AbstractID: 4020 Title: Transition to Heterogeneity Corrections

With the publication of the AAPM's TG-65 report on inhomogeneity corrections for photon beams, physicians and physicists must clearly understand how implementation of such corrections impact dose prescriptions. The TG report details the physics of the heterogeneity algorithms, methods to evaluate these prescriptions, limitations, and most importantly, how to implement. The report gives clear recommendations as to the dialogue needed before implementation takes place. A clinic should perform simultaneous plans by planning and treating the patient with no corrections applied. A simultaneous plan is generated that applies the correction 'after the fact', thereby leaving the homogeneous (and therefore given doses) intact. This will educate the staff as how prescriptions may (or may not) be altered according to the differences observed. In addition, planning volume margins may be affected according the algorithms' ability to calculate penumbra in the presence of inhomogeneous media, particularly lung. In addition, classic beam arrangements may need to be scrutinized due to the impact of increased exit dosing observed with corrections applied.

MDAH found that implementation of inhomogeneity corrections was fairly easy to accomplish, even in a busy clinic. Accounting for heterogeneity resulted in better PTV coverage by changing beam weighting, without significantly changing isocenter dose. The distance from PTV to block edge also increased in some situations. Failure to account for tissue heterogeneity could lead to dose calculation errors, particularly to the PTV, which often results in significant underdosing. Accounting for tissue heterogeneity using many commercially available algorithms changes the dose to the PTV much more than will the future use of Monte-Carlo-based dose calculation algorithms. Heterogeneity corrections are particularly important when using IMRT, particularly in lung cancer treatment. They concluded that the benefits of accounting for tissue inhomogeneity vastly outweigh the minor difficulties with its implementation, will result in more accurate calculation of dose distributions, and hopefully in better outcomes for patients. The use of heterogeneity corrections also allowed the use of higher energy photon beams in 3D planning, because of greater confidence in dose calculation accuracy.

This course will give direction along with caveats in applying inhomogeneity corrections from the perspective of physics and physicians. In addition, there will be a

review of current algorithms commercially available, along with a historical perspective on how various stages of algorithms impacted the radiotherapy community on evaluating and using inhomogeneity corrections.

Educational Objectives: The physicist will learn -

1) the details of TG-65
2) details on commercially available algorithms including limitations
3) the MDAH approach to implementing corrections
4) a historical perspective of studies on evaluating corrections
5) TG-65's recommendation plan for a clinic's implementation.