AbstractID: 13200 Title: The use of a commercial quality assurance device for daily output and positioning checks of three image-guided stereotactic positioning systems

Purpose: To develop a simple, comprehensive daily QA program for a linac and three image-guided stereotactic positioning systems (IGSPSs) and to summarize the results over extended periods.

Method and Materials: The daily output check on a linac is commonly performed utilizing a chamber embedded in a phantom. Three IGSPSs; the AlignRT 3D surface imaging system, the Frameless SonArray System (FSA), and the Elekta kV CBCT are installed in a treatment room housing an Elekta linac. For daily QA, therapists routinely perform dosimetric checks of the linac and geometric accuracy tests of the IGSPSs using different vendor-provided phantoms. We investigated the feasibility of using the commercially available Sun Nuclear DailyQA3^{TM} (DQA3) phantom to perform this task. The QA program encompasses three components: dosimetry, mechanical, and imaging geometry.

Results:The coincidence of the isocenter coordinate for AlignRT, FSA, and the linac mechanical isocenter was within 0.7 mm/0.6° of that of the CBCT system. We used the three imaging systems to inspect the laser alignment and optical distance indicator, which each localized to within 0.5 mm. For gantry and table angles of 0°, the mean displacement vectors were within 0.4 mm and 0.1° for each axis between systems. The differences in couch angles using AlignRT and FSA were within 0.3°. Over a period of eight months, the output remained within 2%, the photon and electron energy remained within 2%, and the symmetry and flatness remained within 1%. The field size and light-radiation field coincidence were within 1mm. The total measurement time for each QA session took 20 minutes or less.

Conclusion:The use of the DQA3 simplifies daily QA measurements, shortening the set-up time, and eliminating systematic errors introduced by switching phantoms. Clinical use of this device has improved the efficiency and thoroughness of our daily QA program for both the linacs and the IGSPSs.