AbstractID: 7212 Title: Developing a convenient and effective IMRT QA procedure using MLC dynalog files

Purpose: To develop a convenient and effective patient-specific IMRT quality assurance (QA) procedure utilizing MLC dynalog files.

Method and Materials: IMRT plans are delivered with multi-leaf collimators (MLC). The complexity of MLC motion and patterns may cause leaf positioning and M errors that lead to IMRT dose delivery errors. MLC dynalog log files record actual MLC leaf motion and MU fractions. MLC log files are taken for the IMRT plan delivery. In-house software is used to analyze the log files. MLC leaf sequence files are rebuilt from MLC log files and used for Monte Carlo simulation to calculate plan delivery error. MU-weighted position-MU (WPM) is defined to quantify the dose error caused by MLC leaf position errors and MU errors. Mapcheck is used to verify the dose error calculation.

Results: Ten IMRT plans for prostate and head-and-neck cancers with different field sizes were included in this study. The plans were generated as real IMRT QA plans and delivered in both sliding-window and step-and-shoot modes on three Varian machines. The average field size for the prostate plans was 9x6 cm^2, and 14.5x16.7 cm^2 for the head-and-neck cases. WPM averaged over prostate plans was -0.2 % for both sliding-window and step-and-shoot modes, while Monte Carlo showed a 0.5 % dose difference between the plan and measurement, and Mapcheck measurement gave a dose error of 1.0 %. For the head-and-neck plans, WPM was 1.74 % in average, and the dose error from Mapcheck was 0.5 %, which was comparable to 0.8 % from Monte Carlo. The variations of WPM between three linacs were less than 0.08 %.

Conclusions: IMRT QA can be simplified utilizing MLC log files. WPM can be directly used to estimate the IMRT dose delivery error caused by MLC motion and MU errors.