AbstractID: 1148 Title: The Impact of tissue inhomogeneity corrections in clinical radiation therapy

The emergence of accurate model-based convolution/superposition dose calculation algorithms for clinical photon beams is encouraging institutions to switch to heterogeneity corrected treatment plans. We studied the impact of heterogeneity corrections in the treatment of breast, prostate, head and neck, and lung. We also studied the effect of non-ionic intravenous contrast. Optimal treatment plans for several representative patients for each disease site with and without heterogeneity corrections were generated to quantify differences in volumetric and ICRU defined prescription point doses. The dose difference in the target and critical structures for prostate and head and neck were found to be within a few percent (<3%). The dose difference for the breast patients ranged from 0-8%, with a mean difference of 4.2%. The uncorrected plan always resulted in higher delivered dose to the prescription point in the breast. The differences in the mean target doses for the 65 lung patients analyzed in this study ranged from 0-20% with an average of 6%. These large variations are attributed to patient-specific anatomy, location, and the density. However, for all lung patients there was no difference between corrected and uncorrected V_{20}, $V_{30,}$ $V_{40,}$ and V_{50} (p-values<0.0001) for the normal lung tissue. Finally, the non-ionic contrast (Iohexol) had negligible effect (<.2%) on the dose distribution for head and neck patients while the dose to the contrast-containing vessels was at most 2.2% different. These data suggests that the implementation of heterogeneity corrections have minimal effect in most clinical situations. The advantages of heterogeneity corrections far outweigh the disadvantages.