AbstractID: 9474 Title: Dose guided patient setup improvement for head-and-neck cancer IMRT using cone-beam CT

Purpose: Accurate dose delivery for H&N IMRT is often compromised by changes in patient anatomy and setup. Verification of setup parameters that have a significant impact on dose delivery presents difficult QA problems. In this work a method was developed to monitor the dose delivery using daily cone beam CT.

Method and Materials: A virtual simulation procedure was developed to assure the region of interest is inside the field of view of cone beam CT. The treatment isocenter was placed accordingly for collision-free patient imaging and treatment. The prescribed isodose surface and other levels of interest in the approved IMRT plan were extracted as auxiliary structures for reference. Patient setup correction was based on vertebral body matching first. Subsequently skin matching between cone beam CT and reference CT was checked. An action level based on phantom studies was established for patient external surface mismatch.

Results: Patient external surfaces with beam intersections were acquired by planning on the region of interest for imaging, critical for calculating the delivered dose. The isodose surface shift due to mismatch of external surfaces could be estimated based on the beam path length, and this could affect the correction of patient setup. Repositioning of patient setup was required when an over 2 cm mismatch of external surfaces in any part of beam intersection was observed, which would result in an over 3% change in dose to PTV and critical structures.

Conclusion: Planning on the imaging volume is a key step to optimize the clinical workflow for geometric and dosimetric verification using cone beam CT. Displaying planned isodose surfaces is useful for patient setup correction. By imaging the patient's external surface we can monitor the delivery of the planned dose distribution and decide when re-planning is necessary.