AbstractID: 3743 Title: DVH Analysis: Consequences for Quality Assurance of Multi-Institutional Clnical Trials

Purpose: The submission of digital treatment planning data is essential for quality assurance (QA) of multi-institutional clinical trials involving advanced technology delivery techniques. Digitally submitted Dose Volume Histograms (DVHs), however, lack consistency due to algorithmic differences among Treatment Planning Systems (TPSs). To maintain consistency among cases in multi-institutional clinical trials, the Image Guided Therapy QA Center (ITC) re-calculates DVHs from submitted 3-D dose distributions and structure contours. In some recent trials involving high dose gradients, sizeable discrepancies have been observed between DVHs re-calculated by the ITC and DVHs submitted by participating institutions, making QA review of these data more difficult.

Method and Materials: Digitally submitted DVH data were collected from various commercial TPSs for protocols requiring digital data submission. Submitted structure volumes and DVHs were compared to those calculated by the ITC. Comparisons were performed for anatomic structures ranging in size from < 1cc (optic chiasm) to > 450 cc (Lung PTV).

Results: Agreement between submitted and re-calculated DVHs varied with the spatial sampling algorithms used by TPSs and improved as the volume of structures increased. Discrepancies in excess of 15% were observed for structures with volumes < 50 cc.

Conclusion: Discrepancies in DVHs calculated by various commercial TPSs have long necessitated re-calculation of DVHs by the ITC for consistent correlation of dosimetry with outcomes. With increasing dose gradients, however, small changes in computed volumes can result in significant differences between dose coverage statistics reported by the treating institution and those computed for QA review. As a result, apparently protocol-compliant plans may be judged to violate QA criteria when submitted data are reviewed. Our analysis of DVH discrepancies among various TPSs can help to set QA criteria for present and future protocols, especially those in which high dose gradients are required.

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