AbstractID: 10430 Title: Using a database of patient geometric and dosimetric information for quantitative IMRT plan quality control.

Purpose: To empower IMRT treatment planners with the ability to judge new plans against the performance of similar past plans. **Method and Materials:** This is accomplished by searching a database of treated patients using the geometric relationships between targets and organs at risk (OARs). We introduce the concept of a shape relationship descriptor to quantify this intuitively important relationship. The overlap volume histogram (OVH) simplifies the complex 3D relationship between a target and an OAR. The OVH is the normalized 1D histogram of the OAR volume within a distance of the target. The OVH descriptor was used to search a patient database, providing a patient specific set of dose volume histograms (DVHs). These DVHs were then presented to the planner to aid their decisions. **Results:** The method was applied to both parotids of 32 treated head-and-neck patients. The 17 parotids that promised the greatest reduction in D_{50} were selected for re-planning. These 17 parotids came from 13 patients. Our method indicated that the doses of the other nine parotids of the 13 patients could not be reduced, so they were included in the re-planning process as controls. Re-planning with an effort to reduce D_{50} was conducted on the 26 parotids of these 13 patients. Average reductions of D_{50} were 6.6Gy for the 17 improvement candidates and 1.9Gy for the controls. Originally, several parotids violated the RTOG planning goal of $V(30Gy) \leq 50\%$. Eleven of these were improvement candidates, and re-planning reduced this number to three. Re-planning had no impact on the five control parotids that were violating the RTOG planning goal. According to the physician reviews, re-planning did not degrade target coverage or OAR sparing. **Conclusions:** Our method offers a patient specific DVH evaluation for OARs, providing an effective mechanism of quantitative IMRT plan quality control.