AbstractID: 8757 Title: Calculations of Organ Doses from Cone-Beam CT IGRT Procedures Using a Suite of Patient Phantoms

Purpose: Widespread uses of Computed Tomography (CT) and image-guided radiation treatment (IGRT) can significantly increase the cumulative exposure to health tissues. AAPM TG-75 was formed to compile data on imaging exposures and to identify ways to optimize the imaging procedure. To address the lack of organ doses and effective doses assessment in the IGRT imaging procedure, this paper describes a study to use a Monte Carlo based method to simulate kV and MV cone beam CT (CBCT) scanners and then calculate organ doses and effective doses. **Method and Materials:** This paper utilizes a whole-body adult male phantom called the VIP-Man, and Adult Male and Female that are adjusted to match with 50^{th} percentile ICRP average population. The MCNPX code is used to simulate CT scanners and finally calculate doses. Several IGRT procedures are considered to demonstrate how this method can assess and compare various protocols. **Results:** For the VIP-Man phantom, the effective dose for kV CBCT (assuming total exposure of 1350 mAs) is about 9.5 mSv for the two anatomical sites while the effective dose for MV CBCT (assuming a total of 6 MU) ranges from 5.10 mSv for the H&N case to 8.39 mSv for the prostate case. For different procedures, the effective dose data can be adjusted accordingly. **Conclusion:** With realistic patient phantoms and imaging scenario, organ dosees can be obtained by Monte Carlo simulation, and consequently effective doses have been calculated. The results show that showed that the effective dose is a useful quantity for the comparison of the performance and patient safety between kV CBCT and MV CBCT. These information can aid the assessment of radiation risk to the patient from imaging procedure. This study demonstrates the feasibility of determining detailed organ doses for various IGRT related cone-beam CT procedures.