Purpose: To demonstrate the dosimetric benefits of using an online adaptive replanning scheme to address interfractional variations in radiotherapy of prostate bed.

Methods: We have previously developed an online adaptive replanning tool (RealART, Prowess Inc.) aiming to address interfractional variations including organ deformation and rotation. Using this tool, we analyzed a total of 102 daily pre-treatment CTs acquired using an in-room CT (CTVision, Siemens) for 10 patients treated with post-operative IMRT of prostate bed. The PTV was assumed to be the volume enclosed by the 95% prescription isodose surface generated for the conventional four field box. On each daily CT set, contours of the PTV, rectum and bladder were generated by populating the planning contours using an auto-segmentation tool based on deformable registration (ABAS, Elekta) with manual editing. Four plans were generated and compared: (1) IGRT (repositioning) plan by copying the original plan with aligning the anterior rectal wall from the daily CT to that of the planning CT, (2) IGRT plan by copying the original plan with aligning the surgical clips, (3) online adaptive plan by tailoring the original plan to conform to the anatomy of the day, and (4) a new plan re-optimized based on the daily anatomy.

Results: The adaptive and re-optimization plans are in general superior than the two repositioning plans in terms of both target coverage and critical structure sparing. For example, the averages of dose volume quantities for all daily CTs are: rectum V45Gy 55.7Â±18.0% (one standard deviation), 57.3Â±17.5%, 48.2Â±11.8%, 42.5Â±9.6%; rectum V60Gy 31.8Â±20.3%, 34.0Â±16.6%, 22.6Â±9.7%, 16.5Â±7.4%; bladder V45Gy 30.0Â±11.9%, 39.5Â±24.2%, 37.6Â±16.8%, 36.5Â±16.2%; bladder V60Gy 17.4Â±9.2%, 25.4Â±18.1%, 24.7Â±12.7%, 23.9Â±12.0%; PTV V100 81.9Â±16.6%, 88.7Â±7.9%, 92.9Â±4.6%, and 94.6Â±2.4% for the above (1)-(4) plans, respectively.

Conclusions: The online adaptive replanning scheme is effective to account for interfractional variations in post-operative radiotherapy of prostate bed.

Funding Support, Disclosures, and Conflict of Interest:

This work is supported partially by MCW Cancer Center Fotsch Foundation.