Scan-based competing death risk model for re-evaluating lung cancer computed tomography screening eligibility

Anton Schreuder 1, Colin Jacobs 1, Nikolas Lessmann 1, Mireille J.M. Broeders 2,3, Mario Silva 4,5, Ivana Isgum 6,7, Pim A. de Jong 8,9, Michel M. van den Heuvel 10, Nicola Sverzellati 5, Mathias Prokop 1, Ugo Pastorino 4, Cornelia M. Schaefer-Prokop 1,11 and Bram van Ginneken 1,12

1Dept of Medical Imaging, Radboud University Medical Center, Nijmegen, The Netherlands. 2Radboud Institute for Health Sciences, Radboud University Medical Center, Nijmegen, The Netherlands. 3Dutch Expert Centre for Screening, Nijmegen, The Netherlands. 4Unit of Thoracic Surgery, Fondazione IRCCS Istituto Nazionale dei Tumori, Milan, Italy. 5Section of Radiology, Unit of Surgical Sciences, Dept of Medicine and Surgery (DiMeC), University of Parma, Parma, Italy. 6Dept of Biomedical Engineering and Physics, Amsterdam UMC – Location AMC, Amsterdam, The Netherlands. 7Dept of Radiology and Nuclear Medicine, Amsterdam UMC – Location AMC, Amsterdam, The Netherlands. 8Dept of Thoracic Surgery, Fondazione IRCCS Istituto Nazionale dei Tumori, Milan, Italy. 9Dept of Biomedical Engineering and Physics, Amsterdam UMC – Location AMC, Amsterdam, The Netherlands. 10Dept of Respiratory Diseases, Radboud University Medical Center, Nijmegen, The Netherlands. 11Dept of Radiology, Meander Medisch Centrum, Amersfoort, The Netherlands. 12Fraunhofer MEVIS, Bremen, Germany.

Corresponding author: Anton Schreuder (antoniusschreuder@gmail.com)

Shareable abstract (@ERSpublications)

Lung cancer CT screening participants with a relatively low risk of lung cancer incidence and a high risk of competing death can be identified by applying two respective post-scan risk models, and in turn may benefit from other personalised trajectories https://bit.ly/2ZDe62K


This single-page version can be shared freely online.

Abstract

Background A baseline computed tomography (CT) scan for lung cancer (LC) screening may reveal information indicating that certain LC screening participants can be screened less, and instead require dedicated early cardiac and respiratory clinical input. We aimed to develop and validate competing death (CD) risk models using CT information to identify participants with a low LC risk and a high CD risk.

Methods Participant demographics and quantitative CT measures of LC, cardiovascular disease and chronic obstructive pulmonary disease were considered for deriving a logistic regression model for predicting 5-year CD risk using a sample from the National Lung Screening Trial (n=15 000). Multicentric Italian Lung Detection data were used to perform external validation (n=2287).

Results Our final CD model outperformed an external pre-scan model (CD Risk Assessment Tool) in both the derivation (area under the curve (AUC) 0.744 (95% CI 0.727–0.761) and 0.677 (95% CI 0.658–0.695), respectively) and validation cohorts (AUC 0.744 (95% CI 0.652–0.835) and 0.725 (95% CI 0.633–0.816), respectively). By also taking LC incidence risk into consideration, we suggested a risk threshold where a subgroup (6258/23096 (27%)) was identified with a number needed to screen to detect one LC of 216 (versus 23 in the remainder of the cohort) and ratio of 5.41 CDs per LC case (versus 0.88). The respective values in the validation cohort subgroup (774/2287 (34%)) were 129 (versus 29) and 1.67 (versus 0.43).

Conclusions Evaluating both LC and CD risks post-scan may improve the efficiency of LC screening and facilitate the initiation of multidisciplinary trajectories among certain participants.

Link to published version: https://doi.org/10.1183/13993003.01613-2021