QIBA Newsletter

QIBA Newsletter January 2018, Volume 10, Number 1: QIBA Updates and International Collaborations

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QIBA MISSION: Improve the value and practicality of quantitative imaging biomarkers by reducing variability across devices, patients and time.

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Edward F. Jackson, PhD, QIBA Chair

IN MY OPINION

QIBA Updates and International Collaborations

By Edward F. Jackson, PhD

The past year has been marked by several key events in QIBA history that I would like to highlight in this article. With regard to QIBA Profiles, there are currently 20 ongoing profile development efforts, with three focused on applications in CT, four on nuclear medicine, 10 on MR and three on ultrasound. This year marked the first time a profile advanced to the technically confirmed stage. That profile is FDG-PET/CT SUV as an Imaging Biomarker for Measuring Response to Cancer Therapy (v1.05). We expect that the CT Tumor Volume Change Profile will achieve the technically confirmed stage very soon. It is also a time during which the largest number of profiles have been released for public comment in a given year,

including those focused on diffusion-weighted MRI, MR elastography, fMRI, and SPECT. Information on all QIBA Profiles can be obtained on the [QIBA wiki site](#).

The impact of QIBA continues to grow with increased citations to QIBA deliverables and efforts in the scientific literature, use of QIBA Profiles (in whole or in part) in clinical trials, and the highlighting of QIBA efforts by the [Cancer Moonshot initiative](#). In addition, QIBA is now represented on selected National Cancer Institute (NCI) initiatives including the recently formed Quantitative Imaging for Radiation Therapy Working Group and requests are increasing for presentations regarding QIBA at many national and international scientific meetings. Interest in developing closer collaborations between QIBA and the NCI Quantitative Imaging Network has increased significantly during the past year, and we look forward to continuing these efforts.

International Efforts Continue to Expand

With regard to international collaborations, the first joint international QIBA Task Force, focused on development of a profile on MR arterial spin labeling (ASL), was formed with the participation of RSNA QIBA and the European Imaging Biomarkers Alliance (EIBALL), which is under the auspices of the European Society of Radiology (ESR). This international effort is also supported by the European Institute for Biomedical Imaging Research (EIBIR). In addition, QIBA's collaborations with QIBA-Japan, with the strong support of the Japan Radiological Society (JRS), continue to expand.

RSNA QIBA wishes to express appreciation to those involved in these international efforts, particularly Professor Siegfried Trattnig, chair of EIBALL, and Professors Tomio Inoue and Shigeki Aoki, who have been instrumental in the QIBA-Japan efforts. We also wish to acknowledge Professors Xavier Golay, Rik Achten, and Matthias Guenther for serving as the co-chairs of the collaborative ASL Task Force. Professors Trattnig, Golay, Inoue, and Aoki have attended and/or provided reports for QIBA Annual Meetings and several QIBA members have had the great pleasure of attending and presenting at JRS and ESR meetings. We are very pleased to see these international collaborative efforts continue to strengthen and expand.

Thanks to NIBIB and All QIBA Supporters

Of course, as many of you know, this year marks the end of QIBA support from three consecutive two-year contracts from the National Institute of Biomedical Imaging and Bioengineering (NIBIB). Due to competing demands on resources, an additional contract opportunity was not available. RSNA QIBA greatly appreciates the strong support of NIBIB, which funded 79 individual groundwork projects without which our success in the development of the diverse profile portfolio mentioned above could not have happened.

With a rather dramatic decrease in funding for the upcoming year, we have made many changes to reduce expenses while maintaining critical support mechanisms. In addition, the RSNA Board of Directors generously agreed to increase funding for fiscal year 2017-18 in support of QIBA efforts in order to partially address the loss of revenue resulting from the cessation of NIBIB contract support. I wish to personally express my sincere appreciation to the NIBIB for its six years of contract support, the RSNA Board for it strong and ongoing support of QIBA efforts and the dedicated efforts of all the RSNA staff members who provide professional, efficient, and effective support of all QIBA efforts.

In addition, I would like to thank the hundreds of volunteers who are the driving force behind past, current, and future QIBA efforts focused on the translation of quantitative imaging biomarkers from

academic centers of excellence to robust use in clinical trials and, ultimately, to the advancement of patient care through precision medicine.

Edward F. Jackson, PhD, is the Chair of QIBA and Professor and Chair of the Department of Medical Physics and Professor of Radiology and Human Oncology at the University of Wisconsin-Madison School of Medicine and Public Health.

ANALYSIS TOOLS & TECHNIQUES

QIBA Profile Conformance Process and Pilot Project

By Rick Avila, MS

QIBA has made substantial progress in recent years creating QIBA Profiles that ensure that high-quality imaging biomarker measures are consistently and reliably attained. While many technical issues have been overcome and QIBA Profiles have been demonstrated to perform well in academic and large medical centers, the applicability of our methods to the community care setting remains a major challenge. Community institutions generally have less technical personnel who can understand and implement profile procedures, have less resources to spend on phantoms, and often use older scanning equipment. However, if we take extra care to support community care institutions, where the majority of healthcare is delivered, we can greatly expand the reach and impact of QIBA Profiles.

The QIBA CT Small Lung Nodule (SLN) Biomarker Committee took on this approach several years ago as we set out to more thoroughly understand solid lung nodule measurement performance on the numerous CT scanner models and acquisition protocols being used globally for this critical measurement. Given that each CT scanner model has over a dozen image acquisition parameters that can impact measurement performance and image quality can vary significantly throughout the scanner field of view, thoroughly understanding performance of global scanners is a major undertaking. However, as QIBA Profiles support a diversity of scanners and protocols and lung cancer screening is most often provided in the community care setting, we had little choice but to develop new methods to more fully understand performance in the real-world setting.

In 2015, we developed a new, low-cost and carefully validated method for collecting CT image quality information based on scanning rolls of 3M Scotch™ tape and using fully automated, cloud-based image quality assessment software for objective analysis. In 2016, we then worked with the Prevent Cancer Foundation, the Lung Cancer Alliance and the COPD Foundation, to launch the 2016 CT Lung Screening Protocol Challenge, for which 27 global screening sites provided image quality data from 54 individual scanners over a two-month period. This early pilot test data gave us a deeper understanding of the

magnitude of CT image quality variation that is present in real-world lung cancer screening scanners, and helped inform and guide SLN Profile specifications. For example, **Figure 1** shows how the mean 3D resolution (+/-1 std dev) changes as a function of distance from isocenter, a level of understanding that we did not have until the challenge.

Over the last year, the QIBA SLN Biomarker Committee has worked closely with advocacy organizations to pilot-test new and innovative methods for verifying conformance. The SLN Profile now has a one-page checklist of simple steps that allows clinical sites to verify numerous conformance requirements by scanning a low-cost phantom, analyzing the data on the cloud, and receiving automated reports that convey QIBA Profile conformance status. The result is that we are pilot testing a new set of tools that we believe will allow community care sites to easily verify conformance. We recently launched the CT Lung Cancer Screening Protocol Challenge 2, for which we are globally distributing 100 low-cost phantoms and providing sites with cloud-based conformance testing software. The use of low-cost phantoms, cloud-based and fully automated conformance analysis software, and crowd-sourcing through collaboration with patient advocacy organizations is showing great potential as an effective way to expand the reach and the quality of QIBA Profiles.
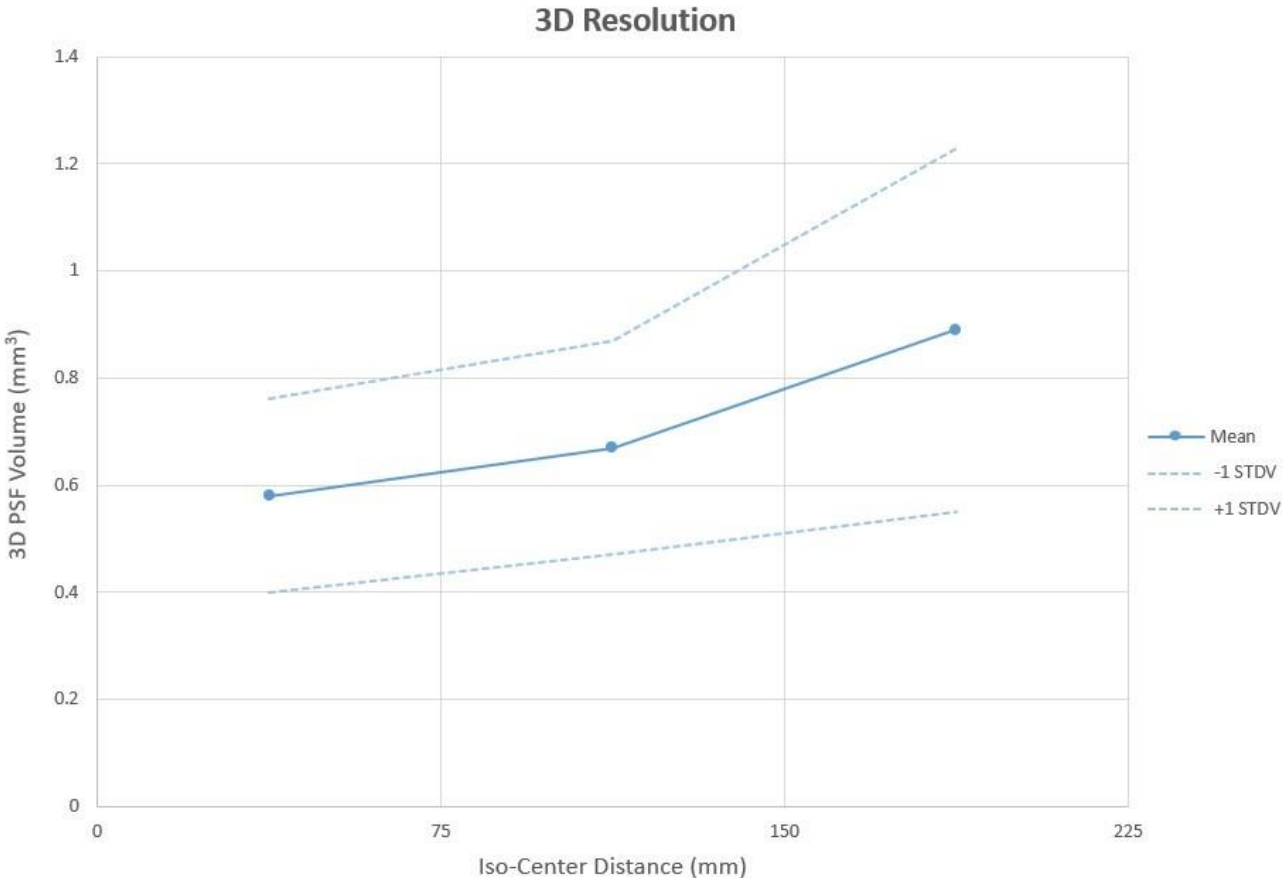

Figure 1: Analysis of the 2016 CT Lung Cancer Screening Protocol Challenge data illustrating the general loss of 3D resolution as a function of distance from CT scanner isocenter. 3D resolution is critical for high quality volumetric measurements and is expressed here as the volume of the 3D point spread function (PSF) ellipsoid; higher values represent lower resolution.

Rick Avila, MS, is a computer scientist and the CEO of Accumetra, LLC. His research interests include computer-aided detection and measurement algorithms of early disease including lung cancer, COPD, and cardiovascular conditions. He is also highly active in open source electronic health record systems and a contributor to the Open Source Electronic Health Record Alliance (OSEHRA).

QIBA Activities

QIBA Biomarker Committees Open to All Interested Persons

Meeting summaries, the *QIBA Newsletter* and other documents are available on the QIBA website *RSNA.ORG/QIBA* and wiki *http://qibawiki.rsna.org/*. Please contact *QIBA@rsna.org* for more information.

View QIBA 2017 Posters

QIBA Posters that were on display in the QIBA Kiosk area during RSNA 2017 are now available for viewing on the QIBA wiki: http://qibawiki.rsna.org/index.php/Education

QIBA Resources:

- QIBA Wiki
- QIBA Biomarker Committees
- QIBA Organization Chart
- QIBA Webpage

Please contact QIBA@rsna.org for more information. We welcome your participation.

QIBA and QI/Imaging Biomarkers in the Literature

QIBA Profile Conformance Process and Pilot QIBA Profile Conformance Process and Pilot. This list of references showcases articles that mention QIBA, quantitative imaging, or quantitative imaging biomarkers. In most cases, these are articles published by QIBA members or relate to a research project undertaken by QIBA members that may have received special recognition. New submissions are welcome and may be directed to QIBA@rsna.org.