Purpose: To verify the applicability of robust fluence approach in IMRT under clinical daily shifts.

Method and Materials: Clinical daily setup shifts throughout the prostate IMRT treatments have been acquired and analyzed with OBI and CBCT images. Two patient shifts have been chosen to represent the “good” and “bad” scenarios – more and less of Gaussian-like distributions of the shift statistics with average standard deviation of 3.5-4 mm. The robust fluencies have been obtained by deconvolution of the static fluence with the corresponding shifts approximated by a Gaussian distribution. To each scenario the doses taken into account the shifts of a typical AP field to a water phantom have been calculated with the static fluence and corresponding robust fluence. The static dose without shifts which is the desired dose was set as the benchmark for comparison.

Results: The robust fluence approach can achieve good dose conformality to the static dose, especially for the Gaussian-like distribution of the shifts. For the shifts having large deviation from the Gaussian distribution (although it is statistically rare) the dose by robust fluence suffers a shift which can be covered by a 2.5 mm margin which is much smaller than a margin-only approach to keep the same dose conformality for this scenario. This conformality provides the possibility to remove or reduce the margin usually added to target to take into account the geometrical uncertainty.

Conclusions: Robust fluence approach is promising to remove or reduce the CTV-PTV margin and consequently reduce the mean dose to surrounding normal tissue.