AbstractID: 4678 Title: Equivalent Uniform Dose (EUD) Based Optimization for IMRT Treatment Planning

Purpose: To investigate whether IMRT optimization based on generalize equivalent uniform dose[1] (gEUD) objectives for target volumes and organs at risk (OAR) alike can lead to superior plans as oppose to multiple dose-volume (D&V) based objectives plans, for head and neck (H&N) and postmastectomy chest wall (CW) treatment sites.

Methods and Materials: We applied gEUD–based optimization to obtain IMRT plans for H&N and CW cancer patients and compared them with the corresponding plans a) optimized with stringent multiple D&V objectives and b) optimized with the standard in-house physician requested (phys) D&V objective. The D&V optimized plans were created with objectives based on the resultant gEUD plans with the same weight of importance, in order to drive the optimization as close to the gEUD plan as possible. The plan comparison at this point was based on DVH analysis.

Results: For all H&N and CW cancer patient in the study, we found that gEUD-based optimization led to superior sparing of OARs, even beyond the specified requirements, with the same or better target coverage when compared to either the phys-based or D&V-based plans respectively. In order to avoid dose inhomogeneities in the target volumes created by the gEUD-based optimization, use additional D&V objectives just for targets needed to be employed.

Conclusions: The general conclusion drawn from our investigation is that the EUD objective function uses smaller number of parameters compared to the D&V and, allows a larger number of solutions with different DVHs but the same EUD. Thus, a better plan was delivered with EUD compared to multiple D&V objectives optimization for either the H&N or CW treatment sites. The use of EUD can allow the plan evaluation to be based on both DVHs and EUD. Details of the method will be discussed.

[1]Niemierko A. Med. Phys. 26 (abstract), 1100 (1999).