QIBA Lung Density Biomarker Committee (BC)

Wednesday, September 23, 2020, 2 PM CT

Call Summary

In attendance

Sean Fain, PhD (Co-Chair)
Charles Hatt, PhD (Co-Chair)
Ehsan Abadi, PhD
Raul San José Estepar, PhD
Timothy Hall, PhD
Bernice Hoppel, PhD
Philip Judy, PhD
Amin Motahari, PhD
John Newell, Jr., MD
Nancy Obuchowski, PhD
Sam Peterson
Joshua Schirm
Daniel Sullivan, MD
Gonzalo Vegas-Sanchez-Ferrero, PhD, MSc

RSNA

Joe Koudelik
Julie Lisiecki

Moderator: Dr. Hatt

Lung Density Profile's Advancement to Stage 2: Consensus (Dr. Fain)

- There is an open Stage 2: Consensus e-ballot at the BC level in progress, which will close on October 7th and then proceed to the CT CC for a vote
- A Google link for Public Comment Resolution was been created for ease of sharing updates with the group
- The updated Profile and resolution spreadsheet have been posted to the QIBA wiki Comment Resolutions page
- Once successful BC and CC votes are completed, the Profile will be published on the QIBA Wiki Profiles Page

Introduction of new BC member

- Joshua Schirm, Director of Imaging Services at VIDA has joined the group
- He is experienced in the fields of medical imaging and informatics, primarily in the applications of quantitative imaging and standardization in the pulmonary space

Next QIBA Profile: Proposal Ideas Under Consideration (Dr. Hatt)

- The BC is in the process of deliberating new proposal ideas for a future Profile
- Availability of clinical evidence and potential claims are important considerations, as well as studies on reproducibility and repeatability, which focus on the specifics of quantification for the biomarker
- A Google document has been compiled noting the pros and cons associated with the proposed topics; BC members are asked to review and provide feedback, expanding on the topics
    - This information will be used to create a poll for the BC to vote on future directions for exploration

New Proposal: Lung Texture (Dr. Hoppel)

- Lung Texture analysis, including algorithmic study and machine learning, focused on the areas of ground glass opacity, emphysema, and honeycombing would be useful in routine clinical practice
- Dr. Newell agreed that honeycombing and ground glass opacity were important
    - These features would aid in distinguishing if interstitial lung disease was fibrotic or non-fibrotic
- He also noted that it would be necessary to differentiate between chronic or acute lung disease and to determine if there was architectural distortion occurring in the lung
    - If a focus on acute COVID-19 studies was preferred, ground glass opacity would be key
    - If the focus were on more chronic conditions, separating out honeycombing from ground glass would be necessary
    - Treatment strategies are very different between fibrotic and non-fibrotic disease
- Algorithms are usually proprietary in terms of deep learning, so, this may pose a challenge, though testing algorithms to simulate ground glass opacity and honeycombing could be very helpful
- Dr. Hoppel stressed that improving data reproducibility with a limited number of features was preferable
- Dr. Hatt agreed that it was important to have a repeatability study since the repeatability coefficient of lung density was the focus of their QIBA efforts
- Dr. Hoppel added that quantitation was critical to study either volume or percentage of disease via whole lung, single lung, or lung lobe
- QIBA could help establish clinical thresholds for normal lung vs. lung disease
- It may be challenging to explain the importance of quantitation to clinicians
- Other metrics mentioned were density, texture pattern, and stiffness to determine how to define a normal lung

Other ideas

- Examining a biomarker that looks at the extent of disease progression may be helpful
- Allowing for the use of a lung density / emphysema Profile with the addition of more than one biomarker to make a "super-Profile" that encompasses several biomarkers (multi-parametric approach) was also discussed
- Dr. Hoppel will add information to the Google document in preparation for the upcoming poll
- Dr. Estepar suggested one more discussion on strategic vision
    - Should the BC pursue low-hanging fruit (practical solutions) for quick impact, or address more challenging issues?
    - Should other biomarkers, such as gas-trapping and air-trapping be considered?
        - Air-trapping has the most power signal, and could be combined with existing research on emphysema, vessel volume, and deep learning
        - How vascular measurements are used and some degree of evidence regarding histological correlates should also be included
    - Dr. Estepar suggested that the list of proposed biomarkers Google document might provide material for a possible future publication for the BC
        - He added that additional details should include how clinically meaningful and robust each biomarker is
- More details are needed for the Google document regarding gas-trapping, deep learning, and repeatability measures for each proposed biomarker
    - Individual topic experts are asked to add more detail on repeatability measures
- Dr. Hatt suggested the possibility of creating task forces to work on up to three different biomarkers for a multi-parametric approach
- For more detailed description of the previously discussed biomarkers, please see recent notes posted to the Lung Density BC QIBA wiki page
- Dr. Hatt will prepare a poll for voting on these new biomarker proposals and circulate after the next call
- All BC members are invited to comment on new biomarker proposals via the shared Google document

Multi-parametric Focus

- The BC is considering the possibility of a multi-parametric Profile incorporating several of the previously discussed biomarkers
- Dr. Obuchowski invited interested parties to join the calls for the Multi-parametric Metrology Task Force
- A special call for Lung Density BC members might be set up with the Multi-parametric Metrology Task Force to exchange ideas
- More discussion may be needed before consensus can be reached on the new direction

Action items:

- BC members are invited to comment on new biomarker proposals via shared Google doc: https://docs.google.com/document/d/1OWV3BTj6AeQ19DxzNCqzT-nITnNfeJf6wAYJx2qH1gE/edit
- Continue discussion of multiparametric Profile suggestions on next call
- Dr. Hatt to create and circulate a poll (perhaps in Google forms) to vote on the new biomarker proposals after the next (October) BC call

Next meetings: 10/28, 11/25, 12/16 *or* 12/23