AbstractID: 13989 Title: Use of Tomotherapy Exit Detector Data to Detect Changes in Patient Anatomy

Purpose: To demonstrate the use of TomoTherapy's exit detector data to identify changes in patient anatomy for GYN radiation therapy. **Methods and Materials:** A pelvic anthropomorphic phantom with six layers of 0.5 cm bolus was used to simulate a patient with excess body fat in the lower abdomen and pelvis. The phantom was CT-simulated, and a GYN helical IMRT treatment plan was created using TomoTherapy treatment planning system. The contours, treatment plan quality, and fractionation were consistent with our department protocols. Two fractions were delivered to the phantom with six layers of bolus. Subsequent fractions following the removal of 1 layer of 0.5 cm bolus to simulate patient weight loss were treated until all layers of bolus were removed. Following each fraction, the exit detector data was collected using TomoTherapy TQA software and analyzed in MATLAB. MVCT scans were for the length of the target volume were obtained following the removal of 1.5 cm and 3.0 cm layers of bolus, and TomoTherapy Adaptive software was used to calculate modified dose distributions and DVHs on the 'thinner' phantom. **Results:** The exit detector data for each fraction is a sinogram with a width of 640 (the number of exit detectors) and a length of $51 \times R_G$, where R_G is the number of gantry rotations required by the treatment plan. Analysis of sinogram differences and ratios (relative to the first fraction with all six bolus layers in place) yields 2-D plots useful for qualitative indications of weight loss. **Conclusions**: Anatomical changes are observed following simple analysis of TomoTherapy exit detector data. Simulated weight loss in a phantom suggests these data will be useful for monitoring anatomical changes in patients. Minor changes have been observed for one GYN patient thus far, and we have begun collecting data for more patients.