

**Purpose:**

This work investigates a simple end-to-end QA procedure for the entire radiotherapy process from treatment simulation, treatment planning to treatment delivery.

**Methods:**

This procedure utilizes a commercial QA phantom, the IBA MatriXX Evolution with the MULTICube. The initial establishment of this QA procedure requires some baseline data according to the following steps: (1) CT scan the phantom, (2) transfer the CT data to all TPS, (3) generate typical IMRT/VMAT plans, (4) transfer all treatment plans to the R&V system, (5) set up the phantom using lasers and other target localization devices, (6) deliver the plans to the phantom, and (7) analyze/record the planned/delivered doses and Gamma analysis passing rates. This procedure is performed at monthly and annual QA to repeat all steps above except for (3) where original plans are used to calculate dose distributions on new CT scans. The new measured doses will be compared with the baseline data.

**Results:**

This procedure checks the entire radiotherapy process including CT scanning, CT#-to-ED conversion, dose calculation, TPS-to-R&V data transfer, patient setup/target localization with the lasers, OBI, EPID, and CBCT, and linac delivery. The baseline Gamma passing rates were 99%(3%/3mm) and 96%(2%/2mm), respectively. In the subsequent QA measurements, any >3% reduction in the Gamma passing rates will trigger a step-by-step examination of the entire process to find the cause. We have tested our procedure by mimicking setup/localization misalignment by 2mm, 5mm and 10mm and found up to 4%, 10% and 14% passing rate reduction, respectively.

**Conclusions:**

The end-to-end QA procedure is practical and efficient for checking the entire radiotherapy process. Baseline data can be established after the initial calibration and commissioning of all the software/hardware components and the end-to-end QA procedure can check the accuracy/consistency of the entire radiotherapy process monthly/annually and after major software/hardware upgrade or component replacement.