

## QIBA CT Angiography Biomarker Committee (BC) Call

8 October 2018 at 11 AM CT

### Call Summary

#### On Call

Andrew Buckler, MS (Co-Chair)  
Svetlana Egorova, MD, PhD  
Philipp Hoelzer, PhD

Edward Jackson, PhD  
Márton Kolossváry, PhD  
Pál Maurovich-Horvat MD, PhD, MPH

Nancy Obuchowski, PhD  
Taylor Richards, MD  
Ehsan Samei, PhD

#### RSNA Staff

Joe Koudelik  
Julie Lisiecki

#### RSNA 2018 Poster:

- Mr. Buckler volunteered to create a draft of the CT Angiography BC poster for the QIBA Kiosk at RSNA 2018
- Technical details regarding the acquisition device requested from Dr. Taylor Richards
- The poster will be formatted as follows:
  - 2/3 Content
    - Why the biomarker is of interest to the community and how QIBA can contribute
    - Profile development and status
  - 1/3 Content
    - Current Duke groundwork project details from Drs. Samei and Richards
    - Future groundwork needed to support Profile development

#### Update from Dr. Taylor Richards:

- Parameters that will be included in the Profile were discussed, including those for acquisition, examination, and patient preparation
- The goal is to identify the range of acquisition parameters that enables conformant image analysis tools to fulfill the Profile's precision and bias claims for a given measurand
- Five parameter axes were agreed upon:
  - Vessel radius {1-3 mm}
  - Vessel displacement {.375 – 4 mm}
  - Image noise ( $\sigma$ ) {30 – 70 Hounsfield Units (HU)}
  - Pixel size {.4 – 1.2 mm}
  - Spatial resolution modulation transfer function (MTF<sub>f50</sub>) {.3 - .6 mm<sup>-1</sup>}
- Dr. Richards to post a standalone executable program for the model on the [QIBA wiki](#)
- Next steps include the following:
  - Need to validate the model while working with actual acquisitions
  - Start testing analysis software components
  - Work with multiple vendors, such as GE, Canon, Philips, Siemens, etc., to do testing
    - Dr. Hoelzer (Siemens) volunteered to aid with testing; follow-up offline planned with Dr. Richards
    - Mr. Buckler to reach out to other potential volunteer vendor reps
  - A testing phantom has not yet been selected
    - Certain analytical parameters are suited to ex vivo tissue while others are more suited to physical phantoms
    - Vessel structure is best tested with physical phantoms or simulated data (for ground truth measurements), not tissue samples subject to shrinkage
    - A phantom must have the appropriate characteristics to answer study questions and be compatible with multiple scanners, e.g. different coil sizes, etc.
    - It would be helpful if the phantom could also be utilized in future conformance testing based on canonical test procedures

- Theoretical parameters that have been validated include modulation transfer function (MTF) and MTF-50, the common parameter used to measure image sharpness
  - These parameters can predict how a more realistic vessel would perform and use a standard phantom to calibrate machines to determine whether they conform to the Profile
  - A smaller scope set of parameters would help to first validate the physical measurements
  - Simulation work can be done first with in vivo tissue work to be done later in order to address complexities
- Conformance assessment procedures will need to be identified with a pathway from validation to conformance
  - Our task is how to assure conformance of technology
  - Need to feed data into the analysis software to measure regions of interest (ROIs)
  - Dr. Richards made some suggestions for section 3 requirements
  - Section 4 assessment procedures for these specs must be written
  - The specs will include:
    - MTF 50
    - Noise in Hounsfield Units (HU)
    - Number of revolutions
- Dr. Obuchowski to aid with a 3-factor, 2-level factorial design of conformance/agreement study
  - Will need to check for agreement with the simulations used to extrapolate settings
  - A multi-factorial study design is ideal; will need to see how such a model correlates to observations
- Mr. Buckler wants to isolate the analysis software from the rest of the scanning process, e.g., hardware, etc.
  - Best is to have a metric to quantify the scanner hardware separate from analysis software (potentially an e-prime concept)
- Dr. Saba is planning a clinical utility study on plaque morphology with the goal that it be underway 6 to 12 months from now, with protocol standardized and analytic performance based on the completed Profile
  - For this to work, assessment and conformance procedures will need to be in place
  - Experiments could be planned for November with analysis planned for December
  - The FDA anthropomorphic phantom may be a good starting point
- Dr. Hoelzer volunteered to help with testing and will follow up with Drs. Richards and Samei
- Drs. Maurovich-Horvat and Kolossváry have also volunteered to do testing
  - Email communications for planning will be needed; all are asked to cc Mr. Buckler and Dr. Obuchowski

#### Next steps:

- Dr. Taylor Richards to review which CT lung densitometry procedures may be applicable to the CT Angiography Profile on the next BC call
- Drs. Richards and Hoelzer to follow up offline regarding testing of parameters
- Dr. Richards to post a standalone executable program for the model on the QIBA wiki
- Dr. Saba volunteered to update the Protocol Specifications Unique to Carotid Arteries table

**QIBA wiki:** Latest version of the Atherosclerosis Biomarkers Profile, as well as other useful documents can be found on the CT Angiography BC page at: [http://qibawiki.rsna.org/index.php/CT\\_Angiography\\_Biomarker\\_Ctte](http://qibawiki.rsna.org/index.php/CT_Angiography_Biomarker_Ctte)

**Next call:** Monday, October 22<sup>nd</sup> at 11 am CT

#### QIBA Working Meeting and Meet-the-Experts Sessions at RSNA 2018:

- All are encouraged to RSVP for the [QIBA Working Meeting](#) on Wednesday, November 28<sup>th</sup>.
- All are invited to volunteer for [Meet-the-Expert](#) session times