QIBA (Vol-CT) Phantom Study Protocol Subcommittee Call
August 21, 2008, 2-3PM CDT
Call Summary

In attendance:

Nicholas Petrick, PhD (Moderator)
Rick Avila, MS
Wendy Hayes, DO
Michael McNitt-Gray, PhD
Charles Fenimore, PhD
Joe Koudelik (RSNA)

Dr. Petrick summarized that the role of this QIBA Vol-CT working group is to layout a Phantom Study Protocol, in an effort to reduce bias of volume estimation, to be presented to the larger Vol-CT Technical Committee. The group is also to determine what type of data sets, machines (scanners) and budget is needed to proceed.

Currently available data from FDA's on-going phantom study for consideration – Dr. Petrick

- 1st Layout - Simple low-contrast spherical nodules; 480 data sets; 16 slice Philips scanner used
- 2nd Layout - Complicated shapes used; 100 HU plots; 700 data sets; Philips scanner used
- 3rd Layout (Washington University) - 10 complicated shapes used; 10 and 20mm in size; 64 slice Siemens scanner used - smaller subset of data collected
- GE 16 slice (NIH project); not much data collected
- Nodule Densities: -800 HU, -630 HU, +100 HU, -10 HU data available
- Small subset of Siemens and GE data available for comparison (cross-vendor)
- Goal is to have all this data acquired on a Philips scanner
- Full data set collection not currently planned for all vendor machines

General Discussion

- Location of spheres in phantom
  - Peripheral lesions not studied
  - Mediastinum region poorly addressed with current anthropomorphic phantom & CIRS phantom nodules combination.
  - Well defined, border areas need attention
- Size & shape
  - Small nodules being used, larger needed to address large lesions issues
  - Spherical nodule data will be available by RSNA 2008
  - Aspherical nodule data needed
- Density of nodules
  - Hard, constant density nodule used for phantom study
  - Deformable nodules needed
  - Nodule density variation needed to mimic clinical/biological characteristics
- Slice thickness
  - Focus on thin slice date (1.5mm)
  - Thin slice data can be reconstructed to thick slice data (4.5mm) with close approximation
  - Thin slice data is needed for phantom studies, to help reduce bias of volume estimations
  - 5mm slice data is more relevant to clinical studies

- Extend phantom data collection to new CT hardware
    - More likely to see effect between CT vendors or different models of CT than between different machines of the same model/vendor.
    - Dr. McNitt-Gray offered to investigate access to a Toshiba CT for data collection
- Algorithm Performance
    - Analyzing acquired data sets will help to assess algorithm performance requirements and direct what the group should be doing to move forward
- Data collection is the main focus for now
    - Software and lesion location issues are secondary
    - Data collection profiles can be changed if needed in the future, as data is acquired and we learn more about the process
- Point-spread-function for future studies proposed
- GGO (non-solid tumors) and heterogeneous density nodules are a challenge to create in phantoms – possible future goal would be to develop models for these lesions
- Additional reconstructions not generally logistically possible after initial acquisition of data sets
    - Definitely not possible with FDA's Philips system
    - Unlikely at other locations as well
- Match Filter approach proposed as to "optimize" software performance (best case performer)
    - Still being developed and evaluated at FDA to see how effective this technique will be in provided a more optimal volume estimate.
- Use what data is available – no need to start over – build on what exists

General Questions Raised

- What are the fundamental questions we want to answer with new data collections
    - Could focus on understanding impact of CT parameters
    - Could focus on understanding how to validate software tools
    - Any other areas that we might want to consider?
- How to expand and in what direction?
- What are the images we want to collect?
- What kind of analysis is needed on acquired data sets?
    - Use clinical or research software package?
- What will QIBA do with all the data collected?
    - Will QIBA allow open or restricted access to data sets and algorithm performance data?
- Need to assess algorithm performance based on phantom, analysis software, etc?
- Biological systems are more variable than current phantom; what is our overall goal?
    - Phantom vs. Clinical relevance of data collection
- What are we hoping to learn from this entire process?

Role of QIBA

QIBA to "broker" all this data and set the time frame for data acquisition, project advancement, etc.

ACTION ITEMS:

- Dr. Petrick to inquire with CIRS if deformable and variable density "soft" nodules available for phantom study
- Dr. McNitt-Gray to investigate access to a 64 slice Toshiba system for potential data collection.
- Dr. Fenimore will inquire about NIST phantom availability for thin slice data collection
- Schedule next group call for end of August/early September