Variations in Lung Cancer Risk Among Smokers

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Background: We developed a model for predicting the risk that an individual will develop lung cancer, based on his or her age, sex, occupational exposure to asbestos, and smoking history. The purpose was to determine whether risk of incident lung cancer could be predicted accurately and if the risk of lung cancer varies substantially among groups of current and former smokers.

Model development and validation. We studied 18,172 subjects enrolled in the Carotene and Retinol Efficacy Trial (CARET), a large, randomized trial of lung cancer prevention. The data from CARET were divided into discrete follow-up intervals, and these intervals were analyzed using Cox proportional hazards modeling. The categorical predictors in the model were sex, asbestos exposure history, and the study drug. The continuous predictors, which were fit using natural cubic splines, were the subject's age, duration of smoking, number of cigarettes smoked on average while smoking, and duration since quitting. We assessed the model's calibration by comparing predicted and observed rates of lung cancer across risk deciles. We assessed the model's validity by assessing the extent to which a model estimated [based] on data from five CARET study sites could predict events in the sixth study site.

Model evaluation. When we applied the model to individuals enrolled in a study of lung cancer screening with computed tomography (CT), we observed that 10-year lung cancer risk varied greatly among participants, even among those who would be eligible (based on standard eligibility criteria) for a clinical trial of cancer prevention.

Implications. We conclude that the risk of lung cancer varies widely among smokers and is predictable based on factors identifiable from a clinical history. Accurate risk prediction may help individuals who are contemplating voluntary screening to balance the potential benefits and risks. Risk prediction may also be useful for researchers designing clinical trials of lung cancer prevention.