AbstractID: 10952 Title: Credentialing SBRT Clinical Trials: Is there a Flaw in the Current Methodology?

Purpose: While the authors strongly support the concept of credentialing and formal QA to evaluate the ability of institutions to perform advanced technology protocols, we question the methodology currently used by the Radiological Physics Center (RPC) for SBRT as an extremely high failure rate is being seen. We have performed a series of tests to replicate the components of the RPC lung phantom thus giving insight into why institutions fail.

Materials and Methods: The Quasar phantom was used to simulate a lung cross section. Firstly an end-to-end test was performed with the phantom scanned and simulated for treatment with 13 small, conformal fields, with a ionization chamber placed both centrally and then in the lung. Then a simulation of the RPC phantom planning procedure was performed where a homogeneous plan was created, the phantom was treated, then the heterogeneous calculation was performed and compared with measured dose. A film test was performed to show that the spatial distribution within the phantom was accurately predicted by the planning system. Finally an assessment was made of the changes that occur to the SBRT plan on the RPC phantom when the homogeneous dose distribution is recalculated under heterogeneous conditions

Results: Every comparison of the dose measured with an ionization chamber against the planned dose was within 3% and the film test passed the department's IMRT test criteria of 3% / 3mm. Dramatic differences in dose gradient and target coverage were seen between the homogeneous and heterogeneous RPC plans.

Conclusions: Tests can readily be performed with commercial materials to validate SBRT delivery. Large differences are seen in plans when heterogeneity corrections are used to correct homogeneous plans of small field lung targets. This may reveal a flaw in the methodology of the RPC testing procedure, leading to a high failure rate amongst national institutions.