

# Description of the prediction tool for survival of stage III non-small cell lung cancer patients

This tool predicts the probability that a patient with stage III non-small cell lung cancer (NSCLC) will be alive at 2 year or 3 year post-radiotherapy treatment.

## To which patients does this tool apply?

The tool is developed for stage III NSCLC patients. FDG-PET has to be used as a staging tool. Patients have to be treated with high-dose conformal radiotherapy alone or high-dose conformal radiotherapy combined with chemotherapy (sequential or concurrent). They have not undergone surgical treatment nor prior chest radiotherapy, nor have distant metastasis at the time of diagnosis.

## How was this tool developed?

The prediction model is based on data of 548 NSCLC patients, treated at MAASTRO clinic with high-dose conformal radiotherapy alone or combined with chemotherapy (sequential or concurrent) and built using a stratified Cox proportional hazards regression analysis. The predicted outcome is 2 and 3 year survival post-radiotherapy.

The predictive mean matching algorithm was used for missing value imputation. The percentage of missing values was 13% for forced expiratory volume 1 s (FEV<sub>1</sub>), 1% for World Health Organization Performance Scale (WHO-PS), 5% for clinical T-stage, 8% for gross tumor volume (GTV) and 6% for number of positive lymph node stations (PLNS).

Variable selection was performed with a bootstrap procedure. First, it was determined how many variables should be included in the model by performing backwards variable selection for 100 bootstrap samples. Subsequently, backwards selection on the original data set was applied to identify which variables should be retained in the model.

The performance of the model is expressed as the AUC of the ROC. The maximum value of the AUC is 1.0, indicating a perfect prediction model. A value of 0.5 indicates that patients are correctly classified in 50% of the cases, i.e. as good as chance. The performance of the model on the training set was 0.65, corrected for optimism this value decreased to 0.62. Two datasets from NKI (Netherlands Cancer Institute) (n=174) and MSKCC (Memorial Sloan Kettering Cancer Center) (n=130) were available for external independent validation of the model. Application of the model to these datasets yielded AUCs of 0.58 and 0.60 respectively.

## What information will you need?

- Gender
- Age at start of treatment
- WHO-PS before start of radiotherapy
- FEV<sub>1</sub> before start of radiotherapy (forced expiratory volume in 1 second)
- Clinical T-stage
- GTV1 (volume of the primary tumor)
- Number of positive lymph node stations (PLNS), assessed with FDG-PET, according to the Naruke map
- Chemotherapy
  - No chemo
  - Sequential as standard protocol

- Sequential given because a patient is not fit enough for concurrent chemo radiation
- Concurrent chemo radiation
- OTT (overall treatment time of radiotherapy, in days)
- EQD<sub>2</sub> (equivalent radiation dose, corrected for fraction size)

### Journal articles that support this prediction tool

C. Oberije et al, A validated prediction model for overall survival from stage III non-small cell lung cancer: toward survival prediction for individual patients. Int J Radiat Oncol Biol Phys, 2015. pii: S0360-3016(15)00254-0. doi: 10.1016/j.ijrobp.2015.02.048. (published free online)

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