AbstractID: 9155 Title: Consolidated Image Quality QA for Diagnostic CT and Radiotherapy Cone Beam CT

Purpose: As IGRT strategies evolve from localization to adaptive planning, it becomes more important to acquire guidance images of higher quality. We utilized a CATPHAN to subject radiotherapy CBCT images acquired under various conditions to the same rigorous tests and evaluation that diagnostic CTs undergo. This study reports on the evaluation of image qualities of diagnostic CT and radiotherapy CBCT and identifies the area of quality differences between the images. **Methods and Materials:** RT-CBCT scans were performed on Elekta XVI using pelvis scan settings on a CATPHAN Model 600. They were then compared to results from a GE Lightspeed16 multidetector CT scanner. The phantom contained modules allowing measurement of slice thickness, spatial resolution, low contrast resolution, Hounsfield Unit (HU) sensitivity and image uniformity. HU uniformity in the axial direction and geometric distortion were also measured. **Results:** For low contrast resolution tests, no targets could be clearly defined in the medium resolution reconstruction on RT-CBCT. Only three spheres could be seen with the high resolution reconstruction (not used clinically) compared to six on diagnostic CTs. Calculated thicknesses for a 1.0 mm slice varied from 1.33 to 2.45 mm. The HU sensitometry test showed large variation from accepted HU values of the targets. These variations were not linear or affected by the reconstruction method. Spatial resolution for clinical settings (medium resolution) was constant at three lp/cm and improved to ten lp/cm with the high resolution acceptance testing reconstruction. This is comparable to diagnostic CT resolution. Axial direction HU uniformity varied in a stepwise fashion as the uniformity module moved away from the CBCT isocenter. No measurable geometric distortion was found as a function of distance from isocenter. **Conclusions:** A consolidated CBCT QA procedure is feasible for monitoring changes in image acquisition systems over time for image quality evaluation in adaptive therapy.