AbstractID: 9636 Title: Evaluation of IMRT plans from three treatment planning systems based on independent Monte Carlo dose calculation

Purpose: This work employs the Monte Carlo method to recompute the IMRT dose distributions from three TPS to provide a platform for independent comparison and evaluation of the plan quality in terms of target conformity and delivery efficiency.

Method and Materials: Three prostate cases were planned with Corvus, Xio and Eclipse TPS using appropriate optimization parameters and dose constraints. The plans were recalculated by Monte Carlo using leaf sequences and MUs for individual plans. Dose-volume histograms and isodose distributions were compared. Other quantities such as D_{min} (the minimum dose received by 99% of CTV/PTV), D_{max} (the maximum dose received by 1% of CTV/PTV), the volume of rectum and bladder receiving 65 and 40Gy (V_{65}, V_{40}), and the volume of femur receiving 50Gy (V_{50}) were evaluated.

Results: Special care must be taken to reproduce the dose distributions from different TPS due to their implementation of effective leaf positions. This may introduce up to a few percent differences in the absolute dose between treatment plans. The Monte Carlo results agreed with the dose distributions from all the TPS to within 5%/5mm. Both XiO and Eclipse plans show less target dose heterogeneity (smaller D_{max}) and lower V_{65} and V_{40} for the rectum and bladder than the Corvus plans. The PTV D_{min} is about 2Gy lower for XiO plans than Corvus and Eclipse plans while the XiO and Eclipse plans have slightly higher V_{50} for the femur than the Corvus plans. The Eclipse and XiO plans require significantly less MUs to deliver than the Corvus plans.

Conclusions: We have tested an independent Monte Carlo dose calculation system for dose reconstruction and plan evaluation. This system provides a platform for the fair comparison and evaluation of treatment plans to facilitate clinical decision making in selecting TPS and beam delivery systems for particular treatment sites.