

QIBA COPD/Asthma Committee Update Call

Tuesday, October 27, 2009

10 AM CDT

Call Summary

In attendance:

Andrew Buckler, MS (Co-moderator)
Philip F. Judy, PhD (Co-moderator)
Harvey O. Coxson, PhD
James D. Crapo, MD
Sean B. Fain, PhD
Eric A. Hoffman, PhD

John D. Newell, Jr, MD
Berend Stoel, PhD

RSNA
Susan Anderson
Joe Koudelik

Literature review (Dr Judy)

- Dr Judy is reviewing several studies which may be relevant to Claims section of Profile, including citations from Drs Stoell and Coxson (citation from *Chest*).
 - Other studies of interest are a paper by Dr Gierada which addresses radiation dose on metrics of emphysema, using different slice thicknesses than were used in the Coxson study
- The important issue is that contemporary thin slice reconstruction may affect precision
- Compile papers on short and long-term reproducibility (Oscar. Dirksen? paper on dose and emphysema metrics, ASTRO/ S. Shaker? paper, Chest/ Yuan paper)

Issues for discussion

- Short term reproducibility – emphysema
 - Are models available to propagate all emphysema metrics into CT number reproducibility?
 - Many models are biased by noise and truncation problems
 - When dose is decreased, noise is increased
 - Issue may be less science and more communication and education
 - Perc (15) encounters fewer problems than fraction CT numbers
 - Median of lung areas deemed a useful measure/metric
- Need to determine whether short-term reproducibility is dependent on slice thickness, reconstruction kernel, and/or image noise.
 - First need coherent characterization of what has been done
 - Several studies have used imaging cases from lung cancer screening to investigate short-term reproducibility
- Is the sponge model a sufficiently accurate for lung volume corrections?
 - Sponge model designed to mimic human “healthy” tissue
 - Slope between volume and density differs between patients
 - Slope will be greater in emphysema patients
 - Slope influences volume corrections
 - Suggest using personalized slopes to perform corrections
 - Dr Stoell has conducted simple experiments with foam, calculating volume and density to look at slope

- Issue may be not only physiological but also related to scanner error or reconstruction
- Is severity of emphysema an issue?
- Would density measures from non-smoking, healthy person generalize to a person with emphysema?

Study design

- 1. Determine what experimental groundwork should be pursued, based on what has already been done
 - a. Multi-center/multi-scanner study (phantom)
 - i. Explore sensitivity to slice thickness
 - ii. Dose sensitivity
 - iii. According to sources of variability identified in spreadsheet
 - b. Minimal detectable change (phantom or patients?)
- COPDGene project may be receiving data from a cardio study; corrections may require two scans on each patient
- Another design could include a small set of duplicate scans several years apart on mid-range COPD patients; same protocol, same scanners
 - Consider adding this experiment to groundwork, need approx. 6 (?) for pilot and need to identify radiologist to pull scans
 - To answer question: how much change in lung density in specific region would be clinically significant?
 - E.g. Is 2-2.5 HU/year change over whole lung enough?
 - Will need to look at lobes or segments for more power
- COPDGene chose high dose to determine best measurement, then reduced dose; COPDGene not obtaining serial data
- Will need two different studies to get correction factor
- Dr Coxson has data on hundreds of patients who were followed at 3m, 6m, 1yr, 2yrs. This data was used in *Chest* article
 - Offered use of data if question can be refined
 - Original protocol involved baseline, low dose scan (approx 40mAs); if nodule was found, a higher dose scan (approx 120 mAs) was done
 - All scans were volumetric CT
- Other sources of raw data may be:
 - Centers recruiting for COPDGene follow-up scans on patients
 - National Jewish Health
- Gather 5-10 subjects from 2-3 centers, volumetric scans at baseline and several years apart; encourage use of COPD Gene protocol for follow-up scans; put results in database for study
 - Issue of one or two scans for volume; Danish study used only one scan
- First converge on activities, e.g. phantom work and then decide on how to accomplish
 - 1. Need to identify which measurement we need to make to characterize and optimize reproducibility
 - 2. Complete short list of data requirements (new or old acquisitions) and activities/groundwork
 - 3. Reach decision on data repository, e.g. National Biomedical Imaging Archive (NBIA), formerly the NCIA
 - Reach decision on use of phantoms or patient data

- Consider appointing a group study leader and defining protocols needed

Next steps:

- Compile papers on short and long-term reproducibility (Oscar. Dirksen? paper on dose and emphysema metrics, ASTRO/ S. Shaker? paper, Chest/ Yuan paper)
- Refine decision on groundwork; consider group leader for study design
- Define which image sets to contribute to an image library and decide on which image library