Application for QIBA Project Funding

Title of Proposal: Quantifying variability in measurement of pulmonary nodule (solid, part-solid and ground glass) volume, longest diameter and CT attenuation resulting from differences in reconstruction thickness, reconstruction plane, and reconstruction algorithm.		
QIBA Committee/Subgroup: qCT		
NIBIB Task Number(s) which this project addresses: 5-7		
Project Coordinator or Lead Investigator Information:		
Last Name: Garg	First Name: Kavita	Degree(s): MD
Institution/Company: University of Colorado Denver, Department of Radiology		

Project Description:

Recently released initial results of the National Lung Screening Trial (NLST) show mortality reduction by 20% in the CT arm compared with CXR. If screening becomes widely adopted in those at high risk, follow-up investigation of positive scans will impose a major burden on the health care system. In patients with positive scans, a risk stratification strategy or quantitative analysis of lung nodules could reduce this burden by reducing the rate of follow-up in those who are determined to be at lower risk. Quantitative CT analysis for solid nodules has been attempted previously, however there is no significant data available for subsolid nodules. Adenocarcinoma is the most common histologic type of lung cancer which presents as a spectrum of nodules of varying attenuation including subsolid types. With better understanding of histopathology, it is now recommended that thin-section CT technique should be used for part solid lesions to record the size of a) the solid component and b) total tumor size including both solid and ground-glass components. Changes in shape, size and attenuation help determine follow-up and when intervention is appropriate. However, there are technique- and patient -related factors which potentially result in measurement variation of subsolid nodules. We have also observed significant nonlinearity in CT attenuation values (0-100HU), varying between models and devices.

This project attempts to find the causes and degree of variance in the measurement of part solid nodules. Two readers will measure nodule attenuation (HU and density histograms), volume and diameter per RECIST independently in random fashion. Lung phantom scans on a wide selection of CT scanners will be performed to assess inherent variability in nodule density between systems.