QIBA Ultrasound Shear Wave Speed (SWS):
System Dependencies *and* Phantom-System Measurement Testing Task Force
Friday, February 12, 2016; 11 AM CT
Call Summary Notes Provided by Dr. Wear

In attendance

Mark Palmeri, MD, PhD (Co-Chair)
Keith Wear, PhD (Co-Chair)
S. Kaisar Alam, PhD
Michael André, PhD
Jun Chen, PhD
David Cosgrove, MD
Manish Dhyani, MD
Al Gee
Gilles Guenette, RDMS, RDCS, RVT
Tim Hall, PhD
Ted Lynch, PhD
Michael MacDonald, PhD
Kathy Nightingale, PhD
Stephen Rosenzweig, PhD
Theresa Tuthill, PhD
Matthew Urban, PhD
Michael Wang, PhD, MASc
Hua Xie, PhD

RSNA
Joe Koudelik
Julie Lisiecki

Moderator: Dr. Wear

1. Review of Previous 1/22/2016 US SWS Biomarker Committee Meeting Summary – approved.

2. Phase II System/Site Analysis. Dr. Palmeri presented results of 3 viscoelastic phantoms at 3 depths. Grand median values were shown. Measurements were labeled by letters A – L, which coded unique systems determined by manufacturer and software version. Dr. Palmeri showed measurements for some systems from multiple sites, which demonstrated that there could be substantial site-variation, suggesting that **data from different sites perhaps should not be averaged together**. Repeatability at the same site was good. Reproducibility across sites was not always good. Therefore, site should be considered a source of variability (unlike what we did for IEEE IUS and RSNA presentations in which data from same systems but different sites were averaged together).

   Dr. Hall suggested that temperature could be a source of variation. Dr. Palmeri looked into that and decided that temperature could not fully explain the site disparities. Dr. Hall suggested that temporal changes could be a source of variation. Phantoms will be returned to Duke for final measurements to assess potential temporal drift.

   Dr. Palmeri did an ANCOVA analysis with 4 variables: phantom, system, site, and depth. Phantom was the dominant factor. System was second. Site was third. Depth was fourth.

   Each manufacturer should have data from all sites with their system. So manufacturers can work on trying to understand site variability with their system.

3. Digital Phantom Analysis Reporting. There is a question regarding how manufacturers are going to provide results. Dr. Palmeri is developing a spreadsheet, which is on the QIDW. It has two sheets: one for elastic and the other for viscoelastic. Each sheet has a complete list of all the configurations that were uploaded.

   The elastic phantom sheet has columns for Young's Modulus, focal depth, f#, and excitation duration. The final column is for the user to enter shear wave speed.

   The viscoelastic phantom sheet has columns for G0, Ginf, beta, focal depth, f#, and excitation duration. The final column is for the user to enter shear wave speed.

   Dr. Nightingale commented that a challenge for manufacturers is that they are used to IQ data, but Dr. Palmeri's data is displacement data rather than IQ data.

   Dr. Rosenzweig felt that the dataset was useful, but it is premature for manufacturers to commit to analyze the complete data set in the near future. Manufacturers are still tweaking algorithms. Dr. MacDonald, in agreement with Dr. Nightingale's comment above, said that it will require a considerable

effort for manufacturers to develop a method to apply their algorithms to Dr. Palmeri's displacement dataset. Dr. Wang agreed. Drs. Wang and Palmeri agreed that the digital dataset could be a useful tool for manufacturers to tweak their analysis algorithms in order to achieve greater agreement with desired results. Dr. Nightingale suggested that it may be easier to report on the elastic dataset because they are less complex than the viscoelastic dataset. (We know what the group speed should be because there is no dispersion). Then the viscoelastic data could be used as more of a tool for internal benefit for manufacturers.

Dr. Hall commented that we need to report back to NIBIB what the benefit of this digital dataset was. This remains unresolved. Dr. Nightingale commented that we could report the number of downloads.

Dr. Palmeri suggested that he could provide the ground-truth frequency-dependent phase velocities for the viscoelastic dataset. There was a consensus that this would be useful to manufacturers. A Matlab function that returns phase velocity as a function of 3-parameter VE material and frequency, along with generating an associated plot, will be written and uploaded for group use.

Upcoming Ultrasound Calls (Fridays, 11 am CT):

February:

- Feb 19: Clinical Task Force
- Feb 26: US SWS BC

March:

- Mar 04: Systems/ Phantom Task Force
- Mar 11: Clinical Task Force
- Mar 18: No call {Week of ISTU / AIUM}
- Mar 25: US SWS BC