AbstractID: 6398 Title: Superiority of Equivalent Uniform Dose (EUD)-based Optimization for Breast and Chest Wall IMRT

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 opposed to multiple dose-volume (DV) based objectives plans, for intact breast and postmastectomy chest wall (CW) cancer.

Methods and Materials: Four IMRT plans with six or seven coplanar 6-MV beams were prepared for a number of chest wall and breast CA patients (10 patients). The first three plans utilized our standard in-house physician-set of DV objectives (phys-plan), gEUD-based objectives for the OARs (gEUD-plan), and multiple, "very stringent", DV objectives for each OAR and PTV (DV-plan), respectively. The fourth was only beam fluence optimized plan (FO-plan), without segmentation and utilized the same objectives as in the DV-plan. The latter plan was to be used as an "optimum" benchmark without the effects of the segmentation for deliverability. Various dosimetric quantities, such as mean dose (D_{mean}) for heart, contralateral breast, and contralateral lung; and V_{20} (volume of organ receiving 20Gy) for the ipsilateral lung were employed to evaluate our results. .

Results: For all patients in this study, we have seen that the gEUD-based plans allow greater sparing of the OARs while maintaining excellent target coverage. The use of gEUD allows selective optimization of the dose for each OAR and results in a truly individualized treatment plan.

Conclusions: gEUD requires a smaller number of parameters for optimization and allows exploration of a much wider space of solutions, thereby making it easier for the optimization system to balance competing requirements in search of a better solution. Thus, gEUD optimization can be used to search for or evaluate plans of different DVHs with the same gEUDs. This method can be efficiently used in routine clinical IMRT treatment planning.

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