fMRI Subcommittee:

co-Chairs
Edgar DeYoe, PhD
Jeffery Petrella, MD
James Reuss, PhD

Activities: Profile Development

QIBA fMRI Profile Development:

Context: Presurgical brain mapping to minimize postsurgical neurological deficits.

Current Focus: fMRI task-induced activation as a biomarker of the location of the center of mass of viable brain tissue (relative to a resectable tumor).

Status: Version 1.0 available for public comment by Sept. 2015.
Activities: Groundwork Research

Past / ongoing projects:

1. fMRI Reproducibility
   - Estimate the reproducibility of center-of-mass coordinates in empirical datasets for hand-motor and visual activation

Reproducibility of fMRI as a Biomarker of Healthy Brain Tissue
Activities: Groundwork Research

Past / ongoing projects:

1. fMRI Reproducibility
   - Estimate the reproducibility of center-of-mass coordinates in empirical datasets for hand-motor and visual activation

2. fMRI Digital Reference Objects
   - Assess ability of different, existing post-processing pipelines to achieve profile claims and to affect precision and bias (J. Voyvodic – Duke)
Multi-Site Results

Site Standard Thresholds (no subjective adjustment)

fMRI Sources of Variance (to be tested)
Activities: Groundwork Research

Past / ongoing projects:

1. fMRI Reproducibility
   - Estimate the reproducibility of center-of-mass coordinates in empirical datasets for hand-motor and visual activation

2. fMRI Digital Reference Objects
   - Assess ability of different, existing post-processing pipelines to achieve profile claims and to affect precision and bias (J. Voyvodic – Duke)
   - Develop synthetic DRO’s and use to assess effects of individual sources of variance on precision and bias (E. DeYoe – MCW)

Matlab DRO Synthesis Program

Anatomy

Noise Source

Signal Weighting Mask

SNR 4.54

Signal Source

Synthesized fMRI Signal

Stimulus-Task timing

Synthesized BOLD response
fMRI DRO Project - Interim Milestones

- Infrastructure for creating customizable DROs in place.
- First round “empirical” DROs created, processed at 8 sites. Meta-analysis underway.
- Hybrid and fully synthetic DROs under production to identify and evaluate individual sources of variability.
- Tested and validated DROs will be publicly available through the QIDW online database.

Activities: Groundwork Research

Upcoming Project:
Quantitating Clinical fMRI Mapping of Language:
- Center-of-mass, spatial extent, and relative strength of active areas (J. Voyvodic - Duke)

Groundwork to extend claims beyond motor system
Activities: Outreach

Liason with DICOM Working Group 16 (J. Reuss):

Milwaukee - Sept. 2015 - Joint meeting with fMRI committee representatives to establish / standardize DICOM header fields for fMRI.

fMRI Committee Members:

James Voyvodic¹, PhD, Edgar DeYoe², PhD (co-chair), Cathy Elsinger³ PhD, Jeffrey Petrella¹, MD (co-chair), David Soltysik⁴, PhD, Kirk Welker⁵, MD, James Reuss⁶, PhD (co-chair), Jay Pillai⁷, MD, Yuxiang Zhou⁸, PhD, Edward Jackson⁹, PhD, Andrew Kalnin¹⁰, MD, Nancy Obuchowski¹¹, PhD, Zhiyue Jerry Wang¹², PhD, Anup Battacharaya¹³, MD, Feroze B Mohamed¹³, PhD.

Affiliations:
¹Duke University, ²Medical College of Wisconsin, ³NordicNeuroLab, ⁴U.S. Food and Drug Administration, ⁵Mayo Clinic, ⁶Prism Clinical Imaging, Inc, ⁷Johns Hopkins University, ⁸Beaumont Health System, ⁹University of Wisconsin, ¹⁰Ohio State University, ¹¹Cleveland Clinic, ¹²UT Southwestern Medical Center, ¹³Temple University.
20 DROs were generated based on empirical fMRI data.
   10 language task DROs
   10 motor task DROs

DROs were uploaded to QIBA’s Data Warehouse web-site
   in both DICOM and NIFTI file formats

DROs were downloaded and analyzed at 8 QIBA sites

Each site used its own standard fMRI processing methods:
   SPM, AFNI, PRISM, BrainEx, fScan

Results were collected at a central site for comparison