Purpose: Summation of daily DVH from KV-cone beam CT (KV-CBCT) to obtain a composite dose volume histogram (DVH) is challenging. Directly translating the planned dose matrix according to measured daily prostate displacements provided a common reference frame for a composite DVH from daily DVHs. The purpose of this study is to evaluate the shifting planned dose matrix method compared to the dose recalculation method using daily KV-CBCT.

Methods: Six patients, who received concurrent IMRT treatment for prostate and pelvic lymph nodes with 124 daily CBCTs, were selected for this study. Contours for CBCT's were transferred from the planning CT after soft tissue registration for prostate and bony registration for pelvic lymph nodes. Using the same planning beam configurations, we re-calculated doses for these CBCTs after shifting to corrected treatment isocenters. The planned dose matrix translation was performed by an in-house program written in MATLAB and incorporated with Computational Environment for Radiotherapy Research (CERR) software. The corresponding daily DVH was obtained by shifting the planned dose matrix according to shifts of treatment isocenters. To compare these two methods, selected endpoint doses for tumor targets and sensitive structures were extracted from DVHs.

Results: For prostate displacement less than 1.5 cm, the dose matrix shifting method resulted in 93% and 98% fractions within 5% differences from the recalculation method for D95 of prostate and pelvic lymph nodes, respectively. These numbers decreased to 58% and 71% when 2% dose difference criterion was used.

Conclusions: Allowing 5% daily dose difference, shifting planned dose matrix provides effective means to evaluating daily dose changes for concurrent IMRT treatment for prostate and pelvic lymph nodes. The utility of this tool is to provide a common coordinate frame to obtain composite dose distributions.