AbstractID: 13647 Title: A novel method to incorporate spatial location of lung dose into predictive radiation pneumonitis modeling

Purpose: Current methods for prediction of severe lung toxicity after thoracic radiation therapy have used basic dosimetric indices derived from dose-volume data. Studies have found that function may vary throughout lung. Our study will develop a novel method to incorporate spatial location of lung dose into a predictive model and test its predictive power on a large clinical database of non-small cell lung cancer patients. **Methods and Materials:** The 3D dose distributions of 547 patients were mapped onto one common coordinate system. The boundaries of the coordinate system were defined by the extreme points of each individual patient lung. Spatial information was incorporated into the Lyman NTCP model. The effective dose term in the Lyman model was defined as the sum of mean lung dose and a spatially weighted lung dose. The spatially weighted lung dose was calculated by scaling each dose voxel with various spatial weighting schemes. We investigated five weighting schemes that scaled the dose linearly according to the following orientations: superior-inferior, anterior-posterior, medial-lateral, left-right, and radial. Model parameters were fit to our patient cohort with the end-point of severe radiation pneumonitis. The accuracy of the spatial dose model was compared against a conventional dose-volume model to determine whether adding a spatial component increased the predictive power of the model. **Results:** The comparison of the spatial dose model and the conventional dose-volume model did not yield a significant difference in model accuracy. A promising trend emerged with a spatial model that placed more weight on peripheral lung dose. **Conclusion:** The method presented is the first method to incorporate the entire 3D dose distribution and explicitly separate location and dose-volume parameters. While statistically significant gains in model accuracy were not reached, radial weighting yielded the best results. In future work, additional spatial weighting schemes will be explored.