QIBA Proton Density Fat Fraction Biomarker Committee (PDFF BC) Call

Thursday, May 7, 2020 at 3 p.m. (CT)

Call Summary

Participants			**RSNA**
Scott Reeder, MD, PhD (Co-chair)	Diego Hernando, PhD	Jonathan Riek, PhD	Joe Koudelik
Takeshi Yokoo, MD, PhD (Co-chair)	Harry Hu, PhD	Suraj Serai, PhD	Susan Stanfa
Mustafa Bashir, MD	Nancy Obuchowski, PhD	Samir Sharma, PhD	
Jean Brittain, PhD	Michael Middleton, MD, PhD	Andrew Trout, MD	
Gavin Hamilton, PhD			

Review of Previous Call Summary

- The 11.07.2020 call summary was approved as presented

Multi-Vendor Calimetrix Phantom Study: Final Results (Dr. Yokoo)

- The purpose of the study was to determine the range of bias in PDFF measurements using vendor protocols at 1.5T and 3T and incorporate results into the Profile
- The round-robin study included scans from GE, Philips and Siemens systems, with a second/repeat scan at Siemens sites for QC
- Three protocols were run at each site: (1) vendor-specific, (2) QIBA-recommended (Profile) and (3) LipoQuant
- Due to larger-than-expected systemic bias toward lower fat fraction, LipoQuant was not included in the final data analysis
- A paper is underway to report on bias found across vendors systems, field strengths and vendor vs. QIBA protocols; it will soon be circulated for PDFF BC member review
- Tables containing imaging parameters for vendor vs. QIBA-recommended acquisitions for: GE 1.5T and 3T, Philips 1.5T and 3T, Siemens 1.5T and 3T were explained
- Discussion re: MRI PDFF vs. True PDFF and quadratic fit vs. linear fit
- Statistical considerations were discussed; Dr. Obuchowski explained the simulations that were conducted and will provide a reference for distribution
- It was concluded that vendor and QIBA protocols were similar in performance, i.e., they resulted in minor output bias
- A linear progression was conducted to determine slope differences and see how slopes varied along with varying biases; this helped to determine whether measurements were statistically different from one another across platforms and sites
- Discussion re: linear fit of each vendor at two different field strengths and plotted vendor protocol / QIBA-recommended protocol
    - GE 1.5: Bias was not detected for either protocol
    - Siemens 1.5: Vendor protocol was lower than QIBA-recommended; Dr. Yokoo to look into this further
    - Philips 3T: Though minimal, there was bias in intercept and slope
    - While Dr. Yokoo had data from all six platforms displayed in a single model, it will not be included when reporting final results
        - The point of the study was to analyze bias across vendors and field strengths and not to determine which platform has the least bias
        - Since Profile users will be using only the equipment available to them at their sites, a “head-to-head” scanner comparison between vendors would be irrelevant
        - The protocol resulting in the least bias will be recommended

- The conclusion was written by Drs. Bashir and Reeder
    - Dr. Yokoo's conclusion was that biases can be field, vendor and protocol-dependent, but if protocols are used wisely, bias can be controlled

- Discussion re: whether differences appeared de-emphasized as a result of using only regression plots
    - It was questioned whether this methodology was correct, and if so, if any other issues were de-emphasized or masked
    - Dr. Obuchowski stated that the purpose is to look at bias patterns
        - Using regression plots may cover up patterns of non-linearity, but if there are no strong deviations identified, then regression plots are acceptable
    - Recommendation to do a Bland Altman plot in addition to looking for strong slope deviations
    - Vendor protocols were known to vary for the same scanner/platform, as vendors often tweak for best result; this alone could be a possible source of bias
    - The out-of-box vendor protocols are significantly heterogenous, but they can be "fixed" to perform better

Next Steps

- Drs. Hu and Yokoo to conduct additional analysis and plotting; they will follow up with additional results and discuss how to interpret them, as well as whether they should be included in the paper
- Dr. Yokoo to delve more deeply into the re-analyzed Siemens data

Next QIBA PDFF BC call: Thursday, June 4, 2020 at 3 p.m. CT
