Cancer Prevention and Screening for Older Adults: Part 1. Lung, Colorectal, Bladder, and Kidney Cancer

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The incidence of most cancers increases with age. Cancer is the second most common cause of death in older adults after cardiovascular disease. Many common cancers in older adults can be prevented from occurring or can be identified at an early stage and treated effectively. The prevention and identification of cancer in its early stages, in an attempt to reduce discomfort and disability associated with advanced cancer and cancer treatment, is also a priority. Overscreening for cancer in older adults can lead to unnecessary diagnostic testing and unnecessary treatment. Both older adults and their healthcare providers need guidance on the appropriate use of cancer prevention and screening interventions. This first of a two-part review addresses special considerations regarding cancer prevention for adults aged 65 and older. Screening decisions and the impact of limited life expectancy and an older adult's ability to tolerate cancer treatment are also addressed. Guidance is provided regarding the prevention and early identification of lung, colorectal, bladder, and kidney cancer in older adults. The prevention of breast, prostate, and female urogenital cancers are addressed in Part 2. J Am Geriatr Soc 68:2399-2406, 2020.

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Lifestyle changes, especially reduced rates of tobacco use, widespread cancer screening, and improved cancer treatment, have led to a decrease in both cancer incidence and cancer mortality in the United States. However, because the incidence of many cancers increases with increasing age, cancer incidence remains high in older adults. Cancer is the second most common cause of death in older adults after cardiovascular disease.[1-3] Cancer prevention is important for older adults, not only to reduce mortality, but also to reduce negative effects on quality of life associated with advanced cancer and side effects from cancer treatment.

Cancer prevention efforts are aimed at both preventing cancer from occurring and identifying cancer at an early stage (screening), with the understanding that most early cancers require less extensive treatment and have better outcomes. The prevention and early identification of cancer is an important component of healthy aging. Efforts to prevent cancer and identify early cancers in older adults need to consider cancer epidemiology, the clinical significance of the cancer, and the effectiveness, drawbacks, and cost of cancer prevention and screening. It is important that clinicians have a clear understanding of the prognosis with and without cancer treatment when discussing cancer screening with older adults.[4]

In this two-part review we provide information and guidance for healthcare providers regarding the prevention of nine solid organ cancers that are common in older adults. In addition to being common in older adults, we chose to address these cancers because there is evidence to

support, adjust, or avoid prevention efforts in older adults. Part 1 reviews lung, colorectal, bladder, and kidney cancer prevention. Part 2 addresses breast, prostate, and female urogenital cancers.

SPECIAL CONSIDERATIONS REGARDING CANCER PREVENTION AND CANCER SCREENING IN OLDER ADULTS

Limited Life Expectancy

Many cancers occur only after long-term exposure to cancer risk factors. Some cancers grow slowly and only become a problem for the patient years after they first occur. For older adults with a limited life expectancy, a late-life cancer may not become clinically significant before they die. The term *overscreening* is applied to identifying such cancers. Recommendations regarding when to stop cancer screening in older adults have historically been based on the patient's age. Over the last decade, practice guidelines increasingly use life expectancy to guide screening decisions. In addition to age and comorbid conditions, an older adult's physical and cognitive function have a significant impact on life expectancy.[5,6] Several tools can help providers determine a patient's life expectancy (Table 1). Unnecessary screening of older adults for cancer is common.[7] Some clinicians may not be aware of the risks of overscreening older adults with limited life expectancy.[8]

Table 1. Tools and Resources to Help Assess Cancer Risk, Determine Life Expectancy, Guide Screening Recommendations, and Determine Cancer Treatment Tolerance for Older Adults

Cancer risk calculators	
Lung	
Memorial Sloan Kettering Lung Cancer Screening Decision Tool	http://nomograms.mskcc.org/Lung/Screening.aspx
Colorectal	
National Cancer Institute	https://ccrisktool.cancer.gov/
Life expectancy calculators	
Suemoto (10-year life expectancy)	https://eprognosis.ucsf.edu/suemoto.php
Lee Schonberg Index (4-, 5-, 10-, and 14-year mortality)	https://eprognosis.ucsf.edu/leeschonberg.php
Lee Index (4- and 10-year mortality and median life expectancy)	https://eprognosis.ucsf.edu/lee.php
Schonberg Index (5-year mortality)	https://eprognosis.ucsf.edu/schonberg.php
Multimorbidity weighted index (10-year mortality)	https://eprognosis.ucsf.edu/mwi.php
Cancer treatment tolerance calculators	
Chemotherapy Toxicity Prediction Tool	https://www.mycarg.org/?page_id=934
Geriatric Assessment: Patient Portion	https://www.mycarg.org/?page_id=1806
Geriatric Assessment: Healthcare Provider	https://www.mycarg.org/?page_id=1936
CRASH scoring analysis	https://moffitt.org/media/4238/crash_scoring_analysis.pdf
Screening recommendations	
Lung	
USPSTF	https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/lung-cancer-screening
ACS	https://www.cancer.org/healthy/find-cancer-early/cancer-screening-guidelines/screening-recommendations-by-age.html
AGS	https://www.choosingwisely.org/clinician-lists/american-geriatrics-society-breast-colorectal-prostate-cancer-screening-in-older-adults/
Colorectal	
USPSTF	https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/colorectal-cancer-screening
ACS	https://www.cancer.org/healthy/find-cancer-early/cancer-screening-guidelines/screening-recommendations-by-age.html
AGS	https://www.choosingwisely.org/clinician-lists/american-geriatrics-society-breast-colorectal-prostate-cancer-screening-in-older-adults/
ePrognosis	http://cancerscreening.eprognosis.org/screening/
Bladder	
USPSTF	https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/bladder-cancer-in-adults-screening

Note: All of the listed online resources were accessed on August 24, 2020.

Abbreviations: ACS, American Cancer Society; AGS, American Geriatrics Society; CRASH, Chemotherapy Risk Assessment Scale for High-Age Patients; USPSTF, U.S. Preventive Services Task Force.

Comprehensive Geriatric Assessment, Patient Goals of Care, and Shared Decision-Making

When deciding whether to recommend cancer screening to an older adult, consideration needs to be given to the patient's ability to tolerate and benefit from cancer treatment, should a cancer be found.[9,10] There is increasing evidence that age is not the primary determinant of either an older adult's ability to tolerate or benefit from cancer treatment.[11,12] Frail older adults who have multiple chronic conditions, difficulty maintaining independence, and several geriatric syndromes are at higher risk for adverse outcomes such as mortality or institutionalization and may not have lasting benefits.[13] Comprehensive geriatric assessment or other frailty assessment tools help identify older adults who are more likely to tolerate and benefit from cancer treatment.[14,15] Although these tools have been used primarily to assess whether a patient will tolerate cancer treatment, this information may also help guide screening decisions for both healthcare providers and their patients. Many older adults are more concerned about their quality of life than their quantity of life, and when the potential benefits and harms of screening for cancer or treating cancer are presented to them, they may choose to forgo the intervention.[16] Shared decision-making between healthcare providers and their patients can be facilitated by assessing the patient's cancer risk, the potential benefits of cancer screening, risks associated with cancer screening, and the ability of the patient to tolerate cancer treatment. Recommendations should be aligned with the patient's preferences and values. In situations where it is not clear that cancer screening should or should not be recommended, we believe shared decision-making between the patient and their healthcare provider may be an appropriate approach.[17]

LUNG CANCER

Epidemiology and Clinical Significance

Lung cancer is the leading cause of cancer death for both men and women in the United States. Each year, more people die of lung cancer than of colon, breast, and prostate cancers combined.[18] In the United States, approximately 70% of lung cancers occur in adults aged 65 and older (Figure 1).[19] The two main types of lung cancer are small cell lung cancer and non–small cell lung cancer; the latter accounts for approximately 85% of all cases of lung cancer.[20] In high-income countries, rates in men declined dramatically in the late twentieth century in tandem with a proportional decrease in the male smoking population. African American men have markedly higher rates of lung cancer than non-Hispanic White or White men.[21] Cigarette smoking is the number-one risk factor for lung cancer. In the United States it is linked to about 80% to 90% of lung cancer deaths. Using other tobacco products such as cigars or pipes also increases the risk for lung cancer. People who smoke cigarettes are 15 to 30 times more likely to get lung cancer or die from lung cancer than people who do not smoke. There is a direct dose–response relationship between the number of cigarettes smoked and the risk of lung cancer.[22] With the decrease in the prevalence of smoking,
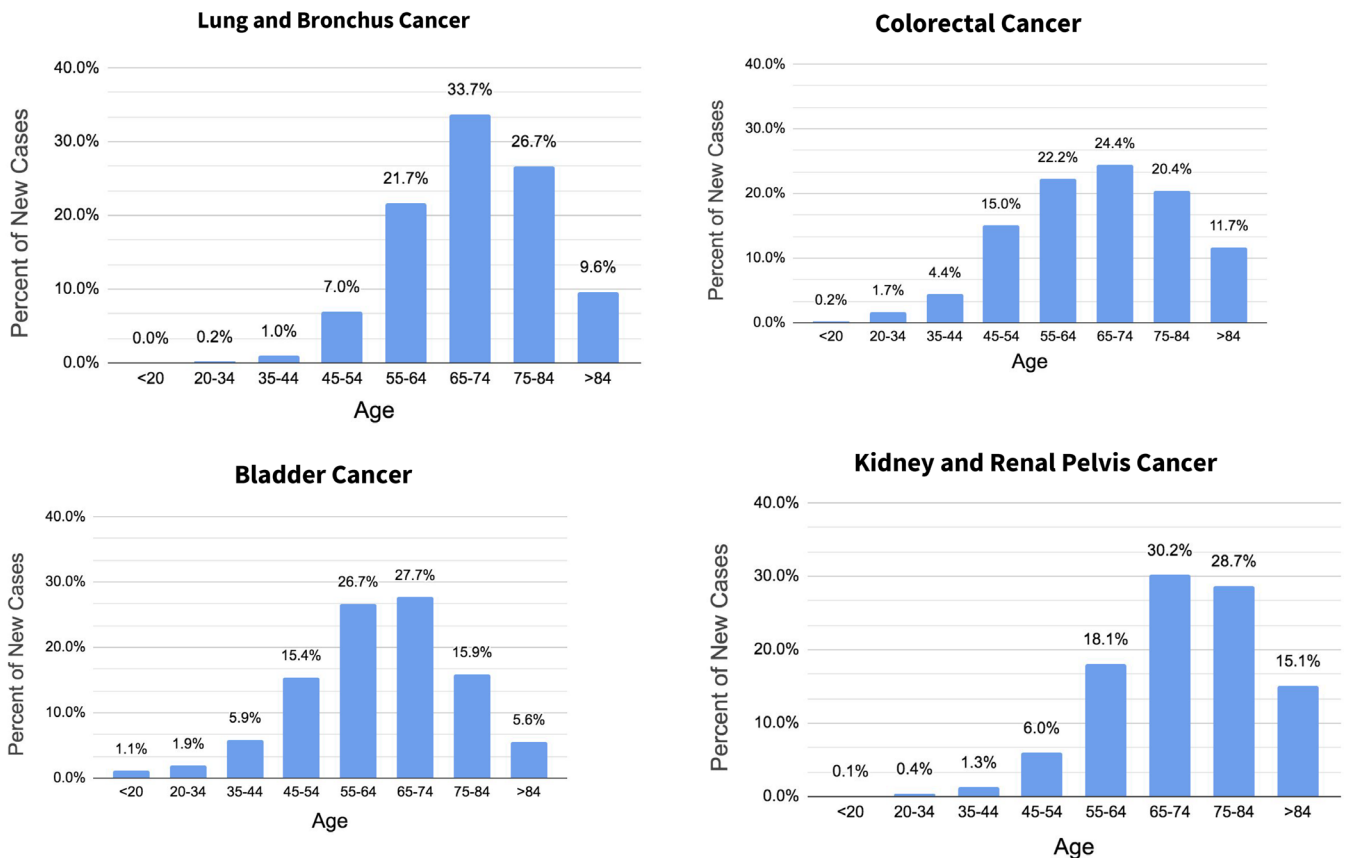

Figure 1. Percentage of new cases of cancer in the United States by age group. SEER 21, 2012–2016, all races, both sexes.

lung cancer has become proportionally more frequent among former smokers. Secondhand exposure to cigarette smoke is a risk.[23]

Lung cancer is also associated with prolonged exposure to air pollution.[24] Mortality risks rise linearly throughout the full range of exposure to particulate matter with a median aerodynamic diameter of less than 2.5 μm. About 8% of global lung cancer deaths can be attributed to exposure to fine particulate matter alone. The dose–response relationship between lung cancer and ambient particulate matter would be even higher, if only adenocarcinomas of the lung are considered.[25] Numerous occupational exposures, such as chemicals, fumes, and radiation, increase lung cancer risk. Radon exposure is also a risk factor for lung cancer. Radon-222 arises naturally from the decay of uranium-238, which is present throughout the earth's crust. It has a half-life of 4 days. It diffuses through soil and into the air before decaying. More than 85% of radon-induced lung cancer deaths are among smokers.[26] Even among people who are aware of radon as a health hazard, only a small fraction live in a home that has been tested. The impact of radon exposure on the incidence of lung cancer in older adults is unknown.

Primary Prevention

Lifestyle

Although their risk is higher than the risk for people who never smoked, people who quit smoking have a lower risk of lung cancer than if they had continued to smoke. Quitting smoking at any age can lower the risk of lung cancer.[22] Older adults, regardless of their age, should be encouraged and supported to stop smoking. At this time there is no evidence to support the use of e-cigarettes as a means of quitting smoking in older adults.

Radon

The surgeon general and U.S. Environmental Protection Agency recommend testing for radon and reducing radon in homes that have high levels. Radon reduction steps should be taken if the radon level is confirmed to be 4 picocuries per liter (pCi/L) or higher.[27]

Screening

In June 2011, the results of the National Lung Screening Trial (NLST) showed for the first time that screening a high-risk population could reduce lung cancer deaths. NLST participant criteria were asymptomatic men and women, 55 to 74 years of age, with a history of at least 30 pack-years of smoking. In this population a 20% relative reduction in mortality from lung cancer was observed with low-dose computed tomography (LDCT) screening.[28] Although specific recommendations vary, there is universal consensus that screening should be offered to those with a history of long-term, high-dose tobacco use.[29] The U.S. Preventive Services Task Force (USPSTF) and American Cancer Society (ACS) recommendations for lung cancer screening are listed in Tables 1 and 2.[30,31]

Online risk calculator tools provide information on lung cancer risk and the appropriateness of LDCT screening.[32]

Risks

Lung cancer screening may cause harm including false-positive results that may result in complications associated with additional unnecessary testing and radiation exposure.[33] In the general population the most common complications of CT-guided biopsy of a lung nodule are pneumothorax (15%), pneumothorax requiring a chest tube placement (6.6%), and hemorrhage (1%).[33]

COLORECTAL CANCER

Epidemiology and Clinical Significance

Colorectal cancer (CRC) is common in older adults. In a cohort of 140,000 patients diagnosed with CRC, the median age was 67 years.[34] In the United States, approximately 57% of colorectal cancers occur in adults aged 65 and older (Figure 1).[19] Between 2000 and 2013, CRC incidence rates in adults in the United States aged 50 and older declined by 32%, with the drop the largest for distal tumors in people aged 65 and older. CRC death rates decreased by 34% among individuals aged 50 and older between 2000 and 2014 but increased by 13% in those aged 50 and older.[35] Trends in both CRC incidence and mortality are difficult to interpret because of the large number of variables involved. More extensive screening contributes to a lower incidence as precancerous lesions are identified and removed. Fewer smokers reduces CRC incidence; increasing rates of obesity increase incidence. Early identification and treatment reduces mortality.

High consumption of red and processed meat and alcoholic beverages and low consumption of foods containing dietary fiber increase the risk of CRC. Obesity increases the risk of CRC, and physical activity protects against CRC.[36] Additional risk factors for CRC include a family history of CRC and a personal history of CRC or colon polyps. Previous negative colonoscopies reduce the risk of CRC. The National Cancer Institute has an online risk calculator for CRC (Table 1).

Primary Prevention

Lifestyle

Although the impact of lifestyle interventions on reducing CRC incidence, especially in older adults, is difficult to quantify, increase in physical activity, reduction or cessation of alcohol consumption, stopping cigarette smoking, increasing dietary fiber, and consuming a diet high in fresh fruits and vegetables promote overall good health and may reduce CRC risk.[36]

Antiplatelet Agents

Although there is evidence to suggest that antiplatelet agents including aspirin prevent CRC,[37] more recent data from the Aspirin in Reducing Events in the Elderly (ASPREE) study indicated that 100 mg of enteric-coated aspirin increased cancer-related mortality and especially colon cancer death in older adults.[38] There is insufficient evidence to recommend the use of antiplatelet agents to prevent CRC in older adults.

Table 2. Primary Prevention and Screening Recommendations for Common Cancers in Older Adults

Cancer	Primary prevention	Screening recommendations
Lung	Do not use tobacco products.[23] Check homes for radon gas and take steps to reduce radon when levels are high.[27]	The USPSTF recommends annual screening for lung cancer with LDCT in adults aged 55 to 80 who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years. Screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery.[30] The ACS recommends that clinicians ascertain the smoking status and smoking history of their patients aged 55 to 74. Those with access to high-volume, high-quality lung cancer screening and treatment centers should initiate a discussion about lung cancer screening with these patients who have at least a 30 pack-year smoking history, currently smoke, or have quit within the past 15 years, and who are in relatively good health. The mortality reduction benefit should be discussed. Adults who choose to be screened should follow the NLST protocol of annual LDCT screening until they reach age 74.[31]
Colon	A high-fiber diet with ample amounts of fresh fruits and vegetables may be helpful.[36] Do not use tobacco products. Antiplatelet agents including aspirin are not recommended for older adults.	The USPSTF recommends that colonoscopy starts at age 50 years and continues until age 75. For most patients screening is recommended at 10-year intervals. For patients aged 76 to 85, the USPSTF focuses on individual and selective decision-making, and for patients aged 85 and older recommends against offering screening for CRC. The USPSTF recommends performing the gFOBT and FIT test every year. FIT-DNA testing can be done every 1 to 3 years.[42] The ACS recommends that adults aged 45 and older with an average risk of CRC undergo regular screening with either a high-sensitivity stool-based test or a structural (visual) examination, depending on patient preference and test availability. The ACS recommends that (1) average-risk adults in good health with a life expectancy of more than 10 years continue CRC screening through the age of 75; (2) clinicians individualize CRC screening decisions for individuals aged 76 to 85 based on patient preferences, life expectancy, health status, and prior screening history; and (3) clinicians discourage individuals older than 85 from continuing CRC screening.[43]
Bladder	Do not use tobacco products.[52] A diet rich in fruits and vegetables may be helpful.[53]	The USPSTF concludes that current evidence is insufficient to assess the balance of benefits and harms of screening for bladder cancer in asymptomatic adults including older adults.[54] The ACS does not include screening for bladder cancer on its list of recommended cancer screenings.
Kidney	Do not use tobacco products.[52] Avoid obesity. Treat hypertension.[56]	Neither the USPSTF nor the ACS has guidelines regarding kidney cancer screening.

Abbreviations: ACS, American Cancer Society; CRC, colorectal cancer; FIT, fecal immunochemical testing; FIT-DNA, multitarget stool DNA testing; FOBT, guaiac fecal occult blood testing; LDCT, low-dose computer tomography; NLST, National Lung Screening Trial; USPSTF, U.S. Preventive Services Task Force.

Screening

Options for CRC screening are guaiac-based fecal occult blood testing (gFOBT), fecal immunochemical testing (FIT), multitarget stool DNA testing (FIT-DNA), colonoscopy, CT colonography, and flexible sigmoidoscopy.

Identification of Precancerous Lesions

Colon imaging studies and stool testing that leads to colon imaging studies prevent colon cancers by identifying noncancerous polyps considered to be high risk. These lesions can be removed before becoming a cancer. Although colonoscopy was demonstrated to have the greatest impact on CRC incidence, sigmoidoscopy and FIT were also shown to have a significant impact.[39]

Colonoscopy and Sigmoidoscopy

Colonoscopy was demonstrated to reduce CRC mortality.[40] However, because the data were observational, it is possible

that lifestyle changes such as decreased smoking or dietary changes explain the observed reduction in CRC mortality. Both colonoscopy and sigmoidoscopy were demonstrated to be more effective at reducing CRC mortality than annual FIT for patients 75 to 79 years of age.[41] The USPSTF and ACS recommendations for CRC screening are listed in Tables 1 and 2.[42,43]

Fecal Testing

Although evidence suggests that colon imaging is the best means of preventing CRC mortality in older adults, fecal testing may also be used to screen for CRC. FIT has largely replaced gFOBT due to both higher sensitivity and specificity. FIT-DNA is more sensitive but less specific and more costly than FIT.[44] When discussing fecal testing with older adults who are frail or have a limited life expectancy, shared decision-making is important. There is little benefit in doing fecal testing if the patient is not willing or is not a candidate for a colonoscopy, although some patients may be willing to have and may benefit from a sigmoidoscopy.[45]

Risks

Significant risks are associated with colonoscopy, especially in older adults.[46] The rate of complications in patients aged 65 and older included perforation (1%), gastrointestinal bleed (6.3%), cardiovascular/pulmonary complications (19%), and death (1%). Octogenarians experienced a higher risk of perforation (1.6%).[46] In addition, some older adults have difficulty tolerating the preparation for a colonoscopy including electrolyte abnormalities.[47] Although fecal testing is less invasive, depending on a variety of patient characteristics, false-positive results occur between 45% and 70% of the time that lead to more invasive procedures.[48] Overscreening as high as 28% was reported for older adults.[49] Tools such as ePrognosis can help guide decisions regarding the appropriate use of CRC screening for older adults.[50]

BLADDER CANCER

Epidemiology and Clinical Significance

Bladder cancer is the second most common urological malignancy in the United States.[19] Approximately 74% of bladder cancers occur in adults aged 65 and older (Figure 1).[19] The median age at time of diagnosis is approximately 70 years, and incidence does not peak until patients are in their 80s. Risk factors for bladder cancer include increasing age, male sex, and smoking cigarettes. People who smoke have a four times increased risk of developing bladder cancer compared with nonsmokers.[51]

Primary Prevention

Lifestyle

Smoking cessation for 1 to 4 years results in a 30% decrease in the risk of bladder cancer. When someone has stopped smoking for more than 10 years, their risk of developing bladder cancer is similar to nonsmokers.[52] Although

there have been no studies looking specifically at the impact of smoking cessation on bladder cancer risk in older adults, those with at least a 5-year life expectancy are likely to benefit. A single meta-analysis demonstrated that increased fruit and vegetable intake was associated with a decreased risk of bladder cancer.[53] The impact of dietary interventions on bladder cancer incidence in older adults is not clear.

Screening

The USPSTF concluded that current evidence is insufficient to assess the balance of benefits and harms of screening for bladder cancer in asymptomatic adults including older adults.[54] Regardless of age, neither urinalysis nor cystoscopy is recommended as a means of screening for bladder cancer.

Risks

Risks from inappropriate screening include anxiety regarding test results, unnecessary surgery, and associated complications.

KIDNEY CANCER

Epidemiology and Clinical Significance

Kidney cancer is the third most common urological malignancy and the eighth most common cancer in the United States. More than 400,000 new cases of kidney cancer were diagnosed worldwide in 2018.[55] The median age at diagnosis is 64 years, and the median age at death from kidney cancer is 71 years. In the United States, approximately 50% of kidney cancers occur in adults aged 65 and older (Figure 1).[19] Known risk factors for the development of kidney cancer include increasing age, obesity, hypertension, family history of kidney cancer, smoking, occupational exposures (eg, trichloroethylene), and renal failure.

Primary Prevention

Lifestyle

Observational data indicate a strong association between cigarette smoking and obesity and the development of kidney cancer. The impact of lifestyle changes on the incidence of kidney cancer in older adults is unknown. Although hypertension is a risk factor for kidney cancer,[56] the impact of lowering blood pressure on the incidence of kidney cancer in older adults is also unknown.

Screening

Screening for kidney cancer is only recommended in the small number of patients with hereditary kidney cancer syndromes. Excluding these patients, there are no specific screening recommendations. Routine urinalysis should not be used to screen for kidney cancer.

Risks

Risks from inappropriate screening include anxiety regarding test results, unnecessary surgery, and associated complications.

In conclusion, cancer is common in older adults. It is important that healthcare providers educate their patients regarding their cancer risks and where appropriate recommend interventions to both prevent and screen for cancer. An older adult's life expectancy is a better determinant of when to stop screening for cancer than the patient's age. Interventions that have not been shown to provide benefit for older adults should be avoided.

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