QIBA COPD/Asthma Committee  
Tuesday, February 16, 2010  
11 AM CST  

Call Summary

In attendance
Philip Judy, PhD (co-chair)  
David Lynch, MD (co-chair)  
Andrew Buckler, MS  
James Crapo, MD  
David Gierada, MD  
Zachary Levine, PhD  
Michael McNitt-Gray, PhD  

RSNA
Fiona Miller  
Susan Anderson, MLS  
Joe Koudelik

Status of COPDGene CT Number Accuracy Conference

- Dr Crapo has postponed planning for large mtg with vendors; instead will convene smaller group meeting of COPDGene investigators, ctte members and others to move towards consensus before involving vendors
- Concrete proposal for phantom design and request from vendors needed before bringing manufacturers together
- COPDGene phantom not stressing algorithms enough; may have difficulty identifying major issues
- Reproducible CT numbers for scanners and algorithms needed in the lung area of -950 to -1000 HU
- COPD/Asthma ancillary study document prepared by Mr Buckler and Dr Judy may have already defined the process
- Drs Judy and Hoffman to review Dr Crapo's proposal

Phantom Modification

- COPDGene, new phantom design, or a combination approach; set of phantoms may be needed
  - New phantom to calibrate algorithms and equipment
  - COPDGene phantom to calibrate scanner consistency over time
- Dr Judy examining COPDGene phantom modification (acrylic annulus), provided by Mr Levy of Phantom Laboratory
- Main focus is lung density across entire “lung density range”; airway wall thickness to be addressed later in development of profile
  - Cross-scanner variability of airway wall thickness exists due to reconstruction kernel issues associated with lung density measurements
  - Airway size measures to be included in proposal; pseudo-airways already exist in COPDGene and ECLIPSE phantoms

COPDGene Phantom Foam

- Medical CT of foam samples have been done by Drew Torigian at UPenn on a clinical scanner
  - The foam samples have now been scanned on micro, mini, and medical CT.
- CT numbers foams appear not to depend on slice thickness while the median CT number of lung does depend on slice thickness.
- Exploring possibility of recovering thicker sections by averaging thinner section
• Histogram of foam (Siemens) compared to recovered thick sections, i.e. a Siemens reconstruction of 5mm sections done; close comparison observed
• Histogram of COPDGene phantom foam does not mimic what happens with imaging of the lung; foam is not comparable to the lung parenchyma
• Slice thickness is an important issue
• Dr Ross work compared 0.75mm vs. 4.75mm lung medians in pilot study
• Adding -950 HU foam material suggested for the proposal
• Putting two foams in a phantom was proposed
  o For example -850 and -950 HU foams to determine homogeneity cross-scanners;
  o Dr Judy indicated that lung tissue is more complex, so two foams alone may not stress scanner performance far enough

Additions Metrics Proposed
• Median lung
• 15th percentile
• Trachea median
• Fraction below -950 HU (changes dramatically as function of slice thickness)
• Modification needed to test beam hardening with COPDGene phantom proposed
• COPDGene phantom may not scan properly with certain scanner, e.g. Siemens Sensation 64
• Beam hardening artifacts may be larger issue than foam; need to test algorithms on beam hardening correction
• New annulus to mimic air in trachea and help determine whether beam hardening effects lead to an increase in CT numbers
• Internal scanner calibration of air trachea to -1000 HU a possibility

(Beam Hardening: If I suggested that modification to the COPDGene phantom would demonstrate a beam hardening effect, my expectation was that any shift in air CT numbers inside annulus would NOT be explained by beam hardening. Phil Judy 2/26/2010)

Additional Issue to Address
• Effect of body mass index on CT numbers; patient size may modify noise and artifacts
• 0.625 – 0.900 mm slice thicknesses may show non-linear effects; correction issues possible with thin slices, but vendors caution using slices below 1mm; 1.0-1.5mm expect to be reproducible and quantifiable; need addition vendor reaction to perceived instability of thin (<1.0mm) sections
• Dr Judy currently planning to compare thin slice with thick slice data on BWH COPDGene cases.

Next Steps:
• Dr Judy to scan the COPDGene phantom with the new annulus
• RSNA staff to forward annulus diagram to group members for reference
• Drs Lynch, Crapo, Levine, Judy, Hoffman to work on proposal draft for meeting; Drs Judy and Hoffman to perform first critique of Dr Crapo's proposal
• Next call scheduled for March 2 at 11 AM CST