

## AbstractID: 13518 Title: Using control charts to analyze the patient specific Nasopharyngeal Carcinoma IMRT QA

**Purpose:** Control charts are an effective statistical tool to control process variation by allowing the separation of systematic causes from random causes of error. In this work, we investigate the use of standard deviation (SD) charts and average (X-bar) charts to identify systematic errors in patient-specific IMRT QA.

**Method and Materials:** Patient-specific IMRT QA was done for 270 nasopharyngeal carcinoma plans using a MapCheck 2D diode array. All MLC-based IMRT plans were generated using the Eclipse planning system for 6 MV on a Varian Clinac 21 or 23 EX linear accelerator. The plans of the patients during March 22, 2007 to February 10, 2010 were observed. Five points at center and 3 cm upper, lower, right, and left (except the high dose gradient point) from MapCheck were compared to those points from Eclipse. The dose differences between measurement and calculation were prospectively plotted each on X-bar and SD control charts. The first fifty points were used to calculate the control limits. The comparison was also done after out-of-control points were removed and the limits were recalculated.

**Results:** For the X-bar control chart, the center-line, upper and lower control limits are: -0.50%, 3.36%, and -4.36%, respectively. For the SD control charts, the center-line, upper, and lower control limits were 2.70%, 5.65%, and 0%, respectively. The systematic errors could identify setup error, incomplete field exposure, and wrong energy for calibration factor, while SD chart could identify setup error and MLC interlock in some field.

**Conclusion:** The SD chart is used for the purpose of identifying deviation in individual, while X-bar chart is used for the population. The X-bar chart gives more details of error than the SD chart. However, using both X-bar and SD charts could provide more information about IMRT QA.