AbstractID: 6396 Title: A Machine Independent Threshold Method for PET Target Delineation

**Purpose:** We have developed a PET image segmentation method for accurate target delineation and volume estimation and compared the performance with other published methods without prior volume estimates from CT or MR.

**Method and Materials:** Eight spheres containing a uniform concentration of FDG and ranging in size from 1 cc to 95 cc were imaged in a Jaszczak phantom. The spheres to background concentration ratio were variable from 3:1 to 12:1. Our hypothesis is that the optimal threshold depends on target volume and target/background concentration ratio and can be derived only from PET image. However, the target volume and concentration ratio both can not be obtained from image directly. For this work, a mean intensity segmentation method was used to obtain an initial target volume. Based on this initial volume estimate and source/background ratio, the concentration ratio was computed. This ratio combined with initial volume provided enough information to derive desired threshold to segment PET image and outline target volume. These volumes were compared with the actual measured sphere volumes. To determine the performance of this method, we also compared the segmentation results from adaptive thresholding, mean SUV and spatial derivative segmentation methods. Preliminary patient studies of lung lesion were also conducted.

**Results:** The overall average error for sphere volume estimation was **8.7%**. The performance was robust and uniform for all spheres in wide range of size and concentration ratio. Preliminary patient studies showed substantial clinic utility.

**Conclusions:** This method results a high-quality and uniform performance for PET image segmentation with acceptable clinic delineation. The method was shown to be superior compared to other methods in phantom studies overall, especially for small volumes.