

**Quantitative Imaging Workshop XV:  
Lung Cancer, COPD and Cardiovascular Disease  
Quality is a Gateway to Deep Learning**

**DATES:** November 5-6, 2018

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**LOCATION:** Hilton Alexandria Old Town  
1767 King Street  
Alexandria, Virginia 22314

## Background and Justification

Lung cancer screening is emerging as an important new cancer service in which quantitative imaging will be central to clinical decision support in achieving optimal care outcomes. In the Fifteenth Annual Quantitative Imaging Workshop, we will review how this exciting process is coming together to support precise, early lung cancer detection and management. The process to define how to best acquire a high quality low dose thoracic CT image has been captured in the Quantitative Biomarker Alliance's (QIBA) Small Nodule Profile, which allows for precise acquisition by measuring aspects of the fundamental properties of the CT scanners' performance allowing for significant reduction in measurement bias that is routinely experienced in clinical imaging. Following up on last year's Workshop close to seventy sites have used the QIBA Small Nodule conformance process to access quantitative imaging process in clinical imaging sites across the United States and across the globe. Those results will be presented at the Workshop and based on those results additional opportunities to further improve image quality will be discussed. Remarkable progress has occurred with lung cancer therapeutic measures for both the surgical and medical approaches and updates for these innovations will be presented. The goal is to consider how all of these areas can contribute to improved early disease management.

Lung cancer screening routinely involves precisely measuring pulmonary nodules to help clinicians decide what cases require more detailed diagnostic work-up. A growing body of research suggests that new CT technology, even using low dose techniques, permits accurate quantitative imaging not only for lung cancer screening but also for COPD and coronary calcification as a marker of host injury from tobacco exposure. A critical and ongoing Workshop topic is consideration of how enhanced image quality can also improve the process of assessing other tobacco-induced disease processes evaluated with thoracic CT scanning including injury relative to Chronic Obstructive Pulmonary Disease and coronary artery disease.

In all of these quantitative assessments it is critical to measuring the growth or regression of the specific

process such as for pulmonary nodules. In routine clinical practice for this task, it will be common to have the serial CT imaging performed on different scans, potentially also using different software tools. To date in this Workshop series, our quality efforts have focused on assessing the performance of the scanner. At this point, it is now important to test whether; the software tool might also contribute to the bias in image quantitation. Therefore, over the last year we have also explored how to assess the consistency of the measurement performance of the software tool. In this year's workshop we will discuss how to evaluate software performance in quantitative analyses. The term for this process is software conformance. A new method has been proposed to allow this type of evaluation and preliminary results in this regard will be presented.

With the growing evidence emerging supporting lung cancer screening, more nations are planning implementation of this service and in fact leading European groups are advocating for implementing lung cancer screening across that continent. With the global roll-out of lung cancer screening services, the need to simultaneously implement quality standards for the proper imaging techniques for low dose CT scans is essential to ensure the reliability of accurately measuring lung nodules. While numerous CT scanners and protocols are more than capable of delivering a high quality CT scan with a low radiation dose, there are multiple scanner settings, such as the type of reconstruction kernel or iterative reconstruction settings that are used. Therefore in providing optimal clinical care, it is critical to establish how, at least a minimum quality specification can be defined for lung cancer screening. Disseminating the QIBA small nodule conformance method could mitigate these quality standardization challenges and at the Workshop discussions will focus on how to best ensure communications about these critical issues including regarding how such specification may affect imaging quality for co-occurring diseases and conditions such as COPD, and coronary artery disease.

As lung cancer remains the leading cause of cancer death globally and a major public health challenge across the entire world. According to the CDC, smoking accounts for \$167 billion annually in health care costs; including significant costs related to lung cancer. The aging of the US population will drive a rise in the total number of annual lung cancer cases by 50% over the next two decades. The workshop also presents an opportunity for discussion on how to accelerate progress in the management of these tobacco-induced diseases. As previously discussed in previous Workshops, the systematic collection of these high quality thoracic CTs with corresponding clinical outcome data would provide a remarkable resource for enabling important research on improving not only detection but also in developing new measurement and modeling approaches that can be useful in drug development and clinical management. In light of this prospect, conversations across a variety of stakeholders have continued over the year. One of the long term sponsors of the Workshop, the International Association for the Study of Lung Cancer (IASLC) sponsored a planning process to develop a thoracic imaging archive including a planning meeting that occurred in Dallas, Texas. A preliminary plan for the archive was developed, considered by the IASLC board and approved. A pilot project to assess the feasibility of a cloud-based image archive was launched and this effort will be presented in Alexandria to focus a discussion about the evolution and potential for collaborations in optimally developing this resource.

In summary, Quantitative Imaging Workshop XV will be focused on two critical areas for progress with the application of quantitative CT imaging for lung cancer. The first issue involves an opportunity arising national and implementation of cloud-based image quality program CT screening for lung cancer. Evaluation of performance of CT scanners and the corresponding image acquisition process

could greatly improve the delivery of high quality screening services.

It is becoming more evident that it is critical to store the full imaging data along with the clinical information to enable continuous quality control, additional research and sustain innovation for this critical new service. Beyond quality control, this clinical follow up/ CT image data base could be a profoundly important resource for enabling rapid research progress in looking at COPD and coronary artery disease in this tobacco-exposed high risk cohort engaged in screening. We will review the imaging factors, the care delivery factors, regulatory issues and the public health policy dimension of this vibrant area. Many of the participants in this Workshop are experts on aspects of these issues so this is a great opportunity to share strategic perspectives and how we can determine approaches that will allow us to make the most rapid progress in this area.

The second focus of the Workshops follows up on a theme that we have discussed at previous Workshops as the use of quantitative imaging tools has the potential to cross fertilize and accelerate image processing research across lung cancer to other tobacco-induced cancers including coronary artery disease and chronic obstructive pulmonary disease (COPD). The use of high resolution CT imaging is providing a window to obtain coronary calcium assessment as we have considered previously. We will now consider how a large, high quality image archive can be used to obtain more robust quantitative assessment in particular settings such as with coronary calcium assessment. Great progress in how we may address the quality issues has been made over the last year which will be presented as this may be a seminal approach to enabling robust quantitative imaging across a broad spectrum of quantitative imaging platforms.

Innovation with these efforts could have broad impact, so our goal for the fifteenth Workshop is to provide a high impact forum for a multi-disciplinary exchange of ideas on the application of quantitative CT imaging to early thoracic disease management and to consider exciting new public health opportunities.