Purpose:PET performance measurements were done on 4 PET scanners from 3 manufacturers; GE, Siemens, Philips. This presentation compares the test results and evaluates their impact on clinical studies. Accuracy of SUV determination is compared between the different manufacturers.
Methods:Testing of PET performance included quantitative analysis of spatial resolution, count rate, sensitivity, uniformity, and accuracy of corrections. Test results were tabulated for comparison. Additional testing included imaging using the Jaszczak Deluxe PET phantom (Data Spectrum, NC). Testing of SUV accuracy was performed using F-18 activity (range of SUVs, 2 -20) within cylinders and background to simulate typical tumor/normal tissue ratios. Images were acquired using parameters optimized for clinically interpretable image quality. The maximum SUV for each cylinder was recorded using a consistent region of interest. Curves were developed of SUV versus volume to evaluate partial volume effect. The SUV of the largest diameter cylinder (2.5 mm) was used to develop a curve of expected versus measured SUV values.
Results:Significant variability is demonstrated between each PET scanner. The image quality and SUV accuracy varied depending on acquisition and reconstruction protocols. The GE 2D, 3D and Philips Non-ToF were the most accurate in predicting expected SUV for all activity concentrations. The Siemens HD was 9-17% higher than expected, increasing as SUV value increased. The Philips ToF was 5-19% lower than expected, decreasing as SUV value increased (attached curve of measured versus expected values).
Conclusions:While image quality is often improved with PET scanner options, the quantitative component of interpretation, SUV, varies with reconstruction algorithm. This can be of concern when patients are scanned on different PET scanners during the course of their disease. Optimizing image quality and developing an SUV calibration curve has allowed us to maintain confidence in the use of the SUV from different PET systems.