QUANTITATIVE IMAGING WORKSHOP GOALS & HISTORY – CATALYZING PROGRESS IN 21st CENTURY PREVENTION

The goals of the Prevent Cancer Foundation's Annual Quantitative Imaging Workshops are to convene multi-disciplinary stakeholders to:

- Explore approaches to more precisely characterize signatures in early lung cancers using imaging tools in routine clinical settings.
- Extract maximally useful clinical information to optimize the benefits/harms ratio for individuals undergoing thoracic evaluation in annual LDCT. screening, especially related to lung cancer, COPD and cardiovascular disease.
- Ensure economical access to screening for all individuals at risk for lung cancer and COPD, while overcoming disparities that have been previously reported in mortality from diseases detected by LDCT.

Background

Lung cancer is the world's leading cause of cancer death, as it is usually found at a time when the cancer has already spread and the prospects for cure are poor. If lung cancer is found early as a localized lesion, cure is generally possible with surgical resection. However, despite this long-standing reality, little progress has occurred with improving lung cancer outcomes from the dawn of the War on Cancer until recently.

In 2004, the Prevent Cancer Foundation committed to advancing earlier detection of lung cancer during the window when cure is still likely. In 1999, advanced imaging approaches using thoracic CT were shown to more frequently detect early localized lung cancer in heavy smokers. However, there was considerable skepticism about the prospect for successfully using thoracic CT in routine clinical settings to realize the survival benefits of this approach.

In response to that situation, the Prevent Cancer Foundation began the Quantitative Image Workshop series. To rekindle momentum in improving lung cancer outcomes, it was decided that rapidly-improving thoracic CT imaging might represent a transformational tool to improve early lung cancer disease management. This

possibility was highlighted by the promising new reports of routine early lung cancer detection by thoracic low-dose computed tomography imaging of small intrathoracic lung cancers (range of size from 6-12 mm in diameter). Simply put, for early lung cancer, "If you can't see it, then it is hard to cure it".

The improved resolution of newer CT scanners provided the ability to visualize small intrathoracic nodules more reliably than ever. Accordingly, the Prevent Cancer Foundation committed to sponsoring workshops to facilitate dialogue around how to catalyze progress in this area. To do this, a steering committee to plan the first Quantitative Imaging Workshop was formed and included James Mulshine, who at the time was an intramural investigator at the National Cancer Institute; David Yankelevitz, who was on the faculty at Cornell University as well as a co-founder of the International Early Lung Cancer Action Program (I-ELCAP); Riccardo Avila, who was head of CT software development at General Electric Medical; and Stefan Schaller, who was head of CT software development at Siemens Medical.

The goal was to use high-resolution thoracic CT imaging in current and former smokers to enable the routine detection of early, pre-symptomatic disease at a time when the morbid and lethal consequences could be pre-empted. Since the Workshop's inception, major randomized trials from the US and Europe have convincingly validated the objective mortality reduction benefit of this approach. In addition, the precise measurement process required to detect early lung cancer can also be applied to measure response to treatment for intrathoracic lung cancer and provides a critical tool to monitor the response of early lung cancer to drug exposure.

The Prevent Cancer Foundation began to host an annual Workshop to accelerate the speed of progress in this complex area in 2004. The Foundation convened world-class experts from a variety of disciplines to define optimal strategies to advance the integration of image-based management to improve outcomes following thoracic CT screening.

It was also evident quite early on that many screening sites were not using technical imaging approaches that routinely led to high-quality thoracic CT images. For that reason, it was recognized that having a process to optimize the screening process was critical. The focus on optimizing quantitative imaging was shared by the Radiological Society of North America (RSNA), which in 2009, launched the Quantitative Imaging Biomarker Alliance (QIBA) as a committee to focus on addressing the need to ensure optimal quantitative imaging processes. The specific component of QIBA working on thoracic CT imaging for early lung cancer was named the Small Pulmonary Nodule Profile Group. Since that time, there has been ongoing collaboration with QIBA participants regarding shared interest in optimizing quantitative imaging for improving the management of thoracic disease that was detected early. The focus of

this measurement is on characterizing very small findings in the lung in a range from 5-12 mm in size.

The COVID-19 pandemic has laid bare the profound disconnects in our society between public health and clinical care. The byzantine US approach to health care is sustained with enormous financial investment but has obviously failed at producing the desired results. We need new models of delivery that demonstrate how to leverage our knowledge base, information systems expertise and public engagement to enable meaningful improvements in our society's health in a more comprehensive and economical fashion. Creating a delivery capability for thoracic screening by leveraging cloud infrastructure allows scaling between analysis of an individual's clinical data and then also analysis of large collections of individuals' data into a large public health data resource at an affordable cost. Therefore, the evolution of cloud computing capabilities can now bridge the existing chasm between individual disease care and public health, while improving both.

A critical result of this breakthrough in early disease management in the lung cancer screening setting is that new clinical information will enable much more timely, productive and economic integration with lifestyle modification approaches to reduce the progression to symptomatic advanced diseases. The integration of thoracic CT screening with advanced image processing and AI is a frontier for application of these powerful new 21st century precision medicine tools.

2022 Workshop Information

Quantitative Imaging Workshop XIX: Utilizing Quantitative Thoracic Imaging to Optimize Population Health, held virtually on November 3-4, 2022.

Additional detail can be found at
https://www.preventcancer.org/conferences/quantitative-imaging-workshop/