

## Assessing Chest Radiography for Early Lung Cancer Detection

Oken MM, Marcus PM, Hu P, et al. Baseline chest radiograph for lung cancer detection in the randomized Prostate, Lung, Colorectal and Ovarian Cancer Screening Trial. *J Natl Cancer Inst* 2005;97:1832–9.

### Study Overview

**Objective.** To report lung cancer detection rates following baseline chest radiography in a large cancer screening trial.

**Design.** Descriptive analysis of data from the Prostate, Lung, Colorectal and Ovarian (PLCO) Cancer Screening Trial.

**Setting and participants.** More than 77,000 healthy participants recruited through direct mail to the PLCO Cancer Screening Trial were randomly assigned to the intervention arm, which included a single-view posterior-anterior chest radiograph at baseline. A baseline questionnaire gathered data about sociodemographic characteristics, family history, medical history, smoking history, and cancer screening history in the 3 years prior to the study. Current or former smokers underwent initial chest imaging followed by 3 annual screens, and never smokers had 2 annual screens after baseline imaging. Radiographs were considered positive if a potentially cancerous nodule, infiltrate, or other abnormality was identified. Participants with a positive screen were referred to their primary care provider. Medical records were obtained to document follow-up. Participants will be followed for at least 13 years.

**Main outcome measures.** Screen positivity rate, lung cancer detection rate, and positive predictive values (PPVs).

**Main results.** 5991 (8.9%) baseline radiographs were suspicious for lung cancer; positive screening rates were highest for older age-groups and for smokers. Among participants with a positive screen, 206 (3.4%) underwent biopsy, 126 of whom (61.2%) were diagnosed with lung cancer within 12 months of the screen. The PPV was 2.1%, with 1.9 lung cancers detected per 1000 screens. Among these cancers, 44% were stage I non-small-cell lung cancer. Current smokers and former smokers (ie, smoked within the past 15 years) had high rates of cancer (6.3 per 1000 screens and 4.9 per 1000 screens, respectively). Never smokers had a lung cancer detection rate of 0.4 per 1000 screens, which accounted for 11% of cancers identified. For former smokers, the number of cancers detected per 1000 screens was more than 4.0 for up to 10 years after smok-

ing cessation and was more than threefold that of never smokers (0.5%) thereafter. The rate of a positive result increased with age for both sexes; men had a higher positive screening rate than women in each age-group and for each smoking status. However, men and women had similar rates of lung cancer diagnosis and similar numbers of lung cancers diagnosed per 1000 screens. Among never smokers, the PPV for a positive chest radiograph was only 0.6%.

**Conclusion.** In the baseline screen for lung cancer, almost half the cancers identified were stage I. It is unknown whether early detection in these patients will result in decreased lung cancer mortality.

### Commentary

Currently, no screening modality (eg, chest radiography, sputum analysis, computed tomography [CT] scanning) has been proven to reduce lung cancer mortality. The hope is that identifying early disease could lead to early, potentially curative treatment (ie, lung cancer resection). Multiple large studies to date have been hampered by length and lead-time biases when interpreting results of screening modality benefit [1,2].

The PLCO Cancer Screening Trial has been undertaken to examine cause-specific mortality reduction from screening for 4 cancers in men and women (lung, prostate, colorectal, ovarian). In this analysis by Oken et al, only lung cancer detection rates from the baseline screening are reported.

This trial represents the largest prevalence screening study for lung cancer to date and includes a population that is varied with regard to sex, race, and smoking history. The strength of this trial is its large size, randomized prospective design, and extensive data collection in terms of baseline demographics and follow-up. The number of cancers found among men and among women was similar, and there was a high rate of adenocarcinoma (a histology whereby peripheral anatomic location may lend itself to detection on chest radiography). A high rate of cancer was found in both active and former smokers but not in never smokers. One important finding from this early analysis is that more than 5700 patients with a positive chest radiograph did not undergo

biopsy—presumably because further evaluation by their primary physician and CT scanning did not warrant it. This group of patients represents an important subset of patients that, with longer follow-up, may indeed include many patients who subsequently develop lung cancer. This group will pose a challenge due to the ethical and legal issues that are raised when screening is suggestive of malignancy early on but appropriate follow-up is omitted or overlooked.

### **Applications for Clinical Practice**

Screening chest radiography has not been proven to reduce lung cancer mortality, although results from prospective

large randomized trials are awaited.

*—Review by David R. Spigel, MD*

### **References**

1. Humphrey LL, Teutsch S, Johnson M; U.S. Preventive Services Task Force. Lung cancer screening with sputum cytologic examination, chest radiography, and computed tomography: an update for the U.S. Preventive Services Task Force. *Ann Intern Med* 2004;140:740–53.
2. Marcus PM, Bergstralh EJ, Fagerstrom RM, et al. Lung cancer mortality in the Mayo Lung Project: impact of extended follow-up. *J Natl Cancer Inst* 2000;92:1308–16.

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