

## QIBA fMRI Technical Committee Update

Wednesday, July 3, 2013 at 11 AM CT  
Call Summary

### In attendance

Ted DeYoe, PhD (Co-Chair)

Cathy Elsingher, PhD (Co-Chair)

Jeffrey Petrella, MD (Co-Chair)

Erich Huang, PhD

James Reuss, PhD

Daniel Sullivan, MD

James T. Voyvodic, PhD

Zhiyue Jerry Wang, PhD

Kirk M. Welker, MD

### RSNA

Fiona Miller

Joe Koudelik

Julie Lisiecki

## QIBA fMRI Technical Committee Call Agenda, Wednesday, July 3, 2013 (11 AM CT)

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### 1. Thank you to poll participants (Jim Reuss) – circulate draft?

### 2. NIBIB upcoming proposals –Project request forms submitted by Friday July 12<sup>th</sup> - (taken from SOW)

fMRI integrated project using digital reference objects (DRO's) to test protocol methods, assess bias and linearity, and establish data qualification guidelines

#### *Aim 1. Generation of fMRI Reference Data Sets – Empirical and Synthetic*

**Objectives:** Create a set of standardized fMRI reference datasets (DRO's) with known “ground truth” related to the time-course, amplitude and spatial distribution of BOLD-like signals embedded in “noise”. DRO's will incorporate realistic brain activity signals as well as several types of noise with and without the inclusion of common fMRI signal artifacts. All activity and noise signal properties will be based on empirical data obtained from existing fMRI data sets. For each combination of signal and noise properties, 2 DRO's differing only in random noise patterns will be developed to assess repeatability.

**Deliverables:** fMRI reference datasets available for QIBA use and subsequent public access.

**Budget estimate:** \$40,000

#### *Aim 2: Multi-site comparison of reproducibility in existing fMRI Analysis Methods:*

**Objectives:** The current fMRI profile has identified many components of the image analysis pipeline as important sources of variance in fMRI maps. Little is known about which of these methods are best for obtaining precise and reproducible quantitative results. To assess this, independent sites will each use their own methods to analyze a standard set of fMRI reference data (see above). Three sites will also implement the methods used in the current draft profile and use them to acquire and analyze limited new data. The resulting brain maps will be returned to the host site for computation of reproducibility metrics, and for cross-method comparison. This project will directly contribute to the production and release of a Profile and protocol (QIBA Objective 1) and will generate additional data for the RSNA-QIBA database (QIBA Objective 5).

**Deliverables:** Field-testing and improved protocol for the fMRI Profile; processed data sets for the QIBA data warehouse; publication of results.

**Budget estimate:** \$40,000

#### *Aim 3: Influence of data signal to noise and fMRI analysis procedures on reproducibility, sensitivity, bias, and linearity*

**Objectives:** One goal of Aim 3 is to assess how each component of the fMRI data-processing protocol affects the reproducibility, bias, and linearity of the brain activation biomarkers described in the Profile claims. Qualitative results from Aim 2 will inform the choice of procedural factors to be tested quantitatively under this aim. The second goal of Aim 3 is to use the optimal processing methodologies to perform a systematic assessment across many DRO's that have multiple levels of known “brain activity” signals embedded in many different types of realistic “noise” signals (e.g., motion, physiology, task performance, instrumentation). This analysis will provide data to be able to develop clear quantitative QA guidelines in our fMRI Profile. These QA guidelines will identify how to

measure each signal and noise source, and how much signal-to-noise is necessary to qualify a scan as suitable to be used as a quantitative biomarker. Such quantitative guidelines are critical for implementing the Profile (QIBA Objective 1) and are much-needed by the fMRI community in general

**Deliverables:** Optimized processing procedures in our fMRI Profile; filled knowledge gaps in the QA sections of the profile; data on bias and linearity for the profile's claims; publication of results.

**Budget estimate:** \$40,000

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### Further Discussion of Projects for QIBA Funding Consideration

- Integrated project will be proposed as **Year 1** and **Year 2** projects
  - **Year 1** will focus on these aspects:
    - Initial DRO development
    - Organized datasets that will be analyzed by multiple sites
    - Addressing the first part of Aim 2
    - All three aims will be underway in Year 1, though it is anticipated that Aim 2 may run into Year 2.
  - **Year 2** will focus on these aspects:
    - Systematic development of DROs with more sophisticated components
- Issues to be resolved when structuring the project proposal
  - Honoraria criteria for the participating sites
  - It was noted that it would be sufficient to list the proposed number of sites and honoraria figure.
    - Sites can be identified from call participants, poll respondents, and other committee volunteers
    - In lieu of an honoraria, inclusion in an academic publication could be offered as an incentive for participation
    - Any statistician fees would also need to be included in the budget proposal
    - PI salary support should be minimal; limited to 1-2 % (post-doc support encouraged)
    - Maximum of 10% indirect proposed if institutions refuse to waive F&A costs

### Action items:

- Deadline for QIBA project applications to Dr. Sullivan ([daniel.sullivan@duke.edu](mailto:daniel.sullivan@duke.edu)) / RSNA staff is **Friday, July 12<sup>th</sup>** ([jkoudelik@rsna.org](mailto:jkoudelik@rsna.org), [fmiller@rsna.org](mailto:fmiller@rsna.org))
- Drs. DeYoe and Voyvodic to collaborate offline and circulate a draft of the proposal to the group **by Tuesday, July 9<sup>th</sup>** for comments
- Dr. Reuss to provide QIBA fMRI Workflow Survey Poster to RSNA staff to post to the QIBA wiki
- Dr. Reuss to provide wording for thank-you email to ASFNR poll participants

### Next calls:

- QIBA fMRI Bias WG call - **Tuesday, July 9<sup>th</sup>**, at **10am CT**
- QIBA fMRI tech committee call - **Wednesday, July 17<sup>th</sup>**, at **11am CT**