Extrapulmonary Findings and Malignancies in Participants Screened With Chest CT in the National Lung Screening Trial

EC: Editor's Choice

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Abstract

Purpose: The aim of this study was to measure the prevalence of clinically significant extrapulmonary findings on chest CT for lung cancer screening in the National Lung Screening Trial (NLST).

Methods: Prospectively acquired data on 17,309 participants who underwent low-dose screening chest CT from August 2002 through September 2007 during the NLST were retrospectively analyzed for extrapulmonary findings. NLST radiologist readers coded such findings as "minor" or "potentially significant." On the basis of review of recorded text descriptions, extrapulmonary findings were assigned to five organ groupings (cardiovascular, thyroid, adrenal, renal, and hepatobiliary). Extrapulmonary malignancies diagnosed during screening were also identified from medical and vital status records in the same population. The prevalence rates of organ-specific findings and newly diagnosed extrapulmonary malignancies were calculated. Exemption from human subjects research review was obtained.

Results: Extrapulmonary findings were noted in 58.7% of CT-screened participants, and 19.6% had findings coded as potentially significant. The prevalence of potentially significant abnormalities was highest for cardiovascular findings (8.5%), followed by renal (2.4%), hepatobiliary (2.1%), adrenal (1.2%), and thyroid (0.6%) findings. Sixty-seven of 17,309 participants (0.39%) had primary extrathoracic cancers diagnosed during screening. The prevalence of cancers among screened participants was 0.26% (n = 45) for kidney, 0.08% (n = 14) for thyroid, and 0.05% (n = 8) for liver cancers.

Conclusions: One in five patients screened with CT for lung cancer will have extrapulmonary findings potentially requiring further evaluation. Indiscriminate workups of incidental extrapulmonary findings could place a significant burden on the health care system with little benefit because extrapulmonary malignancies diagnosed during screening are uncommon. Radiologists reporting screening CT should be familiar with existing recommendations for incidental findings from the ACR white papers.

Key Words: lung cancer screening, low-dose CT, incidental findings, National Lung Screening Trial

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INTRODUCTION

The National Lung Screening Trial (NLST), a randomized multicenter controlled trial with more than 53,000 patients, demonstrated that screening with low-dose CT results in a 20% reduction in mortality from lung cancer and a 6.7% reduction in all-cause mortality [1]. Radiology advocates of low-dose CT lung cancer screening made the argument that the program would be cost-effective under the theory that savings due to the reduction in mortality would offset costs of the program [2,3]. After much debate, low-dose chest CT is now covered by Medicare as a preventive service for individuals aged 55 to 77 years who meet eligibility criteria [4].

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In addition to the costs of screening CT, an important consideration in the cost-effectiveness of lung cancer screening is the detection of incidental findings that subsequently receive workup [5].

Compared with other screening tests such as mammography, the lung cancer screening program presents additional challenges because CT obtains cross-sectional images from the lower neck to the upper abdomen, meaning that unexpected findings can be seen in any of several covered extrapulmonary locations, including the heart, large vessels, thyroid, liver, kidneys, and adrenal glands. Because screening chest CT is performed without contrast medium and at lower radiation dose settings compared with diagnostic CT studies, patients may need subsequent imaging to characterize unexpected findings and face the possibility of biopsy or serial follow-up. The overall burden of incidental findings workups in a lung cancer screening program will depend on the prevalence of findings deemed potentially significant. European and Canadian lung cancer screening trials found the prevalence of incidental findings to vary widely, from 8% to 49% of screened participants, whereas the prevalence of incidental malignancy was less than 2% [6-9]. One of these studies advised against systematically searching for incidental findings and recommending workups [7], whereas another concluded that careful inspection of extrapulmonary findings was necessary [6].

Data from the NLST, a larger study than the European and Canadian studies, have not previously been analyzed to determine the prevalence of incidental findings on low-dose screening chest CT. The NLST data set will provide important information for implementation planning in the United States both because its large study population gives it statistical power and because the data are derived from the US population, which US policymakers intend to benefit. The aim of this study was to measure the prevalence of clinically significant extrapulmonary findings on chest CT for lung cancer screening in the NLST.

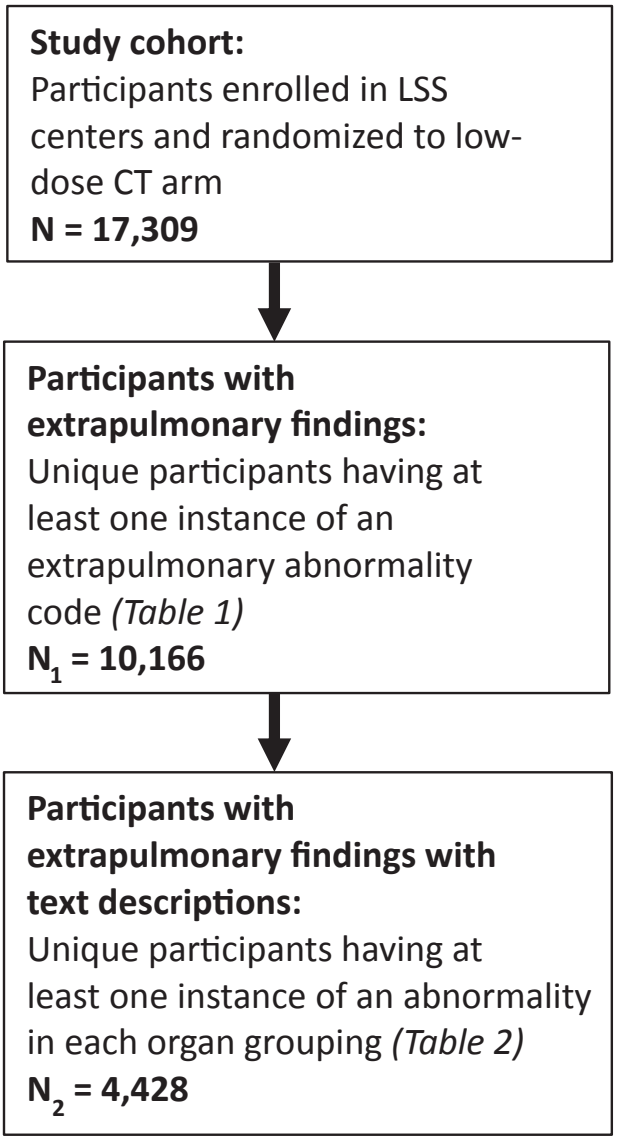

Fig 1. Overview of the study cohort. LSS = Lung Screening Study.

METHODS

Study Group and NLST Protocol

This study is a retrospective analysis of prospectively acquired data regarding extrapulmonary findings from the NLST [1]. Exemption from human subjects research review was obtained by our institutional review boards. Our study cohort consisted of 17,309 participants enrolled at Lung Screening Study centers (Fig. 1). This represented 65% of the 26,722 participants who were randomized to the low-dose CT arm of the NLST. The other NLST participants were enrolled at ACRIN® centers and were not included in this analysis because text descriptions of their extrapulmonary findings were not available to the informatics company that stored the NLST data.

On the basis of the inclusion and exclusion criteria used in the original NLST [1], participants were 55 to 74 years of age at randomization, had no prior lung cancer histories, had smoking histories of at least 30 pack-years, and, if former smokers, had quit within the previous 15 years. Additional exclusion criteria in the NLST included previous chest CT imaging within 18 months before enrollment, hemoptysis, and unexplained weight