AbstractID: 11285 Title: Assessment of Dose Reconstruction Methods for Prostate Image Guided Radiotherapy Protocols

Purpose: Many dosimetric evaluations of prostate intrafraction motion disregard effects of treatment duration and translations of the surrounding body per fraction. However the probability of motion has been shown to increase with time and image guidance strategies transfer interfractional uncertainties from the prostate to the surrounding body. We evaluate the dosimetric effect of these two factors for an online image guidance protocol.

Method and Materials: Using intrafractional measurements from 22 IGRT patients, we calculated a probability density function (PDF) for each beam and for all beams combined excluding residual setup error. The effect of treatment duration was evaluated by computing cumulative dose using 2 convolution methods: population PDF and beam specific PDF. The calculations were performed on both a 30 cm diameter phantom and a patient. We evaluated the dose discrepancy introduced when PDFs were created using various motion magnitudes. The effect of relative motion from surrounding body was evaluated on the PTV dose discrepancy when the surrounding body was translated anterior and posterior by 0-2cm, and after 20 fractions with the surrounding body displaced randomly about the mean using a multivariate normal distribution with various σ.

Results: Differences in D_{99} between dose convolved with a beam specific PDF vs. a single PDF were ~0.3% of mean PTV dose. The discrepancy was ~5 times smaller than the dose discrepancy between static and convolved dose. Translation of the surrounding body increased dose to target, however the effect was small for clinically relevant translations (~0.3% change in D_{99} for ±5mm AP translation). Random translations of surrounding body over multiple fractions caused differences in D_{99} of ~0.3%, but with no apparent trend.

Conclusions: Time dependency and surrounding body motion have modest dosimetric effects (0.3%) to the target, and should be accounted for when high accuracy is desired for dosimetric evaluation of intrafraction motion.