

QIBA fMRI Reproducibility Subcommittee Update

February 1, 2011

11 am CST

Call Summary

In attendance:

James T. Voyvodic, PhD (Chair)

Andrew Buckler, MS

Ted DeYoe, PhD

Cathy Elsinger, PhD

Laura Rigolo, MS

Daniel C. Sullivan, MD

Domenico Zaca, PhD

RSNA:

Joe Koudelik

Julie Lisiecki

Discussion of Quantitation as it relates to fMRI and reproducibility

- Dr. Voyvodic discussed the quantitation in fMRI; can fMRI be quantitated as a biomarker?
- What can be measured? What type of unit of measurement can be used?
- How can quantitation be used in fMRI as it relates to neuro-vascular uncoupling (NVU)?
- Based on the same person/ same task/ different sessions, how does one quantify these results?
- Focus on examples with language - easier to document (visual tasks more challenging).

fMRI Workflows

- Dr. Voyvodic would like a sample workflow from each participating site:
 - How is it ordered? What are the specific tasks? What is in the workflow? etc.

DICOM matrix

- Dr. Tucker is working on a matrix of various workflows for different sites
- Some of the variables included in this document may or may not apply to all sites
- Dr. DeYoe would like to expand the matrix with even more detail; possibly have separate meeting for DICOM group
 - Is a rating scale is being used? If so, how often? And, is it essential?
 - Would like to formalize the scale somewhat to gain a better understanding of the steps for profile development.

fMRI exam is supposed to show (via quantitative measurements):

- Where are the eloquent cortical areas?
- Receptive and expressive speech centers? Edge? Center? Spatial extent?
- Brain coordinates; distance from the center or edge in mm
- Which side is the dominant hemisphere?

Laterality Index:

- Expressed as a number between 1 and -1, (1: dominant left brain; -1: dominant right brain).
- Difficult to determine what gets converted to numbers, as well as what specifically to measure

NVU:

- Want to quantitate (for any part of the brain) – what is the probability that the area is coupled?
- Ability to generate signal from 0 to 1 – based on NVU measurements?
- Are these measurements what we're aiming for? How are these obtained?

Reproducibility:

- Do we measure by using one patient with same region, using multiple versions of exact same exam area on different days? (Day 1, Day 2, Day 3, etc.)
- Are voxels to be measured (how many overlap?) Day 1 vs. Day 2?
- Do we conclude that we need to do fMRI multiple times and take the average?
Would it be preferred to quantitate once and measure the % overlap?
- Do we focus on comparing signals in repeat scans of the same person?

BOLD amplitude:

- What information are we getting from the amplitude signal and relative signal strength?
- What (if any) elements of the BOLD signal are quantifiable?
- Need to make a statement about what BOLD amplitude does and does not mean for the Profile.
 - Investigation may require new subcommittee.
- Compare signals in repeat scans of the same person: relative vs. absolute amplitude

- Calibrations to be make more consistent; relative signal is essential
- NVU model –trying to look at relative signals with quantifiable measures, moving toward absolute measurements.
- Focus on plotting raw % signal change to quantify how reproducible in both relative and absolute measurements for BOLD.

Funding deadlines

- End of February / early March for funding applications
- Call for new applications (especially if they support the group's strategic plan and have existing data available).

Next steps:

- Group to review Rick Buxton article on oxygenation and hemoglobin, and de-oxygenation and what drives it.
- Drs. DeYoe and Tucker to add additional data to the workflow table/checklist.
- Consider what aspects of the BOLD signal are quantifiable and whether or not formation of another subcommittee is warranted to investigate.
- Pull together supporting literature for the Profile.
- Focus on next phase fMRI funding proposals.
- Focus on different ways of looking at NVU (next fMRI Reproducibility call topic).

Next Call for fMRI: Wednesday, **February 9, 2011; 11 AM CST**

Next Call for fMRI Reproducibility: Tuesday, **February 15, 2011; 11 AM CST**