QIBA Volumetric CT Group 1C Update WebEx
Cross-Platform / Inter-Clinical Study

Wednesday, February 18, 2009
11:00 AM CST

Call Summary

In attendance:

Charles Fenimore, PhD (Moderator)
Michael McNitt-Gray, PhD
Nicholas Petrick, PhD
Daniel Sullivan, MD
Binsheng Zhao, PhD

RSNA staff
Susan Anderson
Joe Koudelik

General Discussion

Goal 1
Measure nodule volume on CT imagery collected from several CT scanners/sites (including single scanners with varying settings). Determine the systems to be used and the system settings to be varied.

- Recon filter remains a large issue to resolve
- Efforts underway to equilibrate the filters across platforms (per Dr Petrick)
- A point-spread-function (psf) would be useful to determine system characterization and equivalence
- Standard vs. enhancing filters a key choice to make
- Group 1C pursuing a research project, not a technology assessment
- Concerns - looking at variation between:
    - Manufacturers
    - Design elements between scanners
    - Between scanning sites/centers
    - Reading of output
- Can we create some equivalence using a measurement? Metrics are lacking, how can we do this?
- Is there a metric to determine volume?
- Recon kernels will have an increasing affect on volume determinations
- Recon filters, mAs levels, slice thicknesses all affect noise levels. These parameters can be manipulated to bring systems to conform.
- No standard to rely on that is “equivalent in measuring volumes” in one metric possible
- Need to know what data to collect
- Point Spread Functions
    - Need to differentiate between current and detailed point spread function (psf) to integrate into Rick Avila’s algorithm
    - psf spread - indicative of a variety of elements beyond filters alone
    - 10% psf a good predictor (of what?) and should be used as a cut-off
    - A 1st order predictor needed
    - Need to pursue spatial resolution data from manufacturers about their systems

- Line Pattern Phantoms
    - ACR Bar Pattern Phantom produces high-contrast images for comparison
    - Recon test with any filters to determine cross scanner consensus
    - Manufacturers can help in this area - perhaps RSNA could put efforts here
    - Dr McNitt-Gray to email example of line pattern phantoms showing standard vs. enhancing filter examples
    - A simple metric would be ideal
    - Recon filters - 7 lines/cm in ACR phantom
    - No more than 9 lines/cm to avoid over enhancing effects
    - Dr. Rick Shilski proposed a 5% criteria - potential target to aim for
    - ACR Line Phantom might be available for Group 1C studies
        - Use side-by-side with study phantom as control
        - ACR Line Phantom not affected by drift

- Coronary artery trial using standardized platforms discussed
    - Could be used as a reference to help Group 1C studies
    - Could help with recommendations
    - Could help propose experiments and refine profile specifications for Group 1C

- Protocols are seldom followed exactly, especially series follow-up scans
    - How do we know the extent of protocol deviation?

Goal 4
Determine the minimum detectable level of change that can be achieved when measuring nodules in phantom datasets?

- Goal 4 important; volume change measurements may be better than volume measurements
- FDA lab has a phantom nodule collection, graded in sizes and shapes
    - Printing of nodules possible in Dr Fenimore's physics lab
    - 5mm-20mm is size; slice thickness varies
    - Constant volume structure
    - Non-Uniform Density - significant variations
    - 600 HU centers with 1200 HU edges for larger nodules
        - Background is air
    - A potential approach to incorporating change analysis component into Group 1C study
    - Some CT data already collected and analysis being performed
    - Sub-millimeter slice thickness also being examined
    - 5% difference should be possible with so many pills (nodules)
    - 5% gradation of linear dimensions also possible
    - However, data does not cross scanner platforms
    - Estimating system noise and minimum detectable change should be possible by measuring the same lesion on the same scanner (same object scanned multiple times)
    - Can we really detect volume change between these pills? (Dr McNitt-Gray)

    - Dr Fenimore to provide more information on the phantom nodule collection

- Anthropomorphic Phantom Work
    - Dr Petrick's group also working on a phantom with varying nodule sizes
    - 5, 10, 20, 40, 60 mm nodules throughout

- VolCT Group Status Summary
    - 1A - All images collected - Pilot study to be next step.
    - 1B - No data collection planned. Will use LIDC and RIDER/MSK data.
    - 1C - Not collecting data yet.

Next Steps

- Dr McNitt-Gray to forward paper on emphysema scoring describing a useful recon kernel outcomes metric
- Dr McNitt-Gray to forward details of line pattern phantoms showing standard vs. enhancing filter examples
- Dr McNitt-Gray to provide study paper on intrinsic characterization of imaging systems
- Dr McNitt-Gray to circulate the NLST protocol along with the ACRIN 6678
- Dr McNitt-Gray to compile ppt for next 1C call
- Drs Fenimore and Petrick to discuss the FDA phantom availability
- Dr Fenimore to provide more information on the "pill box"
- Dr Fenimore to follow up with Dr Hayes
- Joe Koudelik (RSNA) to post NLST and ACRIN 6678 acquisition parameters on the Wiki
- Date and time of next call: March 4, 2009 at 12 Noon EST