AbstractID: 5643 Title: Assessment of patient setup variations with a commercial on-board imaging system: Is there a benefit to the patient?

Purpose:
Kilovoltage imaging with a commercial on-board imager (OBI) has been implemented in our treatment room for image-guided radiation therapy (IGRT). It holds great potential to improve treatment accuracy by reducing the setup errors. However, performing patient setup with OBI costs extra time and effort. Thus, it is important to demonstrate which patient will benefit from this new technique. We have assessed patient setup variations and its dosimetric effect.

Method and Materials:
We perform daily OBI setup on the prostate, head-and-neck (H&N), and central-nerve-system (CNS) IMRT patients. Our setup procedure: (1) Patients were aligned to their skin marks. (2) Orthogonal kV images were acquired with OBI. (3) Setup corrections were made by registering the kV images with DRR's based on bony landmark (H&N and CNS patients) or fiducial markers (prostate patients). Shifts larger than PTV margins were verified with MV portal imaging. Setup data from 2 CNS, 9 H&N, and 10 prostate patients were analyzed. For H&N and CNS patients, dose redistributions that incorporate each day's actual shifts were calculated by rigid-body translation.

Results:
(1) H&N and CNS patients: the random setup variations (standard deviation of the daily data) are 0.15cm, 0.32cm and 0.42cm in LR, AP, and SI direction. The systematic setup variations (the average) are 0.5cm. The largest shift is 1.2cm. (2) Prostate patients: average interfractional variations are 0.26 cm (LR), 0.24 (SI) and 0.39 cm (AP). (3) Dose redistribution in the postplans demonstrated that OBI setup corrections typically don't modify the CTV coverage but frequently affect sparing of the critical organs.

Conclusion:
Our random setup variations were found to be smaller than the PTV margin (5mm). With OBI setup corrections, we can further reduce the PTV margin safely. Our postplans have shown that OBI setup corrections can dramatically improve sparing of the normal structures.