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Congress Abstract

Artificial Intelligence in Lung Cancer Screening: A Review of Published Evidence and its Implications for Screening Programmes in Kazakhstan and Central Asia

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Background: Lung cancer leads cancer mortality in Kazakhstan: the International Agency for Research on Cancer estimates 2,798 new cases and 2,617 deaths for 2024. Randomised trials show that low-dose computed tomography screening lowers lung cancer mortality, but population screening brings heavy reading workloads and many false positives. This review examines the published evidence on artificial intelligence in this setting.

Objective: To review published evidence on artificial intelligence in low-dose computed tomography lung cancer screening, with implications for programmes in Kazakhstan and Central Asia.

Materials and Methods: Narrative review of peer-reviewed publications, 2011 to August 2026, in PubMed and publisher databases. Screening trials required a mortality endpoint; artificial intelligence studies required histological outcomes, an expert panel reference standard or randomisation. Included: the National Lung Screening Trial (2011), the Dutch-Belgian screening trial (2020), Sybil (2023), the United Kingdom Lung Cancer Screening trial validation (2025), the 4-IN-THE-LUNG-RUN feasibility study (2025) and a prospective single-centre randomised trial (2026).

Results: The National Lung Screening Trial reduced lung cancer mortality by 20.0 percent (95 percent confidence interval 6.8 to 26.7) versus chest radiography; 96.4 percent of positive screens were false positives. The Dutch-Belgian trial reported a ten-year lung cancer mortality rate ratio of 0.76 (95 percent confidence interval 0.61 to 0.94) among male participants versus no screening. Neither trial used artificial intelligence. Sybil predicted one-year cancer risk from one scan with areas under the receiver operating characteristic curve of 0.92, 0.86 and 0.94 in three retrospective cohorts. In 1,252 United Kingdom baseline scans, an artificial intelligence first reader detected all 31 histologically confirmed cancers, one below its volume threshold (negative predictive value 99.8 percent), with an estimated maximum workload reduction of 79 percent. In 3,678 European baseline scans, artificial intelligence negative misclassifications were 0.8 percent against 11.1 percent for radiologists; its positive misclassifications were 5.7 percent against 0.5 percent for radiologists. In a randomised trial in asymptomatic individuals, artificial intelligence assistance raised detection of Lung Imaging Reporting and Data System positive nodules from 10.3 to 16.9 percent with no significant change in interpretation time.

Conclusions: The mortality benefit belongs to low-dose computed tomography screening itself; no included artificial intelligence study measured mortality. Evidence is strongest for artificial intelligence as a first reader ruling out negative baseline scans while radiologists read the rest; detection assistance raises nodule yield and positive misclassifications; single-scan risk prediction remains retrospective. For Kazakhstan and Central Asia these applications address the reading capacity and false-positive burden that limit programme feasibility, provided tools are validated locally against histological outcomes.

Keywords: Lung Neoplasms; Early Detection of Cancer; Tomography, X-Ray Computed; Artificial Intelligence; Radiographic Image Interpretation, Computer-Assisted; Kazakhstan