AbstractID: 14440 Title: A Primer on Proton Therapy

The use of protons for radiation therapy offers theoretical advantages. Compared to external beam photon radiotherapy, proton therapy enables lowering of the integral dose to the patient due to the finite range of protons. However, proton therapy is less tolerant than photon therapy to uncertainties in both treatment planning and treatment delivery. Therefore, it is important to understand the potential sources of dosimetric uncertainties, the impact of these uncertainties in the accuracy and conformity of dose delivered to patients, and potential strategies that translate physical advantage of proton therapy into a maximized dosimetric benefit in the patient.

One unique difference between proton therapy and photon therapy is that the dose distributions can be significantly affected by changes in anatomy and nearby tissue heterogeneities along proton beam directions. Photon-based PTV is purely based on a geometric concept which disassociates spatial dose distribution from the movements of the patient and internal organs. The traditional PTV concept is inadequate for proton therapy, especially in the presence of setup errors, motion, and anatomical variations.

This session will provide an overview of the state-of-the-art in proton therapy. We will discuss in detail the management of planning and delivery uncertainties for both passively scattered proton therapy and the newest spot-scanning proton therapy techniques.

Educational Objectives:

1. Understand the state-of-the-art on proton therapy
2. Understand the need for knowing potential sources of treatment planning and delivery uncertainties in proton therapy
3. Learn strategies to mitigate both proton therapy planning and delivery uncertainties