AbstractID: 11551 Title: Validating normal tissue complication probability models: a study of generalizability and datapooling for predictive radiation pneumonitis modeling

Purpose: NTCP models usually do not undergo needed tests of external validation or generalizability for eventual clinical use. Here we test and generalize an NTCP model for predicting radiation pneumonitis (RP) using data-pooling with institutional data and a multi-institutional dataset (RTOG 93-11 data). As accurate dosimetry is unavailable for the RTOG dataset, non-heterogeneity corrected dose distributions were used throughout.

Methods and Materials: Data consisted of 313 patients who received definitive conformal radiotherapy for non-small-cell lung cancer (209 from WUSTL, 104 from the RTOG 93-11 trial). For each individual subset patient groups, heart and lung dosimetric variables (abstracted from corresponding treatment planning archives), existing clinical factors, and tumor/high-dose positional parameters are included in multivariate logistic regression modeling to obtain the most predictive multi-variable NTCP model. Cross-validation and bootstrapping methods were used confirm internal model validity, model stability, and optimal model size. The derived best model for each dataset was tested against the other dataset. Finally, modeling over the combined multi-instructional dataset (RTOG 93-11 trial and WUSTL datasets) was conducted and the resulting model was tested against each individual subset of data.

Results: Models derived on the separate datasets performed poorly on the other dataset. However, the best model derived on the full dataset included D10_heart, D10_lung, and center-of-GTV-mass-superior-inferior. which performed well over each individual subset.

Conclusion: These results demonstrate the unique role that full 3-D data-pooling can play: models can be derived that work across a wide spectrum of patient datasets, but the actual target populations should be included in the analysis.

Supported by NIH grant R01 CA85181.