

AbstractID: 7938 Title: Quantification of PET and SPECT Biomarkers

The metabolic information provided by PET and SPECT has great potential for diagnosing and staging disease, customizing treatment doses for a particular patient, and tracking a patients' response to treatment. However, quantifying the information in these images remains challenging. This presentation will review the sources of variability in the data, grouped into three broad categories: patient- related factors (e.g. body habitus, medications); scanner-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, along with methods for minimizing 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. Particular emphasis will be placed on the author's experience as a member of the PET Quality Assurance Committee at the American College of Radiology Imaging Network (ACRIN) PET Core Lab, which has credentialed more than 100 PET scanners for participation in quantitative PET multicenter trials.

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Educational Objectives:

1. Understand the factors that affect the variability and accuracy of PET and SPECT biomarker quantification, with particular emphasis on scanner-related parameters.
2. Understand the importance of minimizing variability in order to enhance the ability to distinguish signal from noise.
3. Understand the efforts currently underway to standardize acquisition and processing protocols and to monitor equipment performance through credentialing and periodic quality control checks.