QIBA fMRI Subcommittee
Wednesday, January 27, 2010
11 AM CST

Call Summary

In attendance:

Cathy Elsinger, PhD (co-chair)
Rasmus Birn, PhD
Bradley Buchbinder, MD
Andrew Buckler, MS
Geoffrey Clarke, PhD
Ted DeYoe, PhD
Deborah L. Harrington, PhD
David Mikulis, MS
Jeffrey Petrella, MD
James L. Reuss, PhD
Daniel C. Sullivan, MD
Douglas M. Tucker, PhD, MBA
James Voyvodic, PhD

RSNA
Fiona Miller
Susan Anderson, MLS
Joe Koudelik

Introduction of new member (Dr Elsinger)

- Welcome to Dr Harrington who is a research scientist at the UC San Diego VA – cognitive neuroscience based on fMRI and MEG methodologies

Identification of Co-chairs

- Ongoing process; Dr Elsinger has extended invitations ; contact Dr Elsinger or RSNA staff (Joe Koudelik, jkoudelik@rsna.org) if interested to join or co-chair group

Future Meeting – f2f Meeting during ASFNR meeting

- Drs Elsinger, Roberts and other to follow-up off-line concerning possible f2f during the February AFSNR meeting in Las Vegas.
- Possible agenda items (determine focus):
    - Discussion of multi-center ASFNR study
    - fMRI subctte and ASFNR group to discuss respective focus, background and activities
    - Profile/Claims discussion

Upcoming Profile Activities

- Need continued discussion on how to improve biomarker development for fMRI studies; distinction between research and single-study exams helpful
- Claims and clinical context to be developed; Profile to articulate how to accomplish goals laid out by the Claims
- Claim needs to specify:
    - "Readout" or data
    - What performance characteristics are needed, e.g. minimum detection limit on readout, what level of variability to pursue, etc
    - Readout examples:
        - vCT in cancer looks at CT volumes
        - PET looking at SUV values
        - MRI looking into Ktrans variables
        - COPD looking at multi-characteristic measures such as density and morphology
    - A quantitative number is needed, e.g.
        - Lateral measurements
        - Extensive activation of area
        - Distance from surgically resectable lesion
- Numeric readouts and statistical requirements lead to Claims based on a given level of reproducibility
- Restrict discussion to Profile design and fMRI administration, e.g. what affects quality of exam or integrity of data collection
    - Test design – adequate baseline needed, e.g. number of observations, etc
- Research vs. clinical scanning
    - Research fMRI based on long scans (1-2 hours) producing extensive data

    - Pre surgical mapping based on short exposures (5-6 minutes scan times) in a clinical setting with a need to collect adequate data in short time span
- Implementation and administration – verify that scanners and peripherals operating, patient training, etc
- Need to combine scanner data for cross-site/cross-platform equipment comparison (e.g. variable conditions)
- Analysis methods – need valid computational methods and statistical significance; control needed to detect if BOLD signal is compromised

Layered/level Approach

- Levels
    1. Do we see signal?
    2. Where is signal seen and how related to structure?
    3. Once signal and position identified, what is the physiological significance?
- QIBA to focus on levels 1 & 2 (technical level); AFSNR collaboration needed to help with level 3 (extensive clinical studies needed)
  AFSNR focusing on currently available quantitative data

Threshold

- Threshold and visual analysis needed to stop scans (enoug**h** data to achieve statistical significance needed)
- Statistical significance may be too simple to determine threshold
- Clinically validated static acquisition parameters needed; optimization with real-time approach later
- Real time-course needed to stop exams based on standards of "enough data collected"
- Single scan runs may not provide adequate data; an average of multiple runs may be required, e.g. 1 long run vs. 3 short runs
- Need to broaden our objectives beyond quantifying minimum thresholds; need additional quantifiable markers technically related to reproducibility

Language Paradigms are problematic

- Question remains on which language paradigm to use
- Guidelines needed based on evidence-based recommendations; methodological guidelines to assure quality of activity by using any chosen paradigm
- Criteria to judge whether a paradigm is 'good' also needed

Selection of Paradigms

- Methodology not to restrict paradigm choice, but apply a process resulting in robust activity
- Activation control condition paradigm needed – another layer of complexity to identify what is relevant
- Guidelines needed based on evidence-based recommendations; methodological guidelines to assure quality of activity by using any chosen paradigm
- Current literature shows no accepted (consensus) mapping model for brain language processing
- Language network (activated clusters) complicates mapping in this area; essential network needed concept needed as a basic template to build upon
- Reproducible paradigms exist, but clinical meaning not know; outcomes correlation needed
- Probability of risk-of-resection needed by neurosurgeons to pass along to patients
- Guidelines for biomarkers is goal; need clinical practitioner input of current challenges and those issues needing to be addressed
- Need to work at the level of the neurosurgeon; what is essential to highlight for the surgeon,
- Final driver for fMRI is what neurosurgeon asks in a clinical context: "What is the fMRI measure for final status of a region that will lead to deficit if resected?"

Next Steps:

- Clarification of Claims needed; feedback requested; can send to Joe as discussion topics for next call
- Dr Petrella to forward literature referring to radiology study correlating quantitative fMRI with mapping
- Bizzi article, *Radiology*, June 2008 to be posted on Wiki for reference
- A QIBA fMRI Wiki page is under development; will be available to post reference materials and allow working documents to be edited
- Dr DeYoe looking into vision and motor paradigms
- Next call: February 10th, 2010 at 11am CST