Screening for lung cancer with low-dose computed tomography: a systematic review to update the U.S preventative services task for recommendation


CRD summary
This review found evidence that low-dose computed tomography screening could reduce lung cancer and all-cause mortalities. This conclusion was driven by a single, large, good-quality trial and, because of heterogeneity in results across trials, this conclusion should not be considered to be reliable.

Authors' objectives
To investigate the effectiveness of screening for lung cancer using low-dose computed tomography (CT).

Searching
MEDLINE (from 2000 to May 2013), Cochrane Database of Systematic Reviews (to end 2012), Cochrane Central Register of Controlled Trials (CENTRAL) and Scopus were searched for studies published in English. Search terms were not presented. References of retrieved articles were searched.

Study selection
It appeared that any randomised controlled trial (RCT) or cohort study that evaluated low-dose CT screening for lung cancer was eligible. The main outcomes were lung cancer and all-cause mortality. Other factors considered included: radiation, false-positives, false reassurance, over diagnosis, psychosocial consequences and smoking behaviour.

Among the included RCTs, the age of screened individuals ranged from 49 to 74; 55% to 100% were men. Between 48% and 68% of participants currently smoked (39 to 56 average - mean or median - pack years). The control groups were usual care, no lung cancer screening, or chest radiography.

It was not stated how many reviewers performed the study selection.

Assessment of study quality
Trial quality was assessed using in-house US Preventive Services Task Force criteria. Details of this method were not presented. Trials were rated as good, fair or poor quality.

Two reviewers performed the assessment, with disagreements resolved by consensus.

Data extraction
For the RCTs, relative risks (RR) with 95% confidence intervals (CI) were extracted for lung cancer mortality and all-cause mortality. For all other outcomes and for cohort studies, results appeared to be extracted as presented in the papers.

It appeared that one reviewer performed the data extraction.

Methods of synthesis
No meta-analysis was performed due to perceived heterogeneity across the studies. Results for each study were presented, and broadly summarised.

Results of the review
Four RCTs were included (64,129 participants, range: 2,472 to 53,454). One trial (the largest) was rated as good quality, two were rated as fair quality, and one as poor quality. Median follow-up times ranged from 33.7 months to 6.5 years. Thirteen cohort studies were included (over 200,000 participants).

Among the four RCTs, the largest good-quality trial found that low-dose CT screening reduced lung cancer mortality (RR 0.80, 95% CI 0.73 to 0.93) and all-cause mortality (RR 0.93, 95% CI 0.86 to 0.99). One fair-quality trial found a reduction in mortality that was not statistically significant. One fair-quality and one poor-quality trial found an increase in mortality.
in mortality using low-dose CT screening, but results were not generally statistically significant.

The positive predictive value of initial low-dose CT screening ranged from 2.2% to 36% (15 studies). The positive predictive value among abnormal low-dose CT results where biopsy was recommended ranged from 50% to 92% (11 studies). The sensitivity of low-dose CT screening ranged from 80% to 100% (six studies).

Screening was not found to affect quality of life or long-term anxiety but, in the short-term, anxiety may increase among people with positive or indeterminate results, but decrease in those with negative results (seven studies). Two trials found no changes in smoking behaviour.

Further results and results from specific studies were presented.

Authors' conclusions
There was strong evidence that low-dose CT screening could reduce lung cancer and all-cause mortalities, but this conclusion was driven by one large good-quality trial. The harms of screening must be balanced with its benefits.

CRD commentary
This review addressed a relevant review question, but the inclusion criteria were not precisely stated. A search was performed, but with limited detail, so it was not clear whether the search would be reproducible. The review was generally not well reported, so reviewer error and bias in the study selection and data extraction processes could not be ruled out.

The quality of the trials was assessed, although only limited results were provided. The quality of the cohort studies was not described. The authors identified considerable diversity in trial quality, populations, interventions used and follow-up times. As a result, no meta-analysis was performed, although an analysis may have been informative for the mortality outcomes.

The authors based their conclusions on a single large trial, despite the results of other trials being inconsistent with this trial. Therefore, the authors’ conclusions should not be considered to be reliable.

Implications of the review for practice and research
Practice: The authors suggested that if low-dose CT screening became routine it would be important to measure the risk of radiation-associated harms.

Research: The authors recommended further research into focusing screening on those at highest risk of disease, improving discrimination between benign and malignant pulmonary nodules, and finding early indicators of aggressive disease.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.