

AbstractID: 5028 Title: Analysis of 10,327 pre-treatment ultrasound localizations for 387 prostate cancer patients treated with conformal 3D external beam radiation therapy

Introduction: Daily 2D ultrasound-based target localization is routinely used for the patient setup in treatment of localized prostate cancer with external beam radiation therapy. A statistical analysis of a large data set can provide insight into target margin definition.

Methods and Materials: Data from 387 patients treated between 2001 and the end of 2005 was retrospectively analyzed. Every patient in the study received daily pre-treatment localization resulting in a total of 10,327 localizations, each comprising an isocenter shift in 3 directions: anterior-posterior (AP), right-left (RL), and superior-inferior (SI). The mean shift for each direction for each patient was computed from daily treatment records, and a mean of the means was used in the analysis. The standard deviations (SD) for each direction were also computed for each patient and averaged. The data was statistically verified for normality. The mean shifts represent systematic uncertainties in the patient setup, and the SD represent the random variations.

Results and discussion: The mean distances required for shifting the target to the required position were 6.1 mm posterior (4.4 mm SD), 2.1 mm superior (4.5 mm SD), and 0.5 mm right (3.6 mm SD). The 6.1 mm shift posterior is indicative of a non-negligible systematic uncertainty. There are several sources of this uncertainty, the major one being the difference in patient setup and procedures between the CT simulation and the treatment room.

Conclusion: Our study has revealed systematic inter-treatment uncertainties. The results support the use of up to a 15 mm PTV margin to encompass the CTV for 95% of our sample, if the ultrasound localization system were not used.