AbstractID: 7041 Title: Unified Dosimetry Index (UDI): A new paradigm for ranking treatment plans

Purpose: A new index for scoring treatment plans that unifies the four dosimetry indices of coverage, conformity, homogeneity and dose gradient, into one simple equation, is introduced. We present results of actual clinical cases evaluated with new scoring index, validating its effectiveness.

Methods and Materials: We formulated a unified dosimetry index (UDI) that computes for any given treatment plan its deviations in terms of dose coverage, conformity, homogeneity, and dose gradient vis-á-vis an ideal plan. We define an ideal plan as one with perfect dose coverage, conformity, homogeneity, and a step-wise fall-off to zero dose outside the planning target. To demonstrate effectiveness of the scoring system, a retrospective evaluation of 21 stereotactic radiosurgery cases was conducted. The cases presented were planned on BrainSCAN (by BrainLAB Inc) utilizing 5-8 single-isocenter non-coplanar fixed beams collimated with micro multi-leaf collimator (MMLC). This index is designed to be utilized also for scoring of radiotherapy treatment plans obtained using various other forward and inverse planning techniques including IMRT, and multiple-isocenters non-coplanar arcs.

Results: For most of the cases evaluated, conformity and dose gradient were the two dominant components. The contribution from dose homogeneity was significant only in a few cases. All plans received very close to full dose coverage, and as a result the contribution from dose coverage component to the overall score was negligible. However, for inverse planning the contributions from dose coverage and homogeneity components to the overall score are expected to be quite more significant and variable.

Conclusion: The unified dosimetry index is demonstrated as an effective tool for scoring treatment plans. Utilizing the mean and standard deviation of UDI scores from a pool of treatment plans of similar modality and planning technique, we suggest a general guide for ranking treatment plans as “excellent”, “good”, “average”, or “poor”.