Purpose: A lower than ideal tolerance limit is used in intensity-modulated radiation therapy quality assurance (IMRT QA) with a 2D diode array due to passing rate fluctuations. The objective is to identify patterns in the passing rates to predict sources of uncertainty that can affect treatment delivery, for example, the need to re-calibrate the multileaf collimator when the passing rates start to decrease.

Methods: Five complex clinical prostate IMRT plans were evaluated with a 2D diode array. The QA for each plan was repeated five times during one and a half month period. One of the plans was randomly selected and repeated the same day five consecutive times. The planar doses calculated by the treatment planning system were compared to the measurements of the 2D diode array. The individual passing rates per beam per plan were compared.

Results: The average passing rate for each plan ranged from 94% to 97%. While the average percent difference of this ranged between -7.67% to 17.61%. Additionally, the minimum and maximum standard deviation among all beams was 0.13% and 9.63% respectively. We also compared the standard deviation of a plan QA repeated during different days versus a plan QA repeated during the same day. For the former the highest standard deviation was 6.05% while for the later 0.21%. We noticed that the largest discrepancy between the passing rates was for angles at around 155° and 205°.

Conclusion: These results show some inconsistency in the IMRT QA passing rates from one day to the next. Moreover, lower passing rates for a specific angle like the ones shown here can represent possible mechanical or tuning problems with the linear accelerator at these specific locations. Early identification of these sources of uncertainty can greatly improve the precision of the treatment delivery.