Purpose: Patient-specific IMRT quality assurance typically compares measured and calculated dose distributions in-phantom. The clinical importance of disagreement between measured and calculated dose is often difficult to interpret. Recently, software has been developed (3DVH Sun Nuclear, Florida USA) that calculates the “delivered” dose distributions in patients by perturbing the calculated dose using errors detected in planar dose measurements. The aim of this work was to validate the accuracy of 3DVH versus commercial treatment planning software (Varian Eclipse 8.9).

Methods: 17 DMLC prostate IMRT treatment plans were modified by Matlab script by adding randomly distributed positional errors of 1 or 3 mm in the planned MLC positions. These modified plans were delivered to a 2D diode array (MapCheck2, Sun Nuclear). Measured doses were compared to the dose planes from the original or recalculated MLC modified plans and 3DVH calculated a “delivered” dose in the patient. DVH comparisons were made based on mean dose and D99 for the PTV, and mean and maximum dose for the bladder and rectal for each patient and MLC error.

Results: Paired Data showed good agreement for planning system and 3DVH dose volume histograms for both targets and organs at risk for both modified and unmodified plans, regardless of MLC error induced. Structure mean dose values as measured for PTV, Bladder and Rectum agreed to within 1% and dose maximum data showing a discrepancy of 2%.

Conclusions: 3DVH is a potentially useful tool to calculate delivered dose distributions during patient specific IMRT quality assurance. The 3DVH data allows the user to analyze the difference between planned and delivered dose to given structures. By introducing random delivery errors, we showed that the 3DVH software was able to detect small fluence changes. This demonstrates the accuracy of 3DVH software against a commercial treatment planning system.