QIBA Multi-parametric Metrology Call

04 May 2020 at 2 PM CT

Call Summary

In attendance			**RSNA**
Nancy Obuchowski, PhD (Co-Chair)	Alex Guimaraes, MD, PhD	Chaya Moskowitz, PhD	Joe Koudelik
Andrew Buckler, MS	Tim Hall, PhD	Gene Pennello, PhD	Julie Lisiecki
Patricia Cole, PhD, MD	Erich Huang, PhD	David Raunig, PhD	
Jana Delfino, PhD	Rudresh Jarecha, MBBS, DMRE, DNB	Daniel Sullivan, MD	
Nandita deSouza, MD	Paul Kinahan, PhD	Xiaofeng Wang, PhD	

Moderator: Dr. Obuchowski

Use Case #1, Multi-dimensional descriptor: (Dr. Raunig)

- Since all four use cases will have much in common, all four papers can share common text elements and format, with individual details provided where appropriate
- Only the Overview paper will provide an overview of the four papers

Discussion topics included the following:

- Missing data problems and possible advantages of missing data
- QIBs as a p-dimensional vector, as mentioned on the RSNA 2019 poster
- Concerns that some of the descriptions may be too simple, e.g., should the group be concerned about losing the strength of its messaging for each case?
- Consider "weighting" QIBs based on degree of biological variability for inclusion in the paper with a nominal or ordinal weight, considering how to do this quantitatively
    - As an example, the ADC biomarker is a robust one for DWI (higher weight), whereas the DCE Profile (which has more biologically variable data) would be assigned less weight
    - Such scoring is done automatically via PI-RADS
    - To use this in other applications, weights would need to be pre-defined, as there are multiple factors for consideration, and it would depend upon who is developing the biomarker and what it will be used for
    - The inclusion of multiple endpoints and how they would be handled was deemed beyond QIBA efforts for now
- Multi-variate vectors
    - Do we need to test for changes and compare characteristics for multi-variate use?
    - Also need to address univariate characteristics and change
    - Prognostic use for multi-variate cases, e.g., the risk of an event occurring
    - Prognosis a large part of use case #3 in relation to risk – not to be addressed in use case #1
- Change over time
    - Biological fluctuation vs. one that is persistent and continuous (biological noise)
    - Fluctuation of biological change different than measurement fluctuation
- Design of study around what is being measured
- Determine measurement repeatability and avoid biological change so that it is not confounded
    - Need to know noise variation due to biology vs. signal change
    - Likely not to have a truth standard – consider how to get measurement error
- Quantitative imaging biomarker (QIB) candidate selection
    - Must be related to what is being measured, i.e. the "theory of measurements"
- Assessing biological plausibility with technical abilities or performance
    - Do we want to look at multi-variate repeatability / reproducibility?
    - Needs to be clinically valid
- Prospective work is needed
    - Simulations could be used for sensitivity analysis or missing data
- Challenges – minimum or maximum number of QIBs

    - 2-3 QIBs deemed minimum
    - What should the maximum QIB number be and how should it be determined?
- Address domain in the paper

Next call: Dr. Delfino to present on Phenotype classification (Use case 2) on Wednesday, May 20th at 10 am CT

Call Schedule:

Date:	**Topic**:	**Lead**:
Wednesday, May 20 (10 am CT)	**Use case** 2: Phenotype classification	Dr. Delfino
Monday, June 1 (2 pm CT)	**Use case** 3: Risk prediction	Dr. Huang
Wednesday, June 17 (10 am CT)	**Use case** 4: Radiomics	Dr. Wang
Monday, June 29 (2 pm CT)	**Use case** 1: Multi-dimensional descriptor	Dr. Raunig

Use cases:

- **Use case 1**: (Multi-dimensional descriptor) a panel to determine how to care for a patient
- **Use case 2**: (Phenotype classification) rule or decision tool to diagnose phenotype
- **Use case 3**: (Risk prediction) several biomarkers will be evaluated to create a prediction or risk score
- **Use case 4**: (Radiomics) may not have a specific biomarker for reference