AbstractID: 4357 Title: Quantitative evaluation of conformal treatment plans: a new methodology.

Purpose: To establish a quantitative method for evaluation of 3D conformal and IMRT plans based on organ specific tolerances and target coverage assessment.

Method and Materials: We propose a novel evaluation criterion, which reflects both target coverage and overdoses in organs at risk (OARs). Critical Organ Scoring Index (COSI) is defined as: $COSI = 1 - (V_{>tol} / TC)$, where $V_{>tol}$ is the volume of OAR receiving more than tolerance dose and TC is the partial volume of target receiving at least prescription dose. To assess overall plan conformity we propose a 2D graphical representation of COSI vs. Conformity Index (CI). This method enables quantitative evaluation of competing plans in terms of multiple organs at risk. The COSI-CI plots were tested for evaluation of the following treatment sites: maxillary sinus and pancreatic tumors, to compare non-coplanar 3D and IMRT plans, and cavernous sinus meningiomas for stereotactic radiation with either dynamic arcs or IMRT.

Results: For all three sites COSI-CI plots assisted the physician in choosing the optimal plan, in terms of both target coverage and critical organ sparing. We verified each choice by analyzing individual DVHs and isodose distributions. Comparing our index to the widely used Conformation Number, we found that in all cases where there were discrepancies between CN and COSI in the choice of optimal treatment plan, the COSI-CI graphs led to the better plan.

Conclusion: We introduced a novel scoring index, COSI, which is a measure of both target coverage and critical organ overdose. Using the COSI index, we propose a two-dimensional representation of plan quality for comparison purposes. The method was found it to be a quick and reliable tool in aiding physicians in the choice of correct plans. The main advantage of the proposed methodology is its ability to simultaneously compare multiple plans as well as multiple critical structures.