QIBA Quantitative CT Group 1C Subcommittee Update

November 18, 2009

2 PM CST

Call Summary

In attendance:

Charles Fenimore, PhD
Kristin Borradaile, MS
John Fraunberger
Mahadevappa Mahesh, MS, PhD
Michael McNitt-Gray, PhD
Kevin O'Donnell
Michael O'Neal, MD
Anthony Reeves, PhD
Ehsan Samei, PhD
Daniel Sullivan, MD

RSNA

Fiona Miller
Susan Anderson, MLS
Joe Koudelik

General Discussion

- Drs Fenimore and Lu visited RadPharm to discuss the design of the 1C study. The sizing of the reading part of the study with its two protocol branches.
- Salient question was raised: Are two protocol branches needed if the parameter settings for collection on the performance-based protocol are similar to the device-specific protocols?
    - Question may be best answered after performance protocols have been defined and performance procedures have been verified
    - There will be device-specific elements in the performance-based protocol

Staging 1C Project (Dr Fenimore)

- Need to fine-tune performance-based protocol based on the FDA anthropomorphic phantom. Whatever performance is required, the preliminary collections of performance data on the ACR phantom at each of the sites is needed to demonstrate the feasibility to the performance levels.
- Neither ACRIN 6678 nor NLST protocols are based on late-stage disease; neither is ideal and should be used as reference only
- Pursuit of a tightly specified protocol preferred (e.g. recon kernel, slice thickness, pitch, etc)
- Some parameters may need to be recorded instead of being specified
- 1C asking for performance levels achievable with various reconstruction filters, allowing vendors flexibility; no single protocol is possible

Single Reference Point Validation

- Validate all scanner systems to a single point, e.g. one mAs setting, one kernel, etc
- Need to identify one 'operating point' and find setting across scanner to produce same operating point; limits needed
- A common (even sub-optimal) operating point is acceptable for Group 1C
    - Move on to optimal operating points in the future
- Clinical relevance is needed for any additional reference points
    - e.g. Better imaging at 80 kVp instead of using 120 kVp
- Specify parameter set:
    - e.g. lung and bone filers, then specify kVp as second parameter

- Consider whether specific noise and resolution are achievable once points are specified
- Propose testing the ACR phantom using different FOV to determine change in image quality and other effects based on bone and lung filter use.
- Filter specifics prove difficult across manufacturers
    - Consider setting down 2-4 operating points, allowing vendors/sites to develop best practices to obtain specific performance
      i.e. number of mAs and filter to obtain 7 lp/cm allowed ... multiple solutions allowed
    - Use set(s) of protocol specifications (1st spec point followed by 2nd spec point with looser parameters)
        - 120 kVp (80 kVp)
        - 7 lp/cm (9 lp/cm)
        - 12% standard deviation (50% SD)
        - 1st spec point (2nd spec point)

Current Protocol

- In the performance protocol, radiation dose is important, but image quality is primary concern (over dose)
    - Show preference for lower doses as long as image quality doesn't suffer
    - Noise and spatial metrics the 1st goal (hard target)
    - Lower doses a 2nd goal (soft target)
- Capture of dose information proposed

Use of ACR Phantom

- ACR phantom can be used to gauge settings
- Image ACR phantom with various FOV and settings/parameters to test image quality
- The FOV should be identical for performance measurement (ACR phantom) and for imaging of the (FDA's) anthropomorphic phantom: medium to large field-of-view (FOV) needed.

Next Steps:

- Region of Interest (ROI) needs to be specified for noise measurement on the ACR phantom; Dr McNitt-Gray to send Dr Fenimore section from ACR manual on ROI
- Dr McNitt-Gray has drafted an initial quality-setting 'recipe' (presented in slide set). It may need changing, with input from subcommittee.
- Need to specify window level to use (100 and 1100 proposed)
- Dr Fenimore to ask Dr Petrick to forward reader data from 1A phantom image data. NIST will review to assess its impact on the design of reading for 1C
- Decision needed on who will scan ACR phantom with various goals of identifying operating points (In their roles with their respective collection sites, Drs Mahesh, Samei, and Petrick may consider doing so. Dr McNitt-Gray has already done so on a suitable Siemens scanner.)
    - Scan ACR phantom with long FOV to accommodate most situations
    - 1st round of scans to be done by end of year
- Resolution and noise with different algorithms proposed
- Need to determine line pairs/cm and noise values and share with Dr Petrick
- Need to report scanner setting that meet performance specifications
- Schedule next call for Dec 16, 2009 for further discussion on scan details