

# Benefits and Challenges of Lung Cancer Screening in Older Adults

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## ABSTRACT

**Purpose:** Lung cancer screening with low-dose computed tomography has been shown to significantly reduce lung cancer–related mortality in high-risk patients. However, patients diagnosed with lung cancer are typically older and often have multiple age- and smoking-related comorbidities. As a result, cancer screening in older adults remains a complex decision, requiring careful consideration of patients' risk characteristics and life expectancy to ensure that the benefits outweigh the risks of screening. In this review, we evaluate the evidence regarding lung cancer screening, with a focus on older patients.

**Methods:** PubMed was searched to identify relevant studies evaluating the clinical outcomes of lung cancer screening. The key words used in our search included *non–small cell lung cancer (NSCLC)*, *screening*, *older*, *comorbidities*, *computed tomography*, and *survival*. While we primarily looked for articles specific to older patients, we also focused on subgroup analysis in older patients in larger studies. Finally, we reviewed all relevant guidelines regarding lung cancer screening.

**Findings:** Guidelines recommend that lung cancer screening be considered in adults aged 55 to 80 years who are at high risk based on smoking history (ie, 30-pack–year smoking history; having smoked within the past 15 years). Patients who fit these criteria have been shown to have a 20% reduction in lung cancer–related mortality with the use of low-dose computed

tomography versus chest radiography. High rates of false-positive results and potential overdiagnoses were also observed. Therefore, screening is generally not recommended in adults with severe comorbidities or short life expectancy, who may experience limited benefit and higher risks with screening. However, several studies have shown a benefit with continued lung cancer screening with appropriate selection of older individuals at the highest risk and with the lowest comorbidities.

**Implications:** Older patients experience the highest risk for lung cancer incidence and mortality, and stand to be the most likely to benefit from lung cancer screening. However, careful consideration must be given to higher rates of false-positives and overdiagnosis in this population, as well as tolerability of surgery and competing risks for death from other causes. The appropriate selection of older individuals for lung cancer screening can be greatly optimized by using validated risk-based targeting. (*Clin Ther.* 2018;■:■■■–■■■) © 2018 Elsevier HS Journals, Inc. All rights reserved.

**Key words:** computed tomography, early stage, lung cancer, older, screening.

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## INTRODUCTION

Lung cancer has the second-highest incidence among all cancers and is the leading cause of cancer-related death in the United States. Approximately 85% of lung cancers are non-small cell lung cancers (NSCLCs). Nearly 80% of patients have regional or distal spread of disease at the time of diagnosis, accounting for poor overall survival.<sup>1</sup> Widespread implementation of lung cancer screening guidelines will be important to shift the diagnosis to an earlier, surgically resectable stage associated with significantly improved long-term outcomes and possibly even cure. However, patients diagnosed with NSCLC are typically older (the median age at diagnosis, 71 years) and often have multiple age- and smoking-related comorbidities, poor functional status, and borderline organ function, all factors that not only cause challenges in management but also independently affect prognosis.<sup>2</sup>

Cancer screening in older individuals remains a complex decision, requiring careful consideration of a patient's overall health, life expectancy, cognition, risk for disease, and preferences.<sup>3</sup> These factors may result in higher risks associated with screening while providing only marginal benefit. Potential risks of cancer screening are generally related to false-positive results or overdiagnosis, which can lead to unnecessary testing (ie, radiation exposure, invasive procedures), further anxiety, and financial toxicity. These concerns have caused considerable controversy with screening for a variety of solid tumors in the older patient population, specifically for cancers that are known to have a more indolent disease course (ie, prostate, breast, colon).<sup>4-6</sup> However, lung cancer is often aggressive and may cause significant morbidity and mortality if left untreated, regardless of age or burden of comorbidity.<sup>7</sup> Therefore, lung cancer screening has received increased interest in recent years, and low-dose computed tomography (CT) screening in selected individuals is now supported by national guidelines. In this review, we examine the evidence of lung cancer screening with a focus on older patients, in order to provide evidence-based guidance in this challenging and commonly affected patient group.

## MATERIALS AND METHODS

PubMed was searched to identify relevant studies evaluating the clinical outcomes of lung cancer

screening. The key words used in our search included *non-small cell lung cancer (NSCLC)*, *screening*, *older*, *comorbidities*, *computed tomography*, and *survival*. While we primarily looked for articles specific to older patients, we also focused on subgroup analysis in older patients in larger studies. Finally, we reviewed all relevant guidelines regarding lung cancer screening.

## RESULTS

### Lung Cancer Screening Guidelines

Several groups have published guidelines on lung cancer screening in high-risk individuals who may stand to benefit from early intervention. The US Preventive Services Task Force<sup>8</sup> recommends annual low-dose chest CT in adults who: (1) are aged 55 to 80 years; (2) have a 30-pack-year smoking history; and (3) are current smokers or quit within the past 15 years. The American Cancer Society<sup>9</sup> and the National Comprehensive Cancer Network<sup>10</sup> have similar guidelines, except that they include patients who are aged 55 to 74 years. In 2015, the Center for Medicare and Medicaid Services began reimbursing lung cancer screening until age 77 years.<sup>11</sup> The US Preventive Services Task Force<sup>8</sup> also recommends continuing annual screening until patients have quit smoking for >15 years or if they develop a health problem that significantly limits life expectancy or the ability to have curative surgery. The American Association of Thoracic Surgery recommends continuing annual screening up to the age of 79 years, while the Society of Thoracic Surgeons recommends no upper age limit in patients with good performance status.<sup>12</sup> Importantly, the guidelines do not recommend screening in adults with severe comorbidities or short life expectancy in whom curative surgery would not be appropriate (Table).

### Benefits of Lung Cancer Screening

Over the years, various screening tests have been studied for detecting early-stage lung cancers, with only low-dose CT shown to be effective. In the 1990s, multidetector CT scanners were able to produce high-resolution images capable of detecting small, subclinical tumors, while limiting the potential risks of radiation exposure and IV contrast. The Early Lung Cancer Action Project<sup>13</sup> was the earliest study to look at low-dose CT screening for lung cancer. This prospective observational study included 1000

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