

QIBA Perfusion, Diffusion and Flow – MRI Biomarker Committee (BC) Call

Wednesday, August 30, 2017 at 11 AM (CT)

Call Summary

Participants

Daniel Barboriak, MD (Co-Chair)

Michael Boss, PhD (Co-Chair)

Eric Achten, PhD

Ishtiaq Bercha, MSc

Nicholas Blockley, PhD

Mark Brown, PhD

Thomas Chenevert, PhD

Patricia Clement

Xavier Golay, PhD

Matthias Guenther, PhD

Daniel Krainak, PhD

Hendrik Laue, PhD

Hanzhang Lu, PhD

Mikko Määttä, PhD

Dariya Malyarenko, PhD

Elizabeth Mirowski, PhD

Henk-Jan Mutsaerts, MD

Nancy Obuchowski, PhD

Mark Rosen, MD, PhD

Samir Sharma, PhD

Nadia Smith, PhD

Brian Taylor, PhD

Junqian (Gordon) Xu, PhD

RSNA

Joe Koudelik

Susan Weinmann

Moderator: Dr. Boss

RSNA 2017 Annual Meeting Posters

- Staff sent out poster focus and specific guidelines, and options for printing and installation to QIBA BC Co-Chairs following the 8/17 QIBA SC meeting
- General information to include activities over the past year related to:
 - Organizational structure updates, e.g., formation of the ASL TF
 - Profile development status
 - Profile impact / implications for clinical trials and patient care
 - Conformance procedure update (if applicable)
 - Groundwork project status/results
- Suggestion to include posters as agenda item on upcoming calls
- Dr. Boss to forward poster guidelines to TF leaders for and request updates on their activities
- Poster content expected to be completed by mid-September with poster creation and submission to RSNA staff no later than October 31

Arterial Spin Labeling (ASL) Update (Dr. Golay) ...highlights taken from Dr. Golay's presentation

- EIBIR ("executive arm" of EIBALL) provides administrative support for the ASL TF
 - Current roster includes 35 task force members from all over the world
 - Hosted first online meeting in March 2017
 - Demonstrations of QIBA methodologies were presented
 - Decision was made to focus on ASL for brain applications including: stroke, dementia and brain tumors
- The ASL TF met twice in July and created three working groups with 5 – 6 members in each:
 - Statistics and technical definition of Claims, led by Dr. Golay
 - Clinical Claims definition, led by Dr. Achten
 - MRI sequences and phantom, led by Dr. Guenther
- Plan to start working on Profile writing in September, due to limited participation over the summer (July/August) holiday period in EU

- Claim definitions to be based on meta-analysis of existing papers, specifically, CoV values from test-retest papers
 - Dr Mutsaerts to perform reanalysis of many datasets using *ExploreASL*
 - ASL Profile to contain both cross-sectional & longitudinal Claims
 - (label – control) ASL difference reflects perfusion, and can be transformed into cerebral blood flow using models
 - A measure of X% difference in measured perfusion signal in certain area of GM can be considered as effectively different from the average GM value with 95% confidence
 - This should be valid for a given SNR for raw data, achievable when following the Profile ‘recipe’
 - General Claim demonstrating patterns (without absolute quantification)
 - Precision and bias:
 - Meta-analyses of comparison with ‘Gold standard’ methods, i.e. Oxygen PET
 - Possibility to use EPI-based studies to calculate ‘within session’ reproducibility
 - Establishment of QC methodologies to be rater-based & automatic based (possibly also using *ExploreASL*)
 - Meta-analyses:
 - A large amount of literature with healthy volunteers
 - Disease-specific
 - All Claims will be based on neurological diseases: either primary vascular diseases, or primary metabolic dysfunction-based diseases
 - ‘Pure’ vascular diseases (G. Harston)
 - Cerebrovascular diseases/stroke
 - Diseases of the vasculature/AVMs
 - ‘Pure’ metabolic dysfunctions
 - Cancer (both primary and metastases) (Drs. Golay & Bisdas)
 - Epilepsy
 - Potentially neuroinflammation (presently not many studies)
 - ‘Mixed’ diseases
 - Neurodegeneration
 - Repeatability Studies
 - Longitudinal data coming from ADNI
 - Repeatability (identical sequence on identical scanner) will be the starting point of the Profile
 - Reproducibility will also be considered (different scanners with possibly different sequences), needed for clinical trials
 - It would be advantageous for the ASL community if vendors were engaged; convergence of techniques from all vendors based on the White papers
- Phantom development
 - Assembly of 10 phantoms has been completed and phantom scanning may commence
 - The following 10 sites participate in beta-test to study reproducibility:
 - UK: Oxford University & University College London

- EU: Fraunhofer Mevis (DE), Leiden University (NL), Erasmus MC (NL)
- US: Massachusetts General Hospital (MA), University of Michigan (MI)
- To be finalized: Institute of Physics (UK), Oslo University (NO), University of Wisconsin (WI)

Template-based Automatic QC of ASL Data (Dr. Mutsaerts)

- Rationale – current need for standardized/automatized QC for ASL
 - There is a clinical need for reliable ASL data
 - During research process, data QC needed upon acquisition, not upon statistical analyses
 - Evaluation performance of parameters obtained in single subject MNI registered ASL image, compare between populations (e.g. sickle cell high motion)
- Methods
 - Comparison of parameter against: 1) previous scans, same scanner or 2) template
 - *ExploreASL* standardization tool to be used
- Experimental
 - Labeling area symmetry
 - Spatial CoV (vascular or other artifacts)
 - Estimation of “effective resolution”/PSF
 - Comparison with T1w tissue segmentation
 - Comparison with CBF template

Discussion on ways PDF-MRI BC may help the ASL TF with their literature analysis process

- Dr. Boss offered best practice guidance for an efficient Profile-writing process
- Dr. Wu has assisted with solutions to be used in phantom creation
- Dr. Obuchowski helping with literature review meta-analysis approach
- Any additional guidance is welcome
- ASL TF may need meeting to focus on Profile-writing & Claims development

➤ **If you plan to attend the 2017 RSNA Annual Meeting, the QIBA Working Meeting will be held on Wednesday, November 29, 2017, 2:30 – 6 PM**

Next PDF-MRI BC Call: Wednesday, September 13, 2017 at 11 AM CT

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