QIBA US Coordinating Committee Update

Annual QIBA Meeting
Wednesday, May 17, 2017

Modality Committee Structure

- **US Coordinating Committee**, Timothy Hall, PhD; Brian Garra, MD
- **US SWS Biomarker Committee**, Timothy Hall, PhD; Brian Garra, MD; Andy Milkowski, MS
  - System Dependencies / Phantom Testing Task Force
  - Clinical Applications Task Force
  - Profile writing Task Force: Brian Garra, MD; Manish Dhyani, MD
- **US Volume Blood Flow (VBF) Biomarker Committee**, Brian Fowlkes, PhD; Oliver Kripfgans, PhD (AIUM supported)
- **Contrast Enhanced Ultrasound (CEUS) Biomarker Committee**, Michalakis (Mike) Averkiou, PhD; Richard Barr, MD, PhD
Current Status: Profile Development

• Profiles in progress:
  • Ultrasound Shear Wave Speed Biomarker Committee
    • Profile under development / revision
    • Awaiting final statistics from phantom studies to write Claims
    • Anticipate Re-review by BC in June-July.2017
    • Release for public comment Sept.2017

• Field / feasibility project in progress:
  • Round 6 project will perform statistical analysis of data to be gathered at MGH and DC VA

Current Status: Profile Development

• Profile in progress:
  • Volume Flow Biomarker Committee

• Profile under development
  • Round 6 groundwork study with phantoms
  • Multiple sites, multiple systems in progress, ahead of schedule
  • On track with plans for internal review of completed document in Sept.2017
  • Anticipate distribution for public comment in Mar.2018

• No current plans of field / feasibility / conformance projects
  • BC too new
Current Status: Profile Development

- Profile in progress:
  - Contrast-Enhanced Ultrasound Biomarker Committee
- Profile under development
  - New Biomarker Committee
  - No groundwork funding
    - Commercial phantoms appear suitable for groundwork studies
  - Slow start; lots of interest

<table>
<thead>
<tr>
<th>YR</th>
<th>Code</th>
<th>Committee</th>
<th>US Projects</th>
<th>Lead</th>
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<tbody>
<tr>
<td>YR 6</td>
<td>2016-BB</td>
<td>SWS</td>
<td>Establishing Acceptable Variance Limits for Healthy, F1 and F2 Fibrosis Shear Wave Speed Values Across Systems and Between Operators for the QIBA Profile</td>
<td>Dhyan</td>
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Example Results of Shear Wave Speed

Shear wave speed estimates among 9 systems in 3 phantoms at 3 depths

Estimates among systems agree very closely if two outliers are excluded
  -- within ±5% in elastic phantoms
  -- within ±10% in viscoelastic phantoms

Example Results of Volume Flow

• **Current 1D/2D volume flow estimation**
  – 1D flow velocity base on range-gate in a 2D image
  – Flow volume is computed based on several assumptions
    • Accurate estimate of the angle between the flow and the acoustic beam
    • Accurate estimate of the vessel diameter
    • Assumed cylindrically-symmetric flow velocity profile
  – Poor assumptions, time-consuming measurements
  – Turbulent flow and curved vessels are common

• **General principle of the new approach**
  measures flow through a surface
Example Results of Volume Flow

3D Blood Flow Velocity

Volume Flow = Cross sectional area times velocity
\[ Q = A_0 \times v_0 \]
\[ A_n = A_0 / \cos(\alpha_n) \quad \text{and} \quad v_n = v_0 \times \cos(\alpha_n) \]
\[ Q = A_0 \times v_0 = A_1 \times v_1 = A_2 \times v_2 \]
Anticipated New Biomarker Committee

- **Anticipated New Biomarker Efforts**
  - Obstetrics: Fetal Growth and Gestational Age
  - Measurement of crown-rump length
    - Not standardized among professional organization
    - At least 106 growth curves used worldwide

- **Joint international, cross-organizational effort**
  - American Institute of Ultrasound in Medicine (AIUM)
  - World Federation of Ultrasound in Medicine and Biology (WFUMB)
  - International Society of Ultrasound in Obstetrics and Gynecology (ISUOG)
  - Society of Maternal-Fetal Medicine (SMFM)
  - Perinatal Quality Foundation (PQF)
  - American Congress of Obstetricians and Gynecologists (ACOG)
  - Several others
    - Get these to commit to a consensus document, the rest will not want to be left out
  - First meeting at SMFM 2017.Jan; Second meeting 2017.Mar AIUM