QIBA 2017: Investigating New Profile Conformance Methods and Concepts

QIBA Profile Challenges & Opportunities

Introduction

The goal of every quantitative imaging biomarker is to enable a significantly improved standard of care for patients in a specific clinical task and ultimately is universally applied to the full patient population. To achieve this requires not only a comprehensive understanding of sources of quantitative measurement bias and variance and effective methods to control and ensure measurement performance in the academic medical center setting, but the new quantitative methods must also be effective and easily achievable in the community care setting. The use of new and innovative QIBA Profile conformance methods that leverage computational innovations provide new opportunities to improve the delivery and adoption of quantitative imaging biomarkers. QIBA is exploring new conformance methods designed to help overcome many of the major challenges faced by all quantitative imaging biomarkers. Here, we review challenges and opportunities to improve the delivery and adoption of QIBA profiles with new conformance methods.

CT Quantitative Measurement Example

CT Scan, Software, Object

- Volumetric Performance

- Reconstructed Image

- Processed Image

- Acquired Image

- Image Envelope

- Object

- Scanner

- Software

CT Acquisition

QIBA Profile Conformance Methods

Goal: To Use Novel Conformance Assessment Methods To Increase Adoption Of And Conformance With QIBA Profiles

Automated Phantom Analysis

- Automated Phantom Detection and Measurements
- Calculates Quantitative Metrics
- Roughly Checks DICOM Tags
- Produces Easy To Use Reports

Cloud-Based Computing

- Leverages Fast & Efficient Computing Resources And Network
- Easily Scales To Support Global Demand

Low-Cost Phantoms

- A Combination of Hardware and Software Innovations Can Keep Costs Down While Maintaining High Image Quality Measurement Performance
- Must Be Designed For Quick Scanning (<5min)

Simple Checklists & Reports

- Automation Enables Short Checklists
- Some Manual Checks Still Needed

Crowd-Sourcing

- Enabled By Low-Cost Phantoms
- Provides Global View of Performance
- Captures Image Acquisition Diversity

Web Calculators

- Performs Complex Profile Calculations For Users
- Can Advise and Educate Users

Cloud-Based Computing

- Enables Simulation of Technical Performance
- Helps Establish Refined Tech Specs

CT Small Lung Nodule Conformance Pilot Project

- Simple Checklists and Reports
- Scanner, Software, and Protocol Checks
- Volume Analysis Checks
- Clinically-Focused and Easy To Use Reports

Fully Automated Phantom Analysis

- 5-6 Minute Phantom Analysis Time in Cloud
- Clear Pass/Fail Communication
- Suggestions and Guidance For Resolving Issues

Crowd-Sourcing

- 100 CTLX1 Phantom To Be Acquired in 2017
- Protocol Optimization Guidance Will Be Provided Based On This Data
- Send Email To info@accumetra.com To Obtain A FREE CTLX1 Phantom And Support This Study

CT Small Lung Nodule Conformance Pilot Project

- Low-Cost CTLX1 Phantom
- < $250
- 5-Minute CT Scan Time
- Have Shipped To U.S. Sites

Web Calculator

- Performs Profile Calculations
- Provides Guidance

Modeling & Simulation

- Surpassing Fundamental Image Quality Characteristics
- Help Establish Refined Tech Specs

Crowd-Sourcing

- Enables Simulation of Technical Performance
- Helps Establish Refined Tech Specs

Web Calculator

- Performs Profile Calculations
- Provides Guidance

CT Small Lung Nodule Conformance Pilot Project

- Low-Cost CTLX1 Phantom
- < $250
- 5-Minute CT Scan Time
- Have Shipped To U.S. Sites

Modeling & Simulation

- Surpassing Fundamental Image Quality Characteristics
- Help Establish Refined Tech Specs

Web Calculator

- Performs Profile Calculations
- Provides Guidance

Design Of Experiments

- CT Scanner Vendor
- Exploring GW Vendor Opportunities

Future Profile Conformance Opportunities

Global Image Quality Optimization

- Strategies For Guiding Sites To Globally-Driven Optimized Imaging Protocols For A Specific Scanner Can Be Investigated
- CT Scanner Imaging Issues Can Potentially Be Identified In Real-Time And Acquisition Protocol Corrections For Quantitative Imaging Biomarker Scans Can Be Made And Verified Quickly

Rapid Global Studies

- Automation and Low Cost Phantoms Enable Large Global Studies To Be Conducted To Investigate Scanner and Algorithm Performance As Well As Inform Clinical Trials On Expected Variance With Quantitative Imaging Endpoints

Link Image Quality Performance Report With Web Calculator


This Novel Profile Conformance Assessment Platform Can Support Other QIBA Profiles And Phantoms.