Recent And Ongoing Research On Advanced Disease

Algorithmic Volume Quantification (3A) Group

Inter-algorithm Performance Study Using FDA Phantom Data

Aim: Estimate absolute volumes using CT phantom data. Report bias and variance.

Method: QIBA CT Volumetry Profile to be executed on human subjects in a multi-institutional trial workflow.”

Results

- Mean volume and variance estimates were bias and variance free.
- Ninety-five percent of points at high tumor volumes actually suggest. RDC, Inter-algorithm reproducibility analysis across tumor size range.

Poster: Algorithmic Volume Quantification (3A) Group.

Lung Nodule Assessment in CT Screening: The “Small Nodule” Group

Purpose

- To define evidence-based consensus standards and processes for CT imaging to allow for reproducible nodule characterization and quantification of biologically meaningful longitudinal volume changes with an acceptable range of error.
- To develop standardized methods for performing repeatable volumetric measurement of lung nodules in the setting of ongoing lung cancer screening.

Overview

- The profiling being developed addresses the accuracy and precision of quantitative CT volumetry as applied to solid lung nodules of <6-12 mm diameters in a range of settings or scenarios (acquisition devices, institutions, radiologists, reconstruction software, and image analysis tools) involved in studies (protocol definition, image data acquisition and reconstruction, and image QA and analysis).
- The requirements are primarily focused on achieving sufficient accuracy and precision representing volumetric change over a sustained period of time.

Table 1: Modeling and simulation workflow results for the basis of comparison of Lung Nodule Assessment in CT Screening.

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The QIBA Profile

- Claim 1: Nodule Volume
  - For a nodule with diameter 6-12 mm and < 12 mm (volume 113.1 mm³ per 10 mm or greater), with measurement coefficient of variation (CV) as specified in Table 1, the following holds:
  - Claim: An acceptable range of variance across vendor platforms and avoiding unnecessary variability of the tumor volume measurements.

- Claim 2: Nodule Volume Change Between Two Time Points
  - For a nodule at time point 1 with diameter ≥ 6 mm and < 12 mm with measurement coefficient of variation (CV) as specified in Table 1 and time point 2 as specified in Table 1, the following holds:
  - Claim: A measured change in lung nodules of 10 mm or greater (CV > 15%).

- An online calculator for investigational use in validating these claims has been made available for developers.

Reference Image Dataset for CT Volumetry with Known Ground Truth

- Aims:
  - Study Lung Nodule Assessment in CT Screening.
  - Methods
  - \( \text{Volume} = \frac{4}{3} \pi \times \left( \frac{d}{2} \right)^3 \)
  - \( \text{CV} = \frac{\text{actual volume} - \text{estimated volume}}{\text{actual volume}} \times 100 \)

Conclusion

- An online calculator for investigational use in validating these claims has been made available for developers.

www.lungvolume.net/CalcResults.html

Advanced Disease Profile

Profile structure:

- Section 1: Executive Summary
  - Claim: What performance claims have been achieved?
  - Section 2: Activities - Biomedical Imaging and Bioengineering, National Institutes of Health, Department of Health and Human Services, under
  - Specifications
  - Procedures for assessing compliance
  - Section 3: Executive Summary
  - Section 4: Activities - Biomedical Imaging and Bioengineering, National Institutes of Health, Department of Health and Human Services, under

Recent work:

- Completed public review; Revisions to Claim (Balancing validity, utility, and statistical rigor)
- Revisions to clinical interpretation, assessment procedures for variance and analysis
- Profile implemented in limited settings.