AbstractID: 4792 Title: A planar dose calculation algorithm for IMRT quality assurance

Purpose: To develop a fast algorithm for independent planar dose verification of IMRT plans delivered with an MLC as part of the IMRT quality assurance procedure.

Methods and Materials: A fast empirical IMRT planner dose calculation algorithm was implemented. In-air output factors were used to model the source distribution, which is used to calculate the planar fluence at the detector plane based on the projected source integration on the source plane shaped by the combined positions of the jaws and MLC. The planner dose is obtained by convolving the planner fluence with a kernel, which is modified from the published kernel by fitting to standard field profiles at the specified depth. MLC-introduced dosimetric effects, such as leaf transmission, rounded leaf end, and tongue-and-groove effects were accounted for explicitly by empirical fits to measured data. The algorithm was applied to two linac models with completely different head designs: a Varian 2100 C/D with 120-leaf MLC and an Elekta Synergy S with Beam Modulator (40-leaf MLC with no backup jaws). The calculated planner dose distributions were compared with both the MapCHECK measurements and with calculations using a commercial planning system (Pinnacle^3, version 7.6) for several clinical cases. Comparison was done using the MapCHECK software in absolute dose mode with 3% dose error and 3-mm distance-to-agreement criteria.

Results: The passing rate for most of the cases is above 95% with most of the failing points in the field edges. The calculation time for each field is about 5 sec using a personal laptop computer and is independent of field size.

Conclusions: A fast algorithm has been developed for independent planar dose verification of IMRT plans as part of the IMRT quality assurance procedure. The algorithm was applied to two linac models with excellent results.

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