

QIBA COPD Phantom Design Subcommittee Update

Thursday, March 18, 2010

2 PM CDT

Call Summary

In attendance

Philip Judy, PhD (co-chair)
Andrew Buckler, MS
Heather Chen-Mayer, PhD
Zachary Levine, PhD
Joshua Levy

RSNA Staff

Susan Anderson, MLS
Joe Koudelik

Status of analysis of CT scans of NIST foams (Dr Judy)

- 'CT numbers of Region' – slide #1 discussed (slide below for reference)
- No difference of reconstruction kernel or tube use found with either B35f or B70f filters
- Air value average consistent at approximately -1000HU, with slight differences seen with means
- Truncation issues available on Dr Judy's website
- Issues deemed beyond scope of mere modeling problem

Implications of discussions of COPD/Asthma Committee on phantom design

- Drs Crapo and Lynch previous discussion on phantom development lead to further foam sample histogram examination by Dr Judy
- Histogram distribution based on number of foam samples and their densities
- Mathematical modeling needed for better understanding of multiple-levels of resolution found in the lung
- Multiple foam densities needed in phantoms to assist with calibration of CT scale effects; 12-15 different foam densities available today
- Effects of manipulating reconstruction filter, slice thickness, mAs, etc to be pursued
- Basic foam fill material/blocks produce good CT numbers by themselves; further testing of plastic storage boxes suggested; consider removing high-density materials, replace with foam blocks (with characterized uniformity) and consider as a 'reference material'
- Commercially available phantom detail to be posted to QIBA Wiki for reference (ACR, COPDGene, Kyoto Kagaku, etc);
 - Possibility of seeking input from phantom manufacturers and vendors discussed

Off-center Scanning Effects

- Enhanced beam hardening issues seen with off-center scanning, e.g. objects placed adjacent to patients
- Variation seen between center-to-side of imaging field; foam filled calibration phantom may not scan well on periphery
- Proposed that foam-in-box structure be used in conjunction with currently-used calibration phantoms, e.g. ACR accreditation, COPDGene, etc.
- Dr Levine to draft a description of a 'realistic' phantom fill material and proper positioning within gantry

Radiation Dose Filtering/Intensity Modulation

- Source filtration not uniform across gantry; center-to-periphery intensity and spectra affect ray angle
- Intensity changes along rays produce equal transmitted dose across object and detector; several specific shaped filters available per scanner, e.g. head, body, etc

QIBA Annual Meeting

- May 25-26, 2010 in the Chicago area
- Dr Chen-Mayer will attend

Next Steps

- Dr Levine to draft a description of a 'realistic' phantom fill material and proper positioning within gantry
- Dr Levine to perform micro-CT once more of foams without plastic insert spacers if needed (using 0.1 mm slices)
- Next call scheduled for three weeks' time: Thursday, April 8th, at 2 PM CDT (3 PM EDT)

Reference slide "CT Number of Region" courtesy of Philip Judy, PhD

