<div align="center">

QIBA Musculoskeletal (MSK) Biomarker Committee (BC) Call
Tuesday, November 20, 2018 at 10 AM CT
Call Summary

</div>

In attendance			**RSNA**
Xiaojuan Li, PhD (Co-Chair)	Peter Hardy, PhD	Mark Rosen, MD, PhD	Joe Koudelik
Thomas Link, MD, PhD (Co-Chair)	Feliks Kogan, PhD	Suraj Serai, PhD	Susan Stanfa
Angie Botto-van Bemden, PhD	Leon Lenchik, MD	Ramya Srinivasan, MD	
Robert Boutin, MD	Edwin Oei, MD	Cory Wyatt, PhD	
Ali Guermazi, MD, PhD	Yuxi Pang, PhD		

Moderator: Dr. Link

2018 RSNA Annual Meeting & QIBA Kiosk

- All were invited to RSVP for the QIBA Working meeting and volunteer for the poster Meet-the-Expert session times
  - New Arthritis Foundation study data were incorporated into the poster

- Due to schedule conflicts of MSK leadership, this group's breakout session meeting was cancelled

Arthritis Foundation Calibration Study Activities (Dr. Li)

- Dr. Li provided an update on the Arthritis-Foundation-sponsored, multi-site, multi-vendor cartilage $T_{1\rho}$ and T_2 quantification effort
- Phantom and clinical data have been collected and results were reported
- Four sites involved
  - Albert Einstein College of Medicine of Yeshiva University
  - Cleveland Clinic
  - University of California, San Francisco
  - University of Kentucky

- Project Aims
  - Sequence development and optimization. Dr. Li, the PI, worked with the PI from each site for development and optimization of the $T_{1\rho}$ and T_2 imaging sequencing on GE, Siemens and Phillips platforms.
  - Collect data from phantom and human subjects from the four sites, evaluate image quality and quantitative reproducibility. Cross-validation across the four sites will be performed with phantoms and traveling subjects.

- Study and Data Management
  - Monthly conference calls with all sites
  - Naming convention for phantoms and human subjects
  - SOPs for phantom and human subject data collection
  - Data transmittal form
  - Data anonymization (for human data) and uploading with uploader to research PACS at CCF
  - Centralized data processing at CCF

- Sites, hardware, software overview and descriptions of phantoms were provided
- Sequence structures were defined and resulting data were displayed
- Phantom and human subject imaging protocol and intra-site and inter-site CV were provided

- A comparison of multi-site multi-vendor Human $T_{1\rho}$ and T_2 data were displayed and discussed
- Single site repeatability CV <3% (consistent with the literature)
- Cross-site multi-vendor variation CV was 6~10% (slightly higher than multi-site single vendor studies)
- Factors that affect quantification: B0 and B1, temperature, SNR and fitting algorithm and reconstruction; next steps:
    - Dedicated cartilage $T_{1\rho}$ and T_2 phantom (temperature, NIST)
    - Large sample size with traveling volunteers; longitudinal reproducibility (6M follow up)
    - Cross-validation in patients
    - Fast imaging (compressed sending, machine learning)
    - Standardized automatic quantification

- Though multi-vendor data analysis is complete, measurements made on different platforms cannot be directly compared; to obtain better comparability, cross-calibration is needed
    - Caution to be taken not to overcorrect data
    - Additional study to continue regarding the impact of temperature on $T_{1\rho}$ and T_2; Dr. Hardy has done some work on this and implications for Dr. Li's MSK BC phantom study included:
        - Temperature contributed significantly to variation found in the data, causing true variation to be obscured
        - Suggestion to develop calibration formula and provide guidance to mitigate measurement error due to temperature
        - Differences between phantom and human subject measurements need to be recognized

    - While efforts have been made to use the same sequence structure, details need to be refined
    - Minimizing differences across vendors (variability) found to be challenging
    - Suggestion to standardize data set to develop reference data by collecting them separately from each vendor
    - A systematic shift in a larger sample size could allow source of variation to be more easily determined; additional funding needed, as it is expensive to fly in travelling volunteers
    - Suggestion to conduct a single site, multi-vendor study with a modest sample size, which can be done at Cleveland Clinic and other sites that have 2 – 3 different platforms
    - Discussion regarding possible variability introduced in human subject by travelling/flying between imaging sites

MSK Profile (Dr. Link)
- Profile streamlined as a result of the removal of redundant information
- Aim to finish draft to send out for public comment by mid-2019
- Dr. Li hopes to secure funding for additional studies whose results could be incorporated into the Profile, e.g. additional sequence standardization, larger sample size volunteers and potentially patients to be scanned with multiple vendors
- Table 1 actors and required activities were discussed
- Section 3.1: Pre-delivery to be removed as MSK has no onsite pre-delivery issues
- Section 3.2: Installation – recommendations needed for pulse sequences, coils, phantoms and segmentation software
    - To work with vendors on obtaining standardized sequences
    - Dr. Link to reword the following as a recommendation: "as coils have a significant impact on signal and measurements quadrature transmit/(min) eight-channel phased-array receive coils should be used."

- Pending funding, a calibration phantom will be used to cross-calibrate the measurements
  - It will be important to validate measurements across sites and vendors to demonstrate reproducibility (will write as a requirement)
  - Dr. Li is working with Dr. Keenan (NIST) and Dr. Mirowski (Verellium) on the phantom design, which may be modelled after the NIST diffusion phantom; Dr. Mirowski estimated 6 – 9 month timeline for delivering phantom prototype (upon receiving funding)
  - Funding needed for phantom development (~$50k): suggestion made to speak with QIBA leadership regarding possible funding for future groundwork projects

- Dr. Link to circulate the updated Profile to MSK BC members; those with suggestions for changes and additions are welcome to email Dr. Link

OARSI imaging discussion group meeting in Toronto during OARSI 2019 World Congress May 2 – 5
- Development of the preliminary meeting program has been completed; strong international participation in presentation of the following topics:
  - Introduction by Drs. Xiaojuan Li and Thomas Link
  - International Workshop on Osteoarthritis Imaging-Aims and Expectations by Dr. Felix Eckstein
  - Introduction of a potential white paper on guidelines for imaging in the clinic by Dr. Flavia Cicuttini
  - Imaging in the clinic – issues of low value care by Dr. Gilian Hawker
  - Cartilage compositions MRI – does it have a role in defining early OA from a clinical perspective? By Dr. Jamie MacKay
  - Role of imaging in different stages of knee OA: a Radiologist's perspective by Dr. Ali Guermazi
  - Discussion

Next Call: Tuesday, January 15 at 10 AM CT (will not meet on Dec. 18 due to close proximity to holidays)