% at age 50 to nearly 50% by ages 75–80,[18, 19] with 1–10% of these polyps progressing to cancer in 5–10 years.[20, 21] A majority of cases of CRC at older ages occur in the proximal colon or rectum.[22] Several tests are available for CRC screening including fecal occult blood testing (FOBT), immunochemical-based fecal occult blood testing (FIT), fecal DNA testing, sigmoidoscopy, colonoscopy, or CT colonography with guidelines detailed in Table 1.[23–26]

Four trials of FOBT screening found a mortality benefit in older adults and included a combined 50,144 adults aged 70–80 years old.[27] Three trials examining biennial FOBTs were conducted in Europe; an RCT in the UK had 3–6 rounds of screening with 28 years of

follow-up,[28, 29] an RCT in Denmark had 9 rounds of screening with 17 years of follow-up,[30, 31] and a county-level trial in France had 6 rounds of screening with 11 years of follow-up.[32] These studies found an 11–16% reduction in CRC-specific mortality with similar risk reductions in older adults.[29, 31, 32] One RCT in the US examined annual FOBTs for 11 rounds or biennial FOBTs for 6 rounds and followed participants for 30 years.[33–35] It found a reduction in CRC mortality at 30 years of 32% and 22% for those screened annually and biennially, respectively, with an overall 53% reduction among adults ≥70 years.[35] The estimated number needed to screen (NNS) to prevent one CRC death through FOBT for average health men and women aged 75–79 years old is 525 and 408, respectively.[16] Although the test is initially the least invasive, false-positive results are common; 86–98% of trial participants had a negative colonoscopy after a positive FOBT.[4] Before screening older adults with FOBT or FIT it is therefore important to discuss false positives and whether patients are willing to consider the risks of undergoing colonoscopy.

The majority of sigmoidoscopy RCTs did not include adults >70 years old,[27] but the Prostate, Lung, Colorectal, and Ovarian (PLCO) Cancer Screening Trial which had a median follow-up of 12 years included 20,726 individuals ≥70 years old. Individuals 65–74 years old had 20% reduced CRC incidence and 35% reduced CRC mortality when screened every 3–5 years.[36] The invited NNS to prevent 1 case of CRC was 282 from this trial.[36] Sigmoidoscopy requires less bowel preparation than colonoscopy and the procedure can be done without sedation in the office; but technical challenges with achieving adequate depth occur more frequently at older ages. Perforation (0.1 per 1000 sigmoidoscopies) is an important harm of sigmoidoscopy.[27]

There are no published RCTs of colonoscopy, but one large prospective cohort showed that adults ≥75 years had a 50% reduction in rates of incident CRC diagnosis in both the proximal and distal colon if >5 years since the last endoscopy and 63% reduction if <5 years from last endoscopy.[37] Age-based NNS estimations to prevent one CRC death with colonoscopy for men and women 75–79 years old of average health are 126 and 98, respectively.[16] Colonoscopies are the definitive test for detection of adenomas and CRC, and have been shown to be cost-effective into older age groups because of the higher diagnostic yield.[38] However, rates of procedure-related risks can increase with age and include perforation (0.4 in 1000), post-polypectomy bleeding (0.8 in 1000), cardiac events (10 in 1000) and death.[15, 27, 39] Challenges with bowel prep in older adults are common and include dizziness, abdominal pain, incontinence, and nausea, and individuals can have challenges with sedation post-procedure.[40]

Guidelines recommend discontinuing CRC screening in adults with <10 year life expectancy due to the lag-time to benefit.[15] However, in 2010 an estimated 51% of adults >75 years with life expectancies <10 years reported being screened.[40] This can lead to risks from unnecessary testing as well as overdiagnosis. On autopsy studies of older adults, 10–33% are incidentally found to have colonic polyps and 2–3% have CRC suggesting the more we look the more we will find, but that we will not always improve patient quality or quantity of life.[4] Therefore particular attention should be focused on exploring patient preferences and educating on risks and benefits to minimize exposure to unnecessary testing. Decision aids

are effective at improving knowledge and reducing decisional conflict,[41] with one tailored to CRC screening in older adults.[42]

Prostate Cancer Screening

Prostate cancer is the most common cancer affecting men over age 70, for whom it affects approximately 1 in 10 men and is the second leading cause of cancer related deaths.[17] The rate of intermediate- and high-risk prostate cancer increases substantially with age, with one study estimating 33% of men >80 years old with prostate cancer having high-risk disease compared with 6% of men <55 years old.[43] Prostate cancer screening is done through an annual or biennial Prostate Specific Antigen (PSA) test, and most organizations no longer recommend routine use of a digital rectal exam (DRE) for screening. Screening guidelines are detailed in Table 1.[44–46]

The evidence for benefit from PSA screening was examined in two major trials. The US PLCO trial included 76,685 men aged 55–74 years old, with approximately 10,000 men over age 70.[47] Men in the intervention arm underwent annual PSA screens for 6 years and DREs for 4 years. However, there were extremely high rates of contamination in the controls where an estimated 80% of controls underwent at least one PSA test during the trial compared to 85% compliance in the intervention arm.[48] This may account for the lack of a prostate cancer mortality reduction even at 15 years of follow-up.[49] Post-randomization analysis by comorbidities showed a significant decrease in prostate cancer-specific mortality in men with minimal or no comorbidities with a NNS of 723, although the subgroup was significantly younger on average than trial participants.[50] The European Randomized Study of Screening for Prostate Cancer (ERSPC) trial randomized men 50–74 years to PSA screening every 2–4 years and the control group received no screening.[51] Results indicated an overall 20% reduction in prostate cancer-specific mortality with a NNS of 1,410 and NNT of 48, which was sustained at 13 years follow-up.[52] Benefits of screening were restricted to men 55–69 years at randomization. In summary, trials on PSA screening indicate minimal evidence of mortality benefit in older adults.

A number of harms have been described from PSA screening. False positives occur at a rate of 30–40% and may lead to psychological distress and unneeded prostate biopsies.[53] Prostate biopsies are associated with several short-term risks, including anxiety, moderate to severe pain (7%), moderate to severe hematuria (6%), infection requiring hospitalization (0.4–1.3%), and hospitalizations in general (7%).[54–56] Overdiagnosis also represents a significant harm since a substantial percentage of prostate cancers detected are slow growing and may have remained asymptomatic during the patient's lifetime; in the ERSPC and PLCO trials, it is estimated that 40–60% of screen-detected cancers were cases of overdiagnosis.[57, 58] Overdiagnosis can lead to psychological distress and unnecessary treatments with resultant adverse effects including bowel dysfunction, urinary incontinence, erectile dysfunction, and premature death, particularly in older men with poor functional status.[59]

USPSTF guidelines changed in 2008 to recommending against screening for men >75 years old, then again in 2012 to recommending against screening for all men.[60] USPSTF

guidelines are set to change again in 2017, with draft guidelines suggesting men 55–69 years old make an individualized decision on screening after discussion with a clinician and men >70 years old not be screened.[44] Prior to 2008, overall 50–60% of men >65 were screened in 2005, including 30–50% of men with <10 year life expectancy,[61–63] and rates remained stable in 2010.[63] After the 2012 guideline change, men >65 years old reported reduced screening rates of 37–44% in 2013, and among men >75 years with life expectancies <10 years, 32% reported being screened.[64] The impact of guideline changes on prostate cancer mortality in older men remains to be seen. Nevertheless, rates of inappropriate screening highlight the continued importance of shared decision making. Decision aids are available to help with this process and have been shown to facilitate discussions and often reduce men's interest in PSA screening.[65, 66]

Breast Cancer

Breast cancer is the most common life-threatening cancer to occur among women and is the second leading cause of cancer death for US women.[17] While 31% of breast cancer diagnoses occur in women ≥70 years, 47% of breast cancer deaths occur among women ≥70 years.[67] In addition to age, postmenopausal hormone therapy use, family history of breast cancer, history of a benign breast biopsy, age at menopause, age at first birth/parity, obesity, alcohol and cigarette use are risk factors for late-life breast cancer.[68] Biennial mammograms are recommended for women 55–74 years at average risk; guidelines are detailed in Table 1.[69, 70]

While mammography screening is estimated to reduce breast cancer mortality by 19% among women 40–69 years,[71] it is not certain whether mammography screening reduces breast cancer mortality for women ≥70 years. None of the 8 RCTs of mammography screening included women ≥75 years and only one trial included women 70–74 years.[72] A subgroup analysis of these women did not find a significant reduction in breast cancer mortality associated with screening.[72] Due to the lack of clinical trial data, the USPSTF states that there is insufficient evidence on whether to screen women ≥75 years old.[69] The American Cancer Society (ACS) recommends continuing mammography screening as long as women are in good health and their life expectancy in >10 years.[70] Despite these recommendations, in 2010, 56% of US women ≥75 years reported being screened with mammography in the past 2 years, including 36% of women with ≤5 year life expectancy.[73]

In the absence of clinical trial data, the benefits of mammography screening must be estimated from simulation models which estimate 1–2 fewer breast cancer deaths per 1,000 women in their 70s who are screened biennially for 10 years.[74, 75] Screening may also benefit older women by finding breast cancers at an earlier stage when they may be easier to treat.[76, 77] In addition, the sensitivity of mammography screening increases with age leading to fewer false positive tests.[78]

However there are important harms to mammography screening including anxiety resulting from false positive tests, false reassurance from an erroneously negative test, overdiagnosis, and complications from work-up and/or treatment of cancer.[75] Among women ≥75 years who undergo biennial screening the cumulative probability of a false-positive mammogram

over 10 years ranges from 12–27%.[75, 79, 80] 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 undergo a benign breast biopsy[75, 79, 80] which can be stressful and uncomfortable for older women.[81] Overdiagnosis is a particularly concerning harm since the risks of breast cancer treatment increase as women age.[82] Quantifying overdiagnosis, however, remains challenging and estimates vary from 0 to 50% of screen-detected breast cancers; however most estimates tend to average around 30%.[74, 83–86] Overdiagnosis likely increases with age since older women tend to have more indolent tumors and more competing mortality risks.[82]

Ideally, older women would consider their risk of breast cancer, life expectancy, and their preferences when deciding whether or not to continue mammography screening. A peer-reviewed decision aid is available by request from the author to help women ≥75 years old decide whether or not to continue being screened.[87] As for the clinical breast examination (CBEs), no trials have compared CBE alone to no screening. The USPSTF states that there is insufficient evidence to recommend for or against CBEs and the ACS does not recommend CBEs for women at average risk for breast cancer.

Lung Cancer

Lung cancer is the second most common cancer and the leading cause of cancer death in the US,[88] accounting for 1 in 4 cancer deaths.[88] Risk of lung cancer increases with age and tobacco use;[89] 85% of lung cancers are due to smoking, and 66% are diagnosed among adults ≥65 years.[88, 90, 91] Since tumor size and stage are strongly related to lung cancer survival there is strong interest in strategies that may detect lung cancer early, with guidelines detailed in Table 1.[92, 93]

The PLCO trial examined the effectiveness of 4 annual chest x-rays for lung cancer screening among 154,942 adults 55–74 years. After 13 years follow-up there was no significant difference in lung cancer incidence rates or mortality among those who were screened compared to those who received usual care.[94, 95] Therefore, several small trials in Europe and one large trial in the US, the National Lung Cancer Screening Trial (NLST), have examined the efficacy of low-dose computed tomography (LDCT) for lung cancer screening (LCS) instead.

The NLST was a well-designed RCT involving 53,454 participants age 55–74 years with a history of at least 30 pack years of smoking who were current smokers or had quit in the past 15 years. Participants were randomized to receive either LDCT or chest x-ray annually for 3 screening rounds. The trial found LDCT was associated with a 16% relative reduction in lung cancer mortality after 6.5 years or an absolute reduction of 0.3% from 21 to 18 lung cancer deaths per 1000 participants compared to those receiving chest x-rays.[96] In addition, LDCT was associated with a 6.7% reduction in all-cause mortality. The NNS to prevent one death from lung cancer was 320 (245 in adults 65–74 years compared to 364 in adults 55–64 years).[97] The NNS to prevent a death overall was 219 over 6.5 years. LDCT was found to have a sensitivity of 93.8% and a specificity of 73.4%. The smaller European trials found no benefit of LDCT screening but they were not adequately powered.[98] The overall average

effective radiation dose used in the NLST was 1.5 millisievert (mSV) compared with 7 mSV for a standard-dose diagnostic chest CT examinations.

Despite the benefits of LCS with LDCT, LCS screening may also cause harm. Risks include false positive and false negative results,[99] anxiety, unnecessary testing, radiation exposure, financial strain, and overdiagnosis (9–25% of screen-detected lung cancers are estimated to be cases of overdiagnosis).[92, 97, 100–103] In the NLST, 39% of participants who had 3 annual LDCTs had at least one positive test and 96% of these results were false positives. The positive predictive value of a pulmonary nodule (≥4mm) was only 3.8%. About 2.5% of positive results in NLST require invasive diagnostic procedures (such as bronchoscopy). Complications related to diagnostic evaluation of positive results was low (1.4% in LDCT group). However, complications may be higher at less equipped medical centers.[89, 104, 105] Of note, false positive rates in NLST may have been lower if the more current LDCT screening and reporting and data system standards were used.[106]

In NLST, no difference in mortality benefit was found for adults ≥65 years compared to those <65 years; however, only 27% of NLST participants were ≥65 years (only 10% were ≥70 years).[107] An analysis comparing adults 65–74 to those 55–64 years in NLST found that adults 65–74 years had a higher prevalence of lung cancer detected but also had a higher rate of false positive results and of invasive procedures after false positive results which is concerning since older adults have higher complication rates from biopsy of pulmonary nodules and higher postoperative mortality from resection of nodules.[108–110]

Based on the NLST, the USPSTF and ACS recommend annual LCS with LDCT in adults 55–74 years (up to age 80 in USPSTF guidelines) who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years.[92, 111] Screening is not recommended for adults with severe comorbidities or short life expectancy for whom curative surgery would not be appropriate. A prediction model for in-hospital death following thoracic surgery is available.[112, 113] In addition, the USPSTF recommends smoking cessation counseling delivered with LCS,[92] since quitting smoking is the most effective intervention to reduce lung cancer risk.[114] Following the USPSTF's recommendations, in 2015, Medicare began covering lung cancer screening with LDCT for adults 55–74 years who meet USPSTF criteria and have engaged in shared decision-making with their clinicians.[115] Shared decision making around lung cancer screening is reimbursed annually but not required after the initial LDCT screening.

LDCT may be most beneficial to adults at high risk of lung cancer who are not at high risk for competing causes of death. A tool is available to assess patient lung cancer risk.[116–118] Decision support tools are also available to help educate adults about benefits and risks of LCS.[119, 120] Strategies for implementing lung cancer screening are being tested; however, a recent VA trial found implementation of LCS challenging, resource intensive, and only 58% of eligible patients chose to participate.[121]

A General Approach to Cancer Screening in Older Adults

We present a general approach to integrating risks and benefits of cancer screening for older adults in shared decision making in Figure 1. We suggest clinicians start by consulting USPSTF and society guidelines to help decide whom to screen. When there is variation in guideline recommendations, patient preferences and risk factors should be included to determine which guidelines best reflect their current goals. For example, older adults who tend to be "maximizers" or prefer "more testing" despite the risks may be managed following more aggressive guidelines while those who tend to be "minimizers" can be managed following more conservative guidelines.[122] Decision aids specific to particular screening modalities can be used to help elicit patient preferences.

While guidelines recommend stopping cancer screening in older adults with <10 year life expectancy, prognostication can be difficult. Fortunately, several tools are available to help clinicians estimate 10-year life expectancy. The Lee-Schonberg index (available at www.ePrognosis.org) estimates whether adults have >50% risk of mortality within 10 years, considered to represent an estimated life expectancy <10 years.[123] It considers factors such as age, sex, body mass index, function, comorbidities, smoking, number of hospitalizations in the past year, and perceived health.[11–13] Walter and Covinsky, using data from 1997 US life tables (and updated using 2012 data in Figure 2), calculated the upper, middle and lower quartiles of life expectancy for US adults ≥65 years stratified by sex and age.[3, 75, 124] Clinicians can approximate whether patients are in the top, middle, or lower quartile of health of their age group and match this to stratified estimates of average life expectancy.

Once a clinician estimates that his/her patient has <10 year life expectancy or that screening is not consistent with current clinical goals, it may be difficult to discuss stopping screening with older adults. As a guide, we recommend that clinicians initiate and re-initiate these discussions so that patients become aware of the need to decide when they want to stop undergoing cancer screening. It is important to discuss how the harms of cancer screening increase with rising age and worsening health while the benefits of screening become more uncertain. So that patients do not feel abandoned, it is important to encourage patients to utilize health promotion measures more likely to help them during their lifespan (e.g. exercise), and reassure older adults that it is still important to work-up concerning symptoms for cancer even if cancer screening is no longer beneficial.[75]

Questions/Future Work

While there are tools available to estimate older adults' life expectancy, there is limited data on how these tools perform in clinical settings and how to incorporate patient prognosis into discussions on shared cancer screening decisions. Research is needed on how to implement existing decision aids successfully in clinical practice and on developing new decision aids for cancer screening. New technologies for cancer screening are continuously emerging, yet these technologies are often incorporated into clinical practice without knowledge of how they will impact older adults. Therefore, it is important to study the benefits and age-specific harms of new screening technologies among older adults before implementation. In addition, since overdiagnosis is a major harm of cancer screening in older adults, future studies should

aim to both obtain better estimates of overdiagnosis and determine how overdiagnosis impacts quality of life in this population to better inform simulation models estimating the benefits and harms of cancer screening.

Conclusions

When discussing cancer screening with older adults, clinicians should indicate whether any data suggests screening tests improves older adults' quality or quantity of life. Clinicians should also discuss the risks of screening, including discomfort from undergoing the test, anxiety, potential complications from diagnostic procedures resulting from a false-positive tests, and overdiagnosis of tumors that are of no threat and that may result in overtreatment. Furthermore, clinicians may want to explain that the frequency and negative impact of many risks, particularly overdiagnosis, can increase with age. Older adults should be asked how they view the potential benefits and harms of different screening tests, so that their values and preferences are considered in screening decisions.

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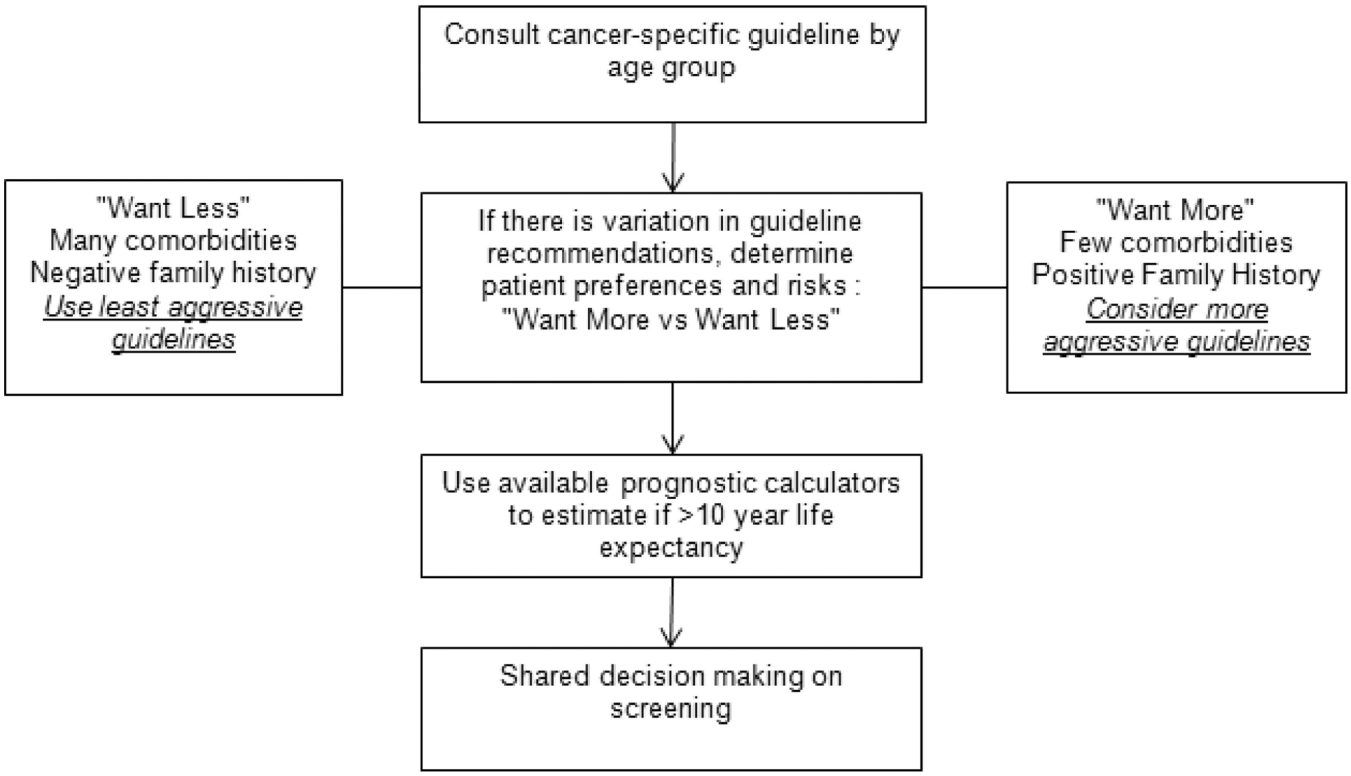

Figure 1.
Approach to cancer screening in older adults

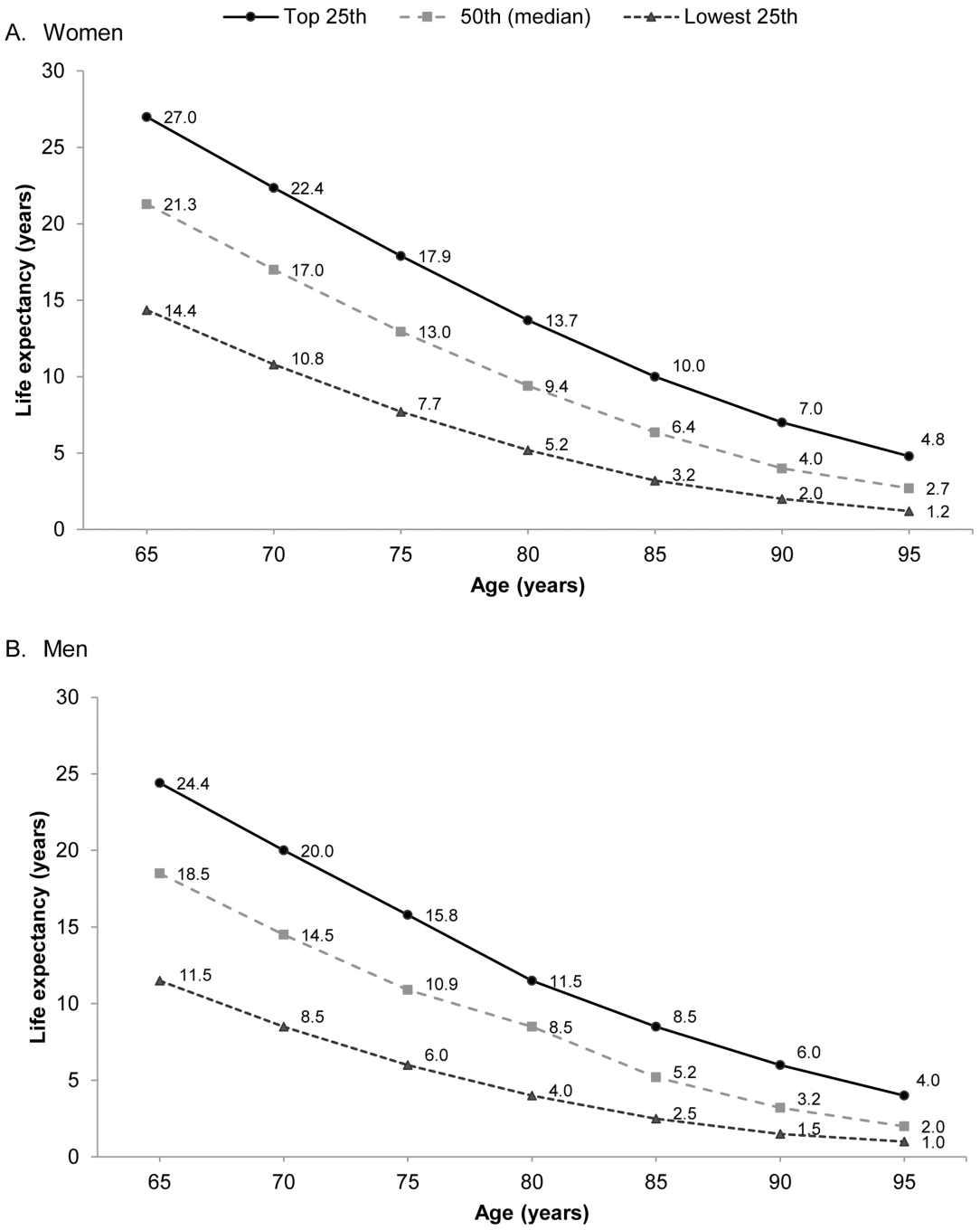

Figure 2.

Upper, middle, and lower quartiles of life expectancy as estimated by 2012 US Life Tables Figure adapted from Louise Walter and Mara Schonberg 2014 [74] using updated 2012 United States Life Table data [123].

Table 1

Selected guidelines on cancer screening for average risk adults

	Test(s)	Guideline	Year	Recommendations
Breast Cancer	Mammography	USPSTF [68]	2016	- Women 50–74 years - Biennial screening (Grade B) - Current evidence is insufficient to assess the balance of benefits and harms of screening in women >75 years (Grade I)
		ACS [69]	2015	- Women 45–54 years - Annual screening - Women 55 years or older with life expectancy of >10 years - Biennial screening - Patient preferences should be considered for women >40 years - Decision aids may improve decision making
Prostate Cancer	Prostate-specific antigen test	USPSTF [44]	2012	- Do not recommend screening for all men (Grade D)
		ACS [45]	2010	- Men >50 years with >10 years life expectancy - informed decision about screening for prostate cancer after receiving information about uncertainties, risks, and potential benefits. Screening should not occur without an informed decision-making process.
		AUA [46]	2013	- Men 55–69 years - shared decision making about screening - Men >70 years - do not recommend routine screening, but if they are in excellent health they may benefit
Colorectal Cancer	FOBT, FIT, stool DNA, Sigmoidoscopy, CT Colonography, Colonoscopy	USPSTF [23]	2016	- Adults 50–75 years - routine screening. Risks and benefits of different screening methods vary (Grade A) - Adults 76–85 years - individualized decisions about continued screening. Adults in this age group are more likely to benefit if never screened. Consider if healthy enough to undergo treatment for colorectal cancer and if comorbid conditions limit life expectancy (Grade C)
		ACS, US Multisociety Task Force on Colorectal Cancer, ACR [24]	2008	- Adults >50 years - routine screening. Cancer prevention tests preferred over detection tests.
		ACG [25]	2008	- Adults >50 years - routine screening. Cancer prevention tests preferred over detection tests.
		ACP [26]	2015	- Adults 50–75 years with >10 years life expectancy - routine screening by patient's preferred modality

	Test(s)	Guideline	Year	Recommendations
				- Adults >75 years or with life expectancy <10 years - stop screening
Lung Cancer	Low-dose computed tomography	USPSTF [91]	2014	- Adults 55–80 years with >30 pack year smoking history and either currently smoke or quit within the past 15 years. Discontinue screening once person has not smoked for 15 years or develops health problems limiting life expectancy or ability or willingness to have curative lung surgery (Grade B).
		ACS [110]	2013	- Adults 55–74 years in good health with >30 pack-year smoking history and either currently smoke or quit within the last 15 years
All cancers		AGS - Choosing Wisely [9]	2013	- Do not recommend screening without considering life expectancy and the risks of testing, overdiagnosis, and overtreatment.
		SGIM - Choosing Wisely [10]	2013	- Do not recommend screening in adults with life expectancy of less than 10 years.

Abbreviations: FOBT – fecal occult blood test, FIT – immunochemical-based fecal occult blood testing, USPSTF – United States Preventive Services Task Force, ACS – American Cancer Society, AUA – American Urological Association, ACG – American College of Gastroenterology, ACR – American College of Radiology, ACP – American College of Physicians, AGS – American Geriatrics Society, SGIM – Society of General Internal Medicine.

USPSTF Grades: A – Service recommended, high certainty that net benefit is substantial, B – Service recommended, high certainty that the net benefit is moderate, C – service recommended to selected patients based on professional judgement and patient preferences, moderate certainty that net benefit is small, D – recommends against service, moderate or high certainty that the service has no net benefit or that harms outweigh benefits, I – current evidence is insufficient to assess the balance of benefits and harms of the service.