AbstractID: 11664 Title: QA of dose-volume histogram

Purpose: Among the various tools used in evaluating the quality of a treatment plan, dose-volume histogram (DVH) has become the most important plan evaluation tool. DVH has also been used in TCP and NTCP calculations to aid in plan selection. The accuracy of a dose-volume relationship of a particular structure depends on the size of the calculation dose grid, but more critically on the contouring of a structure and the dose algorithm used by a treatment planning system (TPS), especially in the presence of heterogeneities. This paper presents a comprehensive review on the calculation of DVH, and attempts to answer the following questions: (1) How do we verify that a DVH calculation is correct? and (2) What is the optimal grid size used in DVH calculation? **Materials & Methods:** DVHs of rectangular and cylindrical structures of known volumes are calculated for a single 6 MV beam setup. Various grid sizes (1.5mm-10mm) and calculation box sizes are studied. In addition, DVHs of various structures uploaded from VoxelQ software are calculated for 3 disease sites (Prostate, Lung and H&N) with different treatment planning systems (TPS). The volume information from the TPS is then compared with that from VoxelQ. **Results**: All grid sizes give the same total volume of a structure, even for such small structures as the lens (<0.5 cm^3). However, the shape of the DVH is grid size dependent. Grid sizes 2-4 mm yield practically identical DVHs, even for small structures and with the presence of heterogeneity. Largest volume difference (>50%) between TPS with pencil beam algorithm and VoxelQ is observed for small structures. VoxelQ provides a good estimation of the volume of a structure, whereas a TPS may not necessarily provide adequate volume information. **Conclusions**: DVH QA should be performed with known structures from CT-simulation as part of TPS commissioning.