AbstractID: 7954 Title: The challenge for clinical RT trials -I

Clinical trials rely on accurate dose reporting, both for the planning target volumes and organs at risk (OAR). Until recently, clinical trials have not mandated that heterogeneity corrections be applied in dose calculations. Therefore history of prescription and reported doses has been for homogenous water equivalent media. The reticence is attributed to lack of confidence in commercial treatment planning algorithms and in lack of direction as how to change prescriptions when accounting for heterogeneous media. Thorax irradiation is the most challenging example of where corrections and prescription changes are difficult but necessary. Two well reported studies, RTOG-8808 and RTOG-9311, required complementary parallel calculations performed. One set was the prescribed and treated homogeneous (water) based calculations, and the other was retrospective heterogeneous CT-based calculations, but using the homogeneous based MU. The calculations demonstrated major variations in the doses that would have been reported depending if heterogeneity corrections were exclusively used. This was confirmed by dosimetric studies showing the failure of algorithms of the 1990s, particularly in regions of non-equilibrium. As OAR, particularly lung volume, were often the limiting factor, dose calculations to the lung itself had to be accurate. High energy-small fields had the largest deviations. The commercial introduction of superposition and Monte Carlo algorithms has remedied the situation by providing accurate calculations, provided they are implemented properly. Simultaneously, publication of AAPM's Report of TG-65 (Inhomogeneity Corrections) gave direction to physicists as how to work with clinician partners to transition to correction based plans and change prescriptions accordingly.

Learning Objectives

From this lecture the physicist will learn;

1) *the history of corrections for clinical trials,*
2) *progression of algorithms,*
3) *methods for making the transition to using heterogeneity corrections*