AbstractID: 8239 Title: Quantifying Interfractional Prostate Motion and Deformation Based on Daily kVCT to Determine Selection Criteria for Adaptive Correction Schemes

Purpose: To quantitatively characterize interfractional prostate motion and deformation using daily kVCT to determine the frequencies of different adaptive corrections and the selection criteria.

Method and Materials: Daily kVCT images for 20 prostate cancer patients treated with CT-guided repositioning using a linac and CT-on-Rails combo (CTVision, Siemens) were analyzed. The prostate, rectum and bladder were delineated for a total of 486 sets of CT images. The daily organ contours were compared to the planning contours after bony anatomy registration. Several quantities, including center of mass (COM), Dice's coefficient (DC), maximum overlapping rate (MOR), were calculated for each of the structures and were used to characterize the prostate motion and deformation and to indicate the need of performing an adaptive correction strategy.

Results: The daily prostate motion and deformation were mainly due to the daily variations in the volumes of the rectums and bladders. The largest differences in daily volumes was 650% for rectum and 820% for bladder. The mean prostate DC is 69.7±13.8% (1SD). In 76% of all cases, DC is lower than 80%. In 57% of all cases, MOR is greater than 85%; 39% is between 70% and 85%; only 4% is below 70%. These, combined with dosimetric data from a separate study, indicate that, on average, the current standard repositioning and the simple correction schemes (such as aperture morphing) are adequate for approximately 60% and 35% of fractions, respectively. The full-scope re-planning is required for approximately 5% of fractions. Criteria in terms of several daily anatomic parameters were suggested.

Conclusion:
Adaptive correction schemes for prostate interfractional changes may be selected based on anatomic quantities such as COM, DC and MOR as determined from the CT of the day. Specific criteria were suggested.

Conflict of Interest:
This work is supported partially by MCW Cancer Center Fotsch Foundation.