

QIBA fMRI Biomarker Committee (BC) Call

Wednesday, July 1, 2020 at 11 a.m. (CT)

Call Summary

In attendance

Feroze Mohamed, PhD (Co-chair)

David Soltysik, PhD (Co-chair)

Cathy Elsinger, PhD

Ping Hou, PhD

Ichiro Ikuta, MD, MMSc

Andrew Kalnin, MD

Ho-Ling (Anthony) Liu, PhD

Nancy Obuchowski, PhD

David Scott, PhD

Judd Storrs, PhD

James Voyvodic, PhD

Yuxiang Zhou, PhD

RSNA staff

Joe Koudelik

Susan Stanfa

Review of Previous Call Summary

- The 06.17.2020 call summary was approved as presented

DRO Study Results (Dr. Voyvodic)

- Dr. Voyvodic plans to submit his DRO study results to *JMRI*, rather than resubmitting it to *Neuroimage* for publication

Discussion Continued on Elliott ML, et al., [What Is the Test-Retest Reliability of Common Task-Functional MRI Measures? New Empirical Evidence and a Meta-Analysis](#), published in *Psychological Science*

- The authors claimed that all fMRI results are suspect because the technique is fundamentally non-reproducible
 - Due to significant variability, measures were deemed unsuitable for brain biomarkers discovery
 - It was suggested that the authors made a broad, sweeping statement from a different perspective, erroneously claiming that fMRI is not reproducible or reliable
- The fMRI BC is considering drafting a response that would argue the conclusions were incorrect
 - If done properly, fMRI is a reliable way of looking at brain activity and can be reproducible
 - The proper procedure (i.e., the fMRI Profile) to be defined
 - The criticism of fMRI being nonreproducible is due to how it is *typically* performed, which is a large obstacle to clinical applications
 - The article is flawed because variability in task designs and inherent problems of reproducibility related to such task designs (rather than fMRI itself) was not considered
 - Also not taken into consideration was subject task performance and variability in cognitive paradigms (i.e., event-related vs. block designs)
- Comparison of Elliot et al. and pre-surgical fMRI was discussed
 - Elliot et al. 2020
 - Cognitive, neuropsychological tasks and voxelwise analysis used
 - Conclusion: reproducibility of voxelwise (whole brain) fMRI activation is poor
 - Not as reproducible, due to large number of sources of variance present in fMRI; presurgical planning was not considered
 - Thresholds cannot be manipulated with voxelwise analysis, which is a fundamental problem
 - Pre-surgical planning
 - Simple motor/language tasks and Cluster-based analysis used
 - Conclusion: center of mass is highly reproducible
 - Patterns of activity are considered; *pattern* of bold signal is reproducible

- Suggestion that what the QIBA fMRI BC has learned about making fMRI reproducible should also be applied to population studies
- Discussion occurred on articles in popular press showing flawed interpretation

The fMRI BC discussed plans for a response, which included identifying the focus, strategizing, and method(s) to use (e.g., letter to editor, article review, etc.)

- The fMRI BC has data to support their forthcoming response
- The first step is to define the article's assertion; if the message is that "every study you've read is wrong," finding at least one published study to disprove this could support the fMRI BC's counterargument
- Fundamentally, the article's assertion is flawed; the QIBA fMRI BC has spent years working to make fMRI a reproducible biomarker and will explain how it can be done; this effort would double as publicity for the fMRI Profile, the committee, and QIBA in general
- In stating that bold signal itself is not unreliable, the article left an opening for the fMRI BC to rebut that the administration of tasks is the key factor in reproducibility
- While important questions are raised by the authors, the conclusion is inaccurate
- Discussion re: drafting a letter to the editor of *Association for Psychological Science* (APS)
 - Several fMRI BC members volunteered to submit short criticisms to Dr. Soltysik for compilation
 - Concern that a response to this type of journal re: clinical fMRI may not be of interest and may not be published; the fMRI BC's focus is from a clinical radiologist perspective and is a little siloed from general psychology and neuropsychology
 - Also pointed out, was that a letter is not peer-reviewed; it is a statement/opinion and cannot be used as evidence
 - Suggestion that a stronger rebuttal would be to publish a separate article outlining the benefits of fMRI as a biomarker in clinical use cases and promote QIBA work on this topic
- Concern that as a result of the Elliot article there may now be doubt in the field re: the reproducibility of fMRI, the QIBA fMRI BC would be operating from a position of defense
 - There is concern that though the practice leads to better patient outcomes, the practice of ordering brain fMRIs prior to surgeries will wane or cease due to patient and/or surgeon distrust

Action Items

- Dr. Soltysik to reach out to Pillai re: contributing to the QIBA fMRI BC response efforts
- Dr. Scott to draft a letter and circulate it for review
- It was suggested that a review article outline be drafted as well
- Dr. Soltysik agreed to submit his slide set used during this meeting to staff for fMRI BC circulation

Next call: Wednesday, July 15, 2020 at 11 a.m. CT (1st & 3rd weeks of each month)

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