

## QIBA Musculoskeletal (MSK) Biomarker Committee (BC) Call

Tuesday, April 28, 2020 at 10 a.m. CT

### Call Summary

#### In attendance

Xiaojuan Li, PhD (Co-chair)

Thomas Link, MD, PhD (Co-Chair)

Michael Boss, PhD

Angie Botto-van Bemden, PhD

Robert Boutin, MD

John Carrino, MD, MPH

Majid Chalian, MD

Maggie Fung, MEng

Ali Guermazi, MD, PhD

Harry Friel, MS

Peter Hardy, PhD

Kathryn Keenan, PhD

Jason Kim, PhD

Jeehun Kim

Feliks Kogan, PhD

Leon Lenchik, MD

Kecheng Liu, PhD, MBA

Elizabeth Mirowski, PhD

Nancy Obuchowski, PhD

Yuxi Pang, PhD

J.M. (Hans) Peeters, PhD

Qi (Chris) Peng, PhD

Rob Peters, PhD

Fraser Robb, PhD

Carl Winalski, MD

Can Wu, PhD

Cory Wyatt, PhD

#### RSNA

Joe Koudelik

Susan Stanfa

**Moderators:** Drs. Li and Link

#### MSK Profile (Dr. Link)

- The latest Profile version was posted to the [MSK Committee QIBA Wiki page](#) as a working draft and will be updated and circulated for a final internal BC review
  - Dr. Link reviewed edits made since the March 24 call and discussed Dr. Boss' suggested edits
  - Dr. Obuchowski to review statistical questions raised by Dr. Boss
  - It was recommended that the MSK BC not delay the vote-to-release for public comment, as it will be an opportunity to receive a wider perspective on details that have been the source of recurring discussion
  - Dr. Boss recommended a public comment period of more than 30-days; the [MSK public comment resolution spreadsheet](#) has been created and will be used to document how feedback is addressed
  - The goal is to begin internal BC review/vote-to-release by the end of May 2020 and have all public comments addressed by the end of 2020
  - It was recommended that the Profile be circulated as widely as possible for public comment
  - Suggestion to reach out to ARRT, as well as technologists and all other actors within MSK BC member institutions; consensus was that technologists would provide critical end-user feedback regarding Profile requirements and feasibility
- Dr. Li received R01 funding to perform a multi-center standardization study, which will help with technical and clinical confirmation
- A new MSK phantom is being developed by Drs. Mirowski and Keenan to obtain reference measurements with  $T_{1\rho}$  and  $T_2$ ; a total of 6 – 9 months is required for completing a prototype phantom
- Phantom reference measurement details needed in the Profile without delaying the public comment phase
  - The Profile could be left as is, with measurements obtained from literature review and prior studies; alternatively, updated measurements could be added following public comment
  - Additional revisions may be made to the Profile at a later date

#### Update on White Paper (Dr. Chalian)

- Dr. Chalian is drafting a white paper based on the MSK Profile in the style of a technical report and will submit it to *Radiology* in ~3 weeks
- This activity will proceed in parallel with the release of the Profile for public comment

## Introduction of the NIH/NIAMS Funded Cross-Calibration Study (Dr. Li)

- The study aims to develop and cross-validate novel fast MR  $T_{1\rho}$  and  $T_2$  imaging methods on MR systems from multiple vendors, followed by feasibility evaluation in patients at risk for osteoarthritis
  - Aim 1: Develop novel acceleration techniques for fast 3D cartilage  $T_{1\rho}$  and  $T_2$  imaging using model-based compressed sensing techniques
  - Aim 2: Develop a calibration phantom suitable for standardization of  $T_{1\rho}$  and  $T_2$  measurements and implement acceleration techniques on MR systems of three major vendors (Siemens, GE and Philips)
  - Aim 3: Demonstrate the availability of the newly developed acceleration techniques to quantify cartilage degeneration longitudinally in a multi-vendor setting
- Study design is based on evaluating intersite and intervender variation
- An overview of the study team was provided
  - **Cleveland Clinic:** Xiaojuan Li, PhD; Carl Winalski, PhD and Nancy Obuchowski, PhD
  - **University at Buffalo:** Leslie Ying, PhD | **UCSF:** Thomas Link, MD and Jing Liu, PhD
  - **Albert Einstein College of Medicine:** Chris Peng, PhD | **University of Kentucky:** Peter Hardy, PhD
  - Phantom design/development: Elizabeth Mirowski, PhD (**Verellium, LLC**) and Kathryn Keenan, PhD (**NIST**)
  - Consultants: Ravinder Reddy, PhD (**University of Pennsylvania**) and Brian Hargreaves, PhD (**Stanford University**)
  - Dr. Li appreciated the support from vendors and the Arthritis Foundation (the AF sponsored the pilot study that helped with preliminary data collection for the new NIH R01)
  - **GE Healthcare:** Rob Peters, PhD; Maggie Fung, PhD and Fraser Robb, PhD
  - **Philips Healthcare:** Can Wu, PhD and Harry Friel
  - **Siemens Healthineers:** Kecheng Liu, PhD; Jinnan Wang, PhD and Xiaodong Zhong, PhD
  - **Arthritis Foundation:** Guy Eakin, PhD; Angie van Bemden, PhD and Jason Kim, PhD

## MSK Phantom Development Update

- Elizabeth Mirowski, PhD (Verellium, LLC) and Kathryn Keenan, PhD (NIST) provided an overview of the  $T_{1\rho}/T_2$  calibration phantom under development
- The prototype was shared and feedback on the phantom design was requested from MSK BC members
  - The first step was to connect with all of the vendors (GE, Philips and Siemens), as well as Invivo, the manufacturer of Philips coils
  - Graphics of the phantom were displayed, and its composition was described
  - 20 vials will have materials that mimic cartilage composition with three  $T_1$  (800ms, 1200ms, 1600ms),  $T_2$  and  $T_{1\rho}$  ranging 15-85ms. All 20 vials will have  $T_1$ ,  $T_{1\rho}$  and  $T_2^*$  measured at three temperatures from NIST. Two vials will be used for short  $T_2^*$  purposes, and two vials will be filled with fat.
  - The phantom will also have a slice profile wedge to determine slice thickness accuracy
  - Discussion re: the contrast thermometer, which can include eight different temperatures; it was noted that the phantom would need to be at room temperature and would be placed overnight in the scanning room; arrange the vials with varying distance.
- Dr. Mirowski to send staff a 3D image of the MSK Phantom initial design specs for distribution
  - Feedback was encouraged and will be accepted until May 8, then discussion on the design will close and the production phase will begin
  - Dr. Mirowski requested scanner coil specifications from all vendor platforms intending to utilize the new MSK phantom; this will help design coil-specific phantom mounts

- The goal is to build an MSK phantom that is as useful/multipurpose as possible without dramatically increasing its cost

#### Next Steps

- Mr. Friel (Philips) to follow up with Invivo
- Prior to the May 26 t-con, the Profile will be finalized and future presentations on phantom development will be anticipated
- Once internal BC review has been completed, release of the Profile for public comment must be approved
  - An e-ballot will be sent to [eligible BC voters](#) for a [vote to release for public comment](#)
  - Following a successful BC vote, MR CC voting members will also be asked to vote on release the Profile

**Next Call:** Tuesday, May 26, 2020 at 10 a.m. CT [4<sup>th</sup> Tuesdays of each month]

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