QIBA fMRI Biomarker Committee (BC) Call

Wednesday, May 5, 2021 at 11 a.m. (CT)

Call Summary

In attendance			**RSNA staff**
Jay Pillai, MD (Co-chair)	Ho-Ling (Anthony) Liu, PhD	James Voyvodic, PhD	Joe Koudelik
David Soltysik, PhD (Co-chair)	Nancy Obuchowski, PhD	Yuxiang Zhou, PhD, DABR	Susan Stanfa
Shruti Agarwal, PhD			

Review of Previous Call Summary

- The 04.21.2021 call summary was approved as presented

fMRI Language-Mapping Profile v2.0: Decisions to be Made

- Once consensus is reached on fMRI data to inform Claims, image quality assurance and image processing methodology, the fMRI BC can proceed with Claim development
- Dr. Voyvodic reported that the figures in his paper have been finalized
- QC is a crucial part of the Profile, so setting criteria re: "a good scan" is a critical factor
- After calculating the correlation coefficient for every single parameter with subjective quality ratings where scans have been evaluated and scored, the strength of the activation of BOLD signal was determined to be the best predictor of data quality, followed by:
    - A consistency index of task performance and its impact on variability and motion
    - Motion parameter (e.g., FD, RMS)
- Discussion re: which atlas(es) to make available online for Profile users to use if they choose, since to meet the Profile Claim, ROIs will need to match those indicated in the Profile
- Broca's area (BA) and Wernicke's area (WA) to be the focus for localization; the ROIs for laterality will include frontal and temporal lobes, symmetrical in the left and right hemispheres
- In Dr. Voyvodic's study, maps were scored based on the amounts of activation overlap, with greater overlap signifying a better scan
- A half max of four (based on a peak value AMPLE threshold of 8) was deemed the best predictor of image quality, but seen as a stringent threshold that may eliminate many smaller clusters of activation in secondary language areas; some fMRI BC members take these smaller clusters into consideration in language activation maps
- There was concern that most users would not be able to meet this standard, causing potentially valid datasets to be discarded
- Dr. Voyvodic reported that 98% of the scans he subjectively rated as adequate were included based on the half max of 4 criterion used with 1,000+ scans; very few scans with a usable signal were excluded as a result of using this threshold (i.e., only bad scans were discarded)
- Dr. Pillai noted that when single runs were done in patients undergoing presurgical mapping, good scans frequently resulted despite patients not always meeting that criterion
- Discussion re: suggestion to use a max of 8 rather than a half max of 4, but this was noted as not having the same intuitive meaning to users
- Suggestion to include an optimal level of performance as well as a minimum quality requirement in the Profile
    - For motor maps, this criterion would be easy to accomplish and could be met by almost every user; there is much greater inter-subject variability in language-mapping
    - On the other hand, the Profile is meant to establish a reproducible biomarker, not necessarily the minimum necessary standard for clinical scanning, so a high bar should be set
    - Dr. Voyvodic to draft text and a figure to explain the results of using different thresholds, including the amount of impact on the quality of data as well as the effect on reproducibility

        - At a half max of 4, all bad scans would be eliminated, and a majority of good scans would be retained
        - At a half max of less than 4, bad scans would be retained
        - Too many usable scans would be omitted with a half max of 5 or 6

- Discussion about the t-value being dependent on the length of the time series
    - Dr. Voyvodic stated that the significance does not change dramatically for different numbers of time points
    - It was noted that peak t-value already mitigates for differences between scanner strengths
    - Criterion for a "good scan" would be unchanged
    - A minimum of time points would be unnecessary

- The procedure for acquiring a good scan will be included in the Profile; however, in Dr. Voyvodic's study, QC criteria were applied after the scan was already done as confirmation that the scan was adequate
- Discussion re: terminology to use for the LI calculation method
    - Use of "Threshold independent" vs. "Threshold dependent" was discussed
    - Dr. Voyvodic had calculated laterality indices using 50% AMPLE thresholding, AMPLE-weighted values, and did not resort to thresholding-independent approaches
    - Recommendation to use "AMPLE-weighted laterality index," as the term for the LI calculation method, including the activation-weighted counts of voxels on each side that meet the top half of activation
    - An accurate, yet concise name to refer to the method was recommended; additional details can be provided in the Profile text

Next Steps

- The goal is to finalize decisions on ROIs, Claim development, and image quality assurance and processing methodology
- Profile-related action items to be determined

Next call: Wednesday, June 2, 2021 at 11 a.m. CT (1st & 3rd weeks of each month)

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