QIBA Multi-parametric Metrology Call

27 July 2020 at 2 PM CT

Call Summary

In attendance			**RSNA**
Nancy Obuchowski, PhD (Chair)	Erich Huang, PhD	Daniel Sullivan, MD	Joe Koudelik
Huiman Barnhart, PhD	Gene Pennello, PhD	Ying Tang, PhD	Julie Lisiecki
Alex Guimaraes, MD, PhD	David Raunig, PhD	Xiaofeng Wang, PhD	
Timothy Hall, PhD			

Moderator: Dr. Huang

Approval of Call Summary

- The notes from July 15, 2020 were approved as presented

Use Case #3, Risk prediction: (Dr. Huang) - Discussed paper section updates:

- Regarding image acquisition and processing protocols, the team discussed deferring to Profile statements and referencing existing QIBA Profiles with examples that are already validated
- Methodology for QIB extraction should be consistent with QIBA Profiles
    - Consider any fundamental differences between the multivariate QIB case
- Interpretations of the model outputs in the context of the intended use
    - Specify cutoffs, e.g., 'high-risk' would be a number above, whereas 'low-risk' would be a number below to determine treatment decision
    - It was also suggested to include a range with moderate risk as well as examples of the cut point
    - Is it context-dependent, e.g., disease types, available treatments?
- Remarks on the biological plausibility of the underlying model
    - Do QIBs included in the model correlated with previous results?
    - Consultation with clinicians recommended regarding whether the model makes sense
        - Model should be explainable or interpretable and should relate to included variables
- Converging and diverging validity of the model
    - Drs. Raunig and Barnhart to provide references for this topic
        - Convergent validity: non-discrimination of patients with similar outcomes
        - Divergent validity: discrimination of patients with different outcomes (related to sensitivity and specificity; may not be entirely clear for quantitative continuous outcomes)
- Reproducibility of model outputs
    - Scale literature: how the same score value leading to different reproducibility coefficients has been handled in the literature
    - Guidelines available from the Clinical Laboratory Standards Institute; Dr. Huang to look up
        - Correlation between QIBs may add further complications in terms of using simulations
        - Variables should relate to specific construct but not one another, as they relate to divergent and convergent validity, principal components, and factor analysis
        - Plan to reference use case #1 from the 2015 papers
- Interpretations of the model outputs with regard to how the model will be used clinically
    - Dr. Pennello to provide Harrell reference
    - Discussion will be in the context of bias-variance tradeoff; binary and categorial outputs have different properties than those for continuous outputs
        - Depends on sample size, e.g., more bias, less variance for certain cases
        - Simulation studies need to demonstrate effects and what could go wrong
            - 4 – 12 QIBs recommended with examples
            - Dr. deSouza may have a real-life example
    - Polygenic risk scores: individual inputs do not contribute much by themselves, but together they are effective

Action items:

- Dr. Huang to distribute revised paper to the group for review
- Drs. Barnhart, Pennello, and Raunig to provide references
- For next discussion on phenotype classification, discuss methodology to verify agreement (reference / truth) and reproducibility component

Next call: Dr. Wang to present on Radiomics (Use case 4) on Wednesday, August 12th at 10 am CT

Call Schedule:

Date:	Topic:	Lead:
Wednesday, Aug 12 (10 am CT)	Use case 4: Radiomics	Dr. Wang
Monday, August 24 (2 pm CT)	Use case 1: Multi-dimensional descriptor	Dr. Raunig
Wednesday, Sept 9 (10 am CT)	Use case 2: Phenotype classification	Dr. Delfino
Monday, Sept 21 (2 pm CT)	Use case 3: Risk prediction	Dr. Huang
Wednesday, Oct 7 (10 am CT)	Use case 4: Radiomics	Dr. Wang

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