AbstractID: 6560 Title: Plan Space Modeling and Decision Support System for Multi-Plan IMRT Framework

Purpose: The conventional treatment planning paradigm involves a *plan-and-evaluate* followed by a *modify-if-necessary* approach. We describe an IMRT treatment planning framework in which multiple plans that differ in the input constraints are generated per case prior to evaluation. We also describe a decision-support-system (DSS) for evaluating and ranking multiple plans and hypothesize that the planning surface can be modeled using quadratic modeling.

Methods and Materials: One hundred twenty-five plans were generated sequentially for a head-and-neck case and a pelvic case by varying the dose-volume constraints on each of the OARs. A DSS was used to rank plans according to DVH and equivalent uniform dose (EUD) values using composite criteria and pre-emptive selection. Two methods for ranking treatment plans were evaluated: composite criteria and pre-emptive selection. The planning surfaces corresponding to the 125-plan sets were modeled using quadratic functions by formulating the problem as a linear program.

Results: The DSS provides an interface for the comparison of multiple plan features. Plan ranking using both composite and pre-emptive criteria resulted in the reduction of plan space to 1-3 “optimal” plans. The planning surface models had good predictive capability with respect to both DVH and EUD values with fit errors of < 6%. Models generated by minimizing the maximum relative error had significantly lower relative errors than models obtained by minimizing the sum of squared errors. The inter-dependence of OAR-OAR properties could be successfully inferred for both clinical cases through the use of contour plots, which represent projections through the multi-dimensional plan property space.

Conclusion: The DSS can be used to aid the planner in the selection of the most desirable plan. The collection of quadratic models constructed from the plan data in order to predict DVH and EUD values generally showed excellent agreement with the actual plan values.

Conflict of Interest: N/A