

## Lung cancer screening-don't forget the chest radiograph

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### Abstract

Lung cancer is a major health burden and early detection only bears the possibility of curative treatment. Screening with computed tomography (CT) recently demonstrated a mortality reduction in selected patients and has been incorporated in clinical guidelines. Problems of screening with CT are the excessive number of false positive findings, costs, radiation burden and from a global point of view shortage of CT capacity. In contrast, chest radiography could be an ideal screening tool in the early detection of lung cancer. It is widely available, easy to perform, cheap, the radiation burden is negligible and there is only a low rate of false positive findings. Large randomized controlled trials could not show a mortality reduction, but different large population-based cohort studies have shown a lung cancer mortality reduction. It has been argued that cancer community-based cohort studies are more closely reflecting the "real world" of everyday medicine. Radiologists should be aware of the found mortality reduction and realize that early detection of lung cancer is possible when reading their daily chest radiographs. Offering a chest radiograph in selected scenarios for the early detection of lung cancer is therefore still justified.

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**Key words:** Lung cancer; Screening; Mortality; Chest radiograph

**Core tip:** Screening with computed tomography (CT) recently demonstrated a mortality reduction in selected patients with lung cancer, but there are several shortcomings of screening with CT (false positive findings, high costs, radiation burden, shortage of capacity). In contrast, chest radiography could be an ideal screening tool in the early detection of lung cancer. It is widely available, its radiation burden is negligible and there is only a low rate of false positive findings. In contrast to randomized controlled trials different large population-based cohort studies have shown a lung cancer mortality reduction using chest radiography. In conclusion, early detection of lung cancer is also possible with chest radiography.

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Lung cancer is a major health burden and early detection only bears the possibility of curative treatment. Therefore a screening test would be desirable. A number of older studies have tested chest radiography and sputum cytology and most of them showed no reduction in mortality compared to randomized control groups<sup>[1]</sup>. The publication of the results of the National Lung Screening Trial (NLST), showing mortality reduction of 20% in patients undergoing screening with low-dose chest computed tomography (CT) in comparison to patients undergoing chest radiography, renewed the interest in screening for lung cancer<sup>[2]</sup>. Based on these results screening with CT for selected patient groups has recently been incorporated in different clinical guidelines. For example the American Association of Thoracic Surgery advocates screening with annual low-dose chest CT for smokers or former

smokers with a 30-pack year history beginning at the age of 55<sup>[3]</sup>. The main problem with CT screening is the excessive number of false positive findings. In the first two screening rounds of the NLST 27.3% and 27.8% of participants showed suspect findings (*i.e.*, a nodule measuring at least 4 mm). Of these nodules only 3.8% turned out to be lung cancers (230 out of 7731 positive results). This leads to high costs with further diagnostics and causes considerable anxiety in affected individuals with a suspect nodule. CT is also expensive *per se* and from a global point of view not readily available everywhere. Most health care systems will not be able to finance such a CT-based screening program. The radiation burden due to repeated CT scans should also be taken into account.

In contrast, chest radiography could be an ideal screening tool in the early detection of lung cancer. It is widely available, easy to perform, cheap, its radiation burden is negligible and there is only a low rate of false positive findings. As randomized controlled trials (RCT) have shown no reduction in lung cancer mortality compared to control groups it has been concluded by most investigators that screening with chest radiography is ineffective<sup>[1]</sup>. This view has been repeatedly challenged: most RCT have shown a survival advantage for screened individuals because of a stage shift in diagnosed cancers<sup>[4,5]</sup>. Because RCT are prone to selection bias (selection of highly motivated individuals and problem of generating two comparable groups) population based cohort studies may give a more realistic view of the situation in medical care<sup>[5,6]</sup>. Recently, a group of Italian investigators presented their follow-up data of a large population based cohort study<sup>[7]</sup>. Participation in this trial was offered to all patients at risk for lung cancer (smokers with more than 10 pack years between 45 and 75 years of age) by their general practitioner. The trial consisted of a baseline two view chest radiography and an annually repeated examination (single view) for the following four years. Five thousand eight hundred and fifteen subjects participated and follow up was 8 years. Compared to a statistical control population derived from the national health services data there was a lung cancer mortality reduction of 18% (172 deaths to lung cancer instead of 210 expected). Interestingly, there were only 3.4% false positive findings and only 0.16% unnecessary invasive procedures<sup>[7]</sup>. There are also several case-control studies from Japan showing a reduction of lung cancer mortality between 40% and 60% using screening with chest radiography and sputum cytology<sup>[8]</sup>. One population based case-control study from Japan used X-ray screening only and found a lung cancer mortality reduction of more than 20%<sup>[9]</sup>. Newer technologies like digital radiography, bone suppression or computer-aided nodule detection may further enhance the sensitivity of chest radiography in the detection of early lung cancer, but have not been adopted in the studies mentioned above<sup>[10]</sup>. Caro *et al*<sup>[11]</sup> calculated cost-effectiveness of lung cancer screening with chest radiography. They concluded that even an achieved mortality reduction of 6% could be cost-effective.

In conclusion, radiologists should realize that screen-

ing with chest radiography leads to reduced lung cancer mortality in population-based cohort studies. Radiologists should be aware that early detection of lung cancer is possible when reading their daily chest radiographs. And in the clinically common scenario of a worried middle aged smoker asking for lung cancer “screening” a chest radiograph is still justified.

Despite the exiting results of the NLST there are many unresolved issues with CT-based screening for lung cancer (how to reduce false-positive findings, optimal patient selection, long term outcome of screened patients, transferability of the results of the NLST to other populations)<sup>[12]</sup>. Until more data from ongoing trials is available, CT-based screening should therefore not be advocated and used cautiously only.

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