Purpose: To detail and compare data collected during RPC onsite dosimetry review visits at proton therapy centers.

Methods: The RPC has established a complete review process for proton therapy institutions wishing to participate in NCI-funded clinical trials that includes an on-site dosimetry review visit performed by the RPC. During the visit, the RPC takes measurements that include CT# vs. relative stopping power (RSP) conversion, beam output, depth dose, lateral profiles, QA procedure reviews and anthropomorphic phantom irradiations. The RPC reviewed beam output, depth dose and lateral profiles for 5 specific anatomic treatment sites, reference, prostate, lung, brain, and spine as compared to the institution's measured or treatment planning-derived values. In addition, the RPC has compared results from each institution's proton prostate phantom irradiation.

Results: All of the institutions visited had RPC/Institution output ratios that ranged between 0.95 - 1.02 where the acceptance criterion was ±5%. For the CT# to RSP comparison, there was a larger variability. Only two institutions agreed within five percent of the recommended values, while the other five institutions had disagreements of up to 20 percent in the high density (high CT number) region of the conversion curve that may have a clinical impact on dose delivery. For the prostate phantom irradiation, 3 institutions failed to meet the RPC's ±7%/4mm acceptance criteria on the initial attempt, but in the end all 7 sites met the criteria.

Conclusions: The proton beam output for 7 proton centers, as measured by the RPC, is comparable (±5%), however, there are large discrepancies in the CT# vs RSP conversion curves used from institution to institution. As a result of the RPC onsite dosimetry review visits, several institutions have modified their procedures and dosimetry parameters to improve proton therapy delivery for NCI funded clinical trials.

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