AbstractID: 14224 Title: A Linear Metric of Knowledge-Based IMRT Treatment Plan Quality for the Prostate.

Purpose: In prostate IMRT treatment planning, the variation in patient anatomy makes it difficult to a priori estimate the maximum extent of dose reduction possible to rectum and bladder. Such an estimation would greatly aid treatment planning by letting clinicians adjust PTV margins to satisfy their dose sparing requirements. This work provides a Mutual Information-based framework for estimating rectal and bladder sparing, developed using an existing database of treatment plans. **Method and Materials:** The database consists of 100 prostate patients, previously planned with IMRT. Beam's Eye View images were created for seven standard gantry angles, with each projection showing bladder, rectum, PTV and all possible overlaps. The summed mutual information between patients in the database for the seven gantry angles were correlated against the DVH results (at specific constraint cutpoints) from the IMRT plans. A linear relationship between the Mutual Information and DVH reductions was established. **Results:** Initial results of 13 patients, compared against a total of 74 known plans, show a strong linear correlation of a set of DVH-cutpoints to a weighted MI, that is fit using individual weights for every possible region of overlap. The initial unweighted R^2 correlation of DVH quality to MI was 0.46, and after fitting the correlation was 0.84. **Conclusion:** This study shows the potential to extract from a large enough data bank, information about the structural importance of the various critical structures of the prostate region and the PTV. The increase of the R^2 correlation indicates that the fit is good, and that the value of this weighted MI better indicates treatment plan quality.