

## QIBA Lung Density Biomarker Committee (BC) Call

May 27, 2020 at 2 PM (CT)

Call Summary

### In attendance

Charles Hatt, PhD (Co-Chair)  
Miranda Kirby, PhD (Co-Chair)  
Ehsan Abadi, PhD  
Raul San Jose Estepar, PhD  
Chase Hall, MD

Timothy J. Hall, PhD  
Stephen Humphries, PhD  
Philip Judy, PhD  
Joseph Mamarappallil, MD, PhD  
Amin Motahari, PhD

Nancy Obuchowski, PhD  
Juan Carlos Ramirez-Giraldo, PhD  
Daniel Sullivan, MD  
Gonzalo Vegas-Sanchez-Ferrero, PhD, MSc

### RSNA

Joe Koudelik  
Julie Lisiecki

**Moderator:** Dr. Hatt

### Brief Update BC Work (Dr. Hatt):

- Dr. Fain has nearly completed addressing the public comments received
- The BC is almost ready to declare their Profile at the Consensus Stage

### New Directions Discussed:

- The BC discussed several options for new biomarkers during their previous t-con

### Airways:

- It was determined that Protease Inhibitor 10 (Pi10) as a metric for airway analysis was not viable due to the vendor-specific proprietary methods for obtaining metrics

### Deep Learning (DL) Opportunities:

- There was some discussion regarding the pursuit of deep learning for interstitial lung disease
- Dr. Chase Hall mentioned that it might be possible to utilize DL for segmentation related to emphysema, though ground truth would need to be determined
- Dr. Hatt noted the importance of repeatable and reproducible DL measurements
- The possibility of a Profile to describe how to qualify a DL algorithm was discussed
  - This might be a different approach that would describe how to qualify a machine learning algorithm in general, not a specific one, with more emphasis on the process
  - It might include access to data for training of algorithms and the curation of data
- Expansion into the field of artificial intelligence (AI) will also allow for the development of standards for development and testing

### Multi-parametric Metrology Related to Deep Learning:

- Dr. Obuchowski mentioned that the QIBA Multi-parametric Metrology Task Force (TF) is trying to generate consensus regarding work with multiple quantitative imaging biomarkers (QIBs) and multiple parameters
  - They are discussing the uses of AI algorithms to provide a single risk score
  - Use cases are being evaluated in terms of what type of Profile claim can be made
  - This process is more complicated depending on the “weight” of these scores
  - The TF is trying to generalize methodology for each of the use cases
  - A collaborative approach was suggested for validation /qualification of AI metrics

### Emphysema Study Conducted by Dr. Humphries:

- Dr. Humphries described a recent study he completed with visual qualification of emphysema, through the use of a classification algorithm for the COPDGene Study, with an emphysema scoring (pattern) system developed by the Fleischner Society

- The emphysema classification prediction made by AI was compared to visual/manual reads
- These patterns were used to train the system to automatically score the severity of emphysema
  - 2500 CT Scanners were trained using the algorithm
  - 7500 remaining cases were tested
  - Data were then compared with lung function and survival with more information utilized from the ECLIPSE study, which used a different scanning protocol
- Dr. Obuchowski noted that the patient outcome data was very helpful and may even be used as clinical confirmation data, i.e., to advance to Profile to Stage 5: Clinical Confirmation
  - She recommended discussing repeatability and suggested a cross-sectional claim with a clinical prediction
    - Repeatability of data input and output to be considered
    - Emphasis on the sensitivity and specificity of what the algorithm is measuring
    - May also focus on reproducibility and repeatability
    - Cross-sectional claims are useful particularly in clinical trials to determine trial eligibility
- Dr. Hatt sees much potential in determining how to bridge the gap from a slightly subjective score to a more specific confidence interval using deep learning
  - There is not much guidance in how to do this type of work
  - Dr. Hatt intends to broach the topic at the upcoming CT Coordinating Committee Call

#### Call for Ideas:

- All are asked to contact the co-chairs with any new ideas or feedback regarding the Profile using the contacts below:
  - Sean Fain, PhD [sfain@wisc.edu](mailto:sfain@wisc.edu)
  - Charles Hatt, PhD [charleshatt@imbio.com](mailto:charleshatt@imbio.com)
  - Miranda Kirby, PhD [Miranda.Kirby@Ryerson.ca](mailto:Miranda.Kirby@Ryerson.ca)

#### Profile Stages:

- To officially reach Consensus (Stage 2), the BC must complete its response to the Public Comments received and request a vote to publish at both the BC and CT CC levels
  - Checklists and Conformance Procedures must also be established
- Profiles and respective [comment resolution sheets](#) and checklists to be updated
- A [Google link for Public Comment Resolution](#) has been created for ease of sharing updates
- QIBA Wiki Profiles Page: <http://qibawiki.rsna.org/index.php/Profiles>

#### Action items:

- Dr. Fain to follow up with Mr. O'Donnell (QIBA Process Cmte Chair) re: next steps for Profile advancement
- Next BC call in June – discussion will focus on using machine learning to map images

**Next meetings:** 6/24, 7/22, 8/26