AbstractID: 7823 Title: Evaluation and Ranking of Lung IMRT Treatment Plans Using a Dose-Volume Biological-Response Index

External beam radiotherapy (RT) is commonly used for patients with lung cancer. While tumor shrinkage and palliation are frequently achieved, local control and cure remain elusive. With regard to local control, the fundamental problem is that RT-induced normal tissue injury limits the dose that can be delivered to the tumor. While IMRT allows for the delivery of higher tumor doses and the sparing of proximal critical structures, multiple competing plans can be generated based on dosimetric and/or biological constraints that need to be considered/compared. In this work, a lung IMRT treatment plan evaluation/ranking index, based on accurate dosimetric and biological/physiological criteria is presented. The treatment plan with the *highest* conformity volume index (CVI) for the target, the *lowest* toxicity volume index (TVI) for the critical structures, and the *highest* uncomplicated equivalent uniform dose (EUD^+) for the target, or combination thereof, is ranked at the top. The CVI and TVI are figures of merit calculated using dose-volume data. The EUD^+ incorporates our recent lung biological-response data relating the reduction of regional perfusion to regional dose. A number of competing lung IMRT plans are compared. Results show the plan with the best CVI, TVI, and EUD^+ values (or weighted combination) correlated well with the best-optimized dose distributions. The study demonstrates that clinically relevant dose-volume- and biological-response-based indices, which summarize complex dose distributions through a single index in each anatomical structure, can be used to automatically select the optimal plan among competing plans and may be appropriate for evaluating/ranking lung IMRT dose distributions.