AbstractID: 7990 Title: Quantification in 3D PET/CT Imaging

In oncology, imaging studies play an increasingly important role in assessing patients' response to treatment. Serial CT scans of a patient are evaluated for changes in the number and size of tumors, while serial PET scans are assessed for changes in the metabolic activity of the lesions. The advent of combined CT and PET systems streamlines the fusion of these anatomic and functional images. However there are many confounding effects that complicate quantification in 3D PET/CT imaging.

This lecture will review these sources of variability in the data, grouped into three broad categories: patient-related factors (e.g. dose, uptake time before imaging, blood glucose level, body habitus); instrument-related factors (spatial and energy resolution, sensitivity, data acquisition mode (2D or 3D), attenuation and scatter correction method, image reconstruction algorithm, respiratory and cardiac motion-correction method); and operator-related factors such as acquisition and reconstruction protocols, instrument and image quality control, instrument calibrations, and method of image analysis. The impact of these variables on quantification will be discussed, with particular emphasis on how to minimize those that are controllable.

The presentation will conclude with a review of current efforts by government agencies, professional organizations, academic institutions, and sponsors of multicenter trials to grapple with the additional complexities that arise from combining data from multiple patients at multiple sites. Research partially supported by the American College of Radiology Imaging Network (ACRIN).

Educational Objectives:

1. Understand the scope of the problems inherent in using PET/CT imaging to detect changes in patient response to treatment.
2. Understand the factors that affect the variability and accuracy of PET/CT quantification.
3. Understand the importance of minimizing variability in order to enhance the ability to identify non-responders to treatment over ever-shorter time intervals.
4. Understand the efforts currently underway to standardize acquisition and processing protocols and to monitor equipment performance through credentialing and periodic quality control checks.