

QIBA CT Volumetric Group

6 Month Update Report : HHSN268201000050C Project (2a):

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This document describes interim report of the QIBA project titled “Assessing the Measurement Variability of Lung Lesions in Patient Data Sets”. In this project, CT image datasets were annotated by multiple readers to assess measurement variability. These datasets were unique in that they were from a set of “Coffee Break” exams in which patients were scanned twice within a very short period of time (15 minutes) under identical scanning conditions. These datasets therefore represent a “no change” condition. Radiologists from CoreLabs were then asked to measure the size of a specific lung lesion from each patient dataset.

Measurements were done in random fashion and included measurements that were one dimensional (single longest diameter), two dimensional (single longest diameter and perpendicular diameter) and three dimensional (total lesion volume). Measurements were done on datasets from each time point and differences in each measure (diameter, volume, etc.) between datasets were calculated. Ideally, the difference should be zero (as this is the “no change” condition), so the difference that is observed is due to measurement variation and other effects (but not biological change).

Therefore, in this effort, the investigation focused on determining the minimum detectable level of change that can be achieved when measuring tumors in patient datasets under a “No Change” condition.

Analyses that were completed as part of this project included:

- 1) A pooled analysis across all 5 readers and all 32 lesions identified for this study. For this analysis, the mean percent difference between measurements on scan 1 and scan 2 of the coffee break were calculated as well as the standard deviations. This was done for 1D, 2D, and 3D measures.
- 2) Several Subgroup analyses were performed as well with a few different schemes as to how to break the lesions into different groups:
 - a. One grouping was based on whether the lesion would be considered as a “RECIST measureable” lesion or not. This determination was made by a member of CoreLabs who was an experienced radiologist, but who was not one of the readers in the annotation phase of the study.
 - b. Another grouping was based on segmentation difficulty as assessed by Dr. McNitt-Gray
- 3) A third analysis was the “minimum detectable change” analysis in which the 95% confidence interval was calculated for each measurement method (1D, 2D, 3D).

The results from each of these analyses have been shared with the QIBA Volumetric CT committee. This work will also be presented at the RSNA annual meeting.

REFERENCES

Zhao B, James LP, Moskowitz CS, Guo P, Ginsberg MS, Lefkowitz RA, Qin Y, Riely GJ, Kris MG, Schwartz LH. Evaluating variability in tumor measurements from same-day repeat CT scans of patients with non-small cell lung cancer. *Radiology*. 2009 Jul;252(1):263-72.