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Lung cancer prevention and the role of screening: where do we go from here?

Background

Lung cancer is one of the most common and fatal types of cancer. Although considerable progress has been made in therapy in recent years, many patients continue to die from this disease. Patients' chances of survival improve if the disease is detected early on in its treatable stages, before the tumor cells spread to other tissues. In addition to reducing known risk factors, such as smoking, chronic lung disease or exposure to harmful particles in air pollution, asbestos or radon, screening and early detection could help reduce the alarmingly high number of deaths caused by lung cancer each year. However, despite its potential, many European countries still have no population-wide screening programs for lung cancer in place.



Computed tomography with a low radiation dose (low-dose CT, or LDCT) can detect lung cancer at an early stage. Clinical trials involving heavy smokers have shown that CT scans of the lungs can detect many tumors at an early stage and that this, alongside early treatment, can reduce lung cancer mortality by up to 30 percent. However, this positive result also came with various negative side effects. Study participants in whom no malignant tumor was found were unnecessarily exposed to the radiation dose of the CT scan. Even though the radiation dose administered through LDCT is low, damage to the healthy tissue and an increased risk of cancer due to radiation, cannot be ruled out. In addition, there were also study participants in whom the CT scan revealed abnormalities that later turned out not to be lung cancer. These false positive findings may lead to a period of uncertainty around the possibility of a cancer diagnosis associated with high emotional burden and psychological distress.

Methods of improving the selection of participants for lung cancer screening may help to minimize these negative effects while maintaining the positive outcomes of an earlier lung cancer diagnosis and better treatment options.

Latest results from the ESTHER study

A variety of formulas or models have been developed which can be used to select those who are most likely to have lung cancer based on risk factors and who should therefore be invited for a CT scan.

The most important risk factor remains smoking, so these formulas take into account whether and how much someone has smoked during their lifetime and currently smokes. However, they also incorporate the exposure of a person to other known lung cancer risk factors. We evaluated the 11 most promising models using data from the ESTHER study, a population-based cohort study of older adults conducted in Saarland, Germany. The analysis included 4812 smokers or former smokers.



During the 17-year follow-up period, 262 of these ESTHER participants developed lung cancer. Of the 11 models compared, three predicted future lung cancer particularly well. One of these was the BACH model, which, in addition to a detailed question about current and previous smoking, only asks about gender, age and exposure to asbestos. This information is very easy to collect using questionnaires.

In further analyses with the data from the ESTHER study participants, we checked whether these simple formulas, such as the BACH model, can be further improved by markers measured in the blood.

In doing so, we discovered inflammation markers and biological markers of lifetime smoking exposure with which study participants with a high risk of lung cancer could be identified even better than with the BACH or other models.



Summary and outlook



The results of the ESTHER study have shown that it is possible to derive formulas from risk factors that are easy to collect via questionnaires and markers that can be measured in blood samples, which can be

used to estimate the risk of lung cancer very well. This risk assessment can enable effective pre-selection for lung cancer screening using a CT scan and give

us confidence that improving models for pre-selecting participants based on their lung cancer risk will significantly reduce the incidence of fatal lung cancer. The LUCIA project will work towards extending and developing such methods to further improve the understanding of risk factors, identification of prediction markers and pre-selection for screening. The LUCIA project thereby aims to inform effective guidelines and give recommendations to EU countries for implementing optimized lung cancer screening programs.

References and links for more information

The results discussed in this blog were recently published in the following international journals: „Lung Cancer“, „Cancers“, und „Cancer Communications“. The articles are available as open-access publications and are freely accessible using the following links:

<https://doi.org/10.1016/j.lungcan.2022.10.011>

<https://doi.org/10.3390/cancers14092146>

<https://doi.org/10.1002/cac2.12450>.



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