OPEN SOURCE
IMAGING CONSORTIUM

against *Interstitial Lung Disease*

Quantitative Imaging Workshop

NOVEMBER 2, 2023

Dr. Simon Walsh - Imperial College, London
Elizabeth Estes - OSIC

OSIC Mission

Be passionate in our quest to make **radical** progress on behalf of people living with fibrosing lung diseases, their families and caregivers.

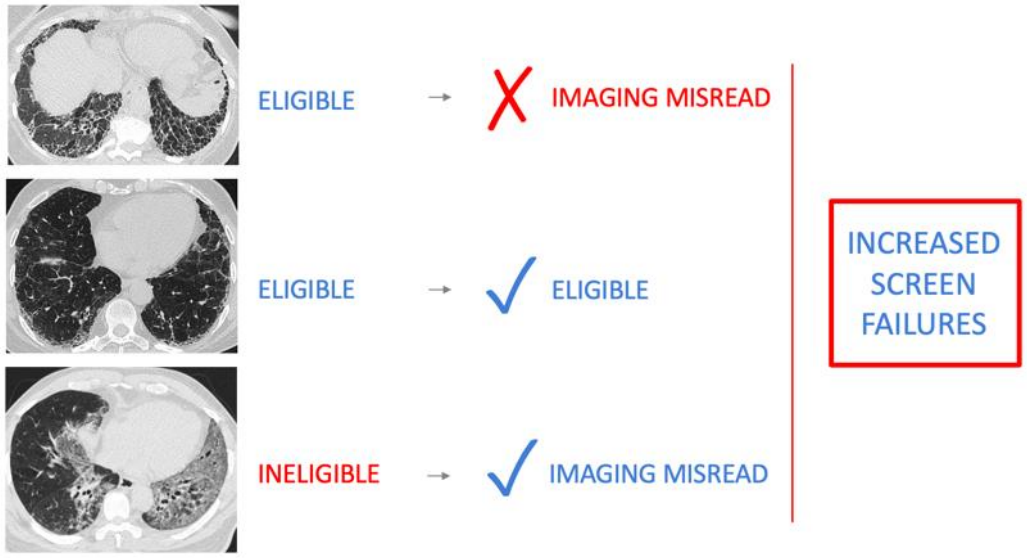
Drive ecosystem innovation and efficiencies to deliver actionable solutions to clinicians.

- **Not-for-profit, co-operative** effort between **academia, industry and philanthropy – founded in 2017**
  - Academic institutions provide minimum 500 scans to receive access to entire database and consortium
  - Industry and Technology Partners - fee based
  - Patient organizations are free
- The largest and **most diverse, curated and integrated** ILD image and clinical database
- Accessible machine learning, imaging and pulmonology expertise
- Speed of progression achieved with the **open science model**

Imaging Is Vital for Clinical Progress in ILD

Imaging vs. FVC

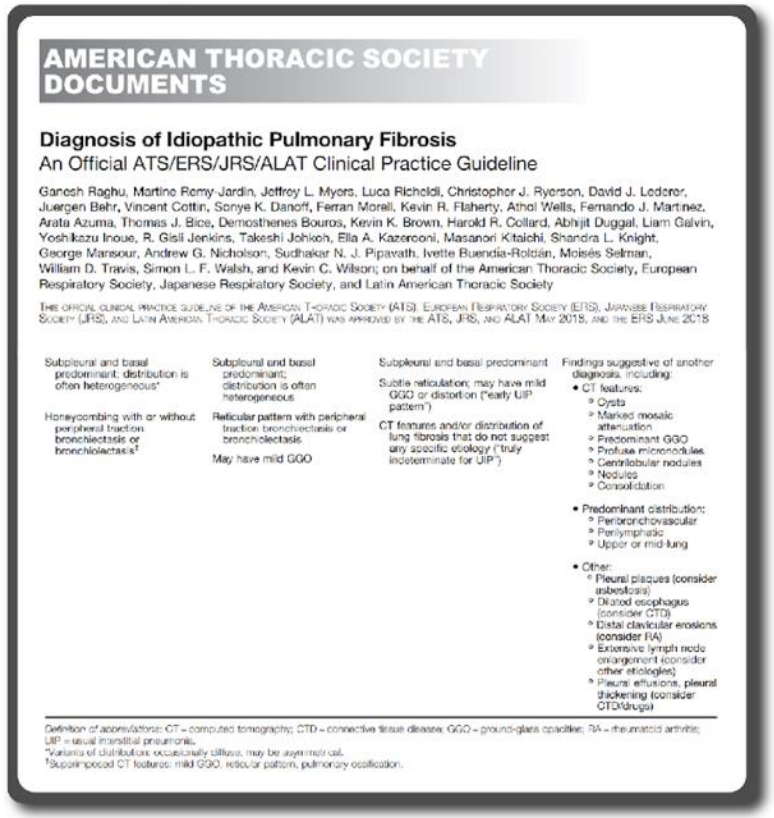
- FVC (the current SOC) is a bad endpoint/metric of disease severity
  - Mechanistically uninformative
  - Lags behind changes in the lungs
- Imaging can be a less variable biomarker for disease progression and can allow quantification
- Imaging can play a major role in drug trial eligibility
  - Reducing drug trial cost and failed trials
  - Reducing chances of companies giving up
- Reduce lung biopsies and other unnecessary tests which burden the system and worse – cause patients distress
- Today's tools can find patterns and with expertise, make meaning from the patterns
- Today's tools can see things the human eye can't



Almost 50% of screen failures in IPF drug trials are from misclassification of HRCT at central read

ILD Real World Diagnostic Challenge #1

Experts Often Cannot Agree



AMERICAN THORACIC SOCIETY DOCUMENTS

Diagnosis of Idiopathic Pulmonary Fibrosis

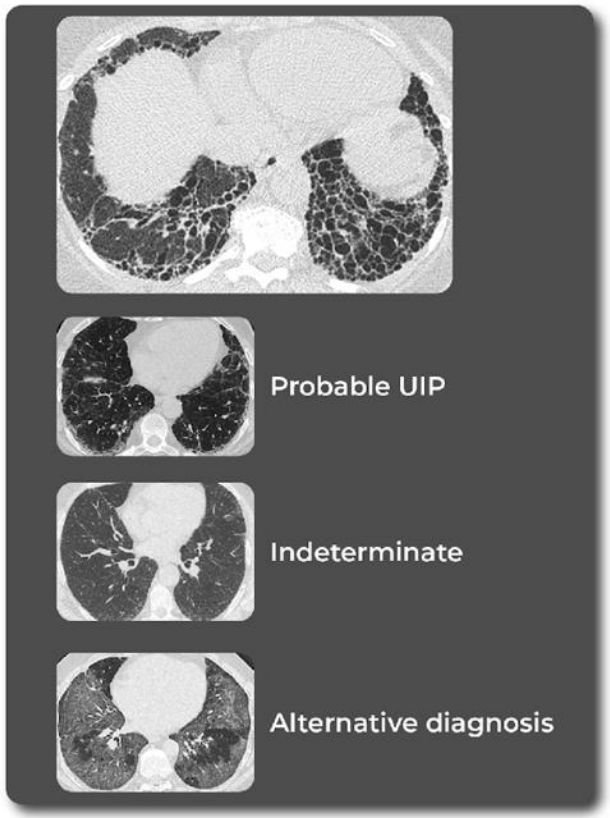
An Official ATS/ERS/JRS/ALAT Clinical Practice Guideline

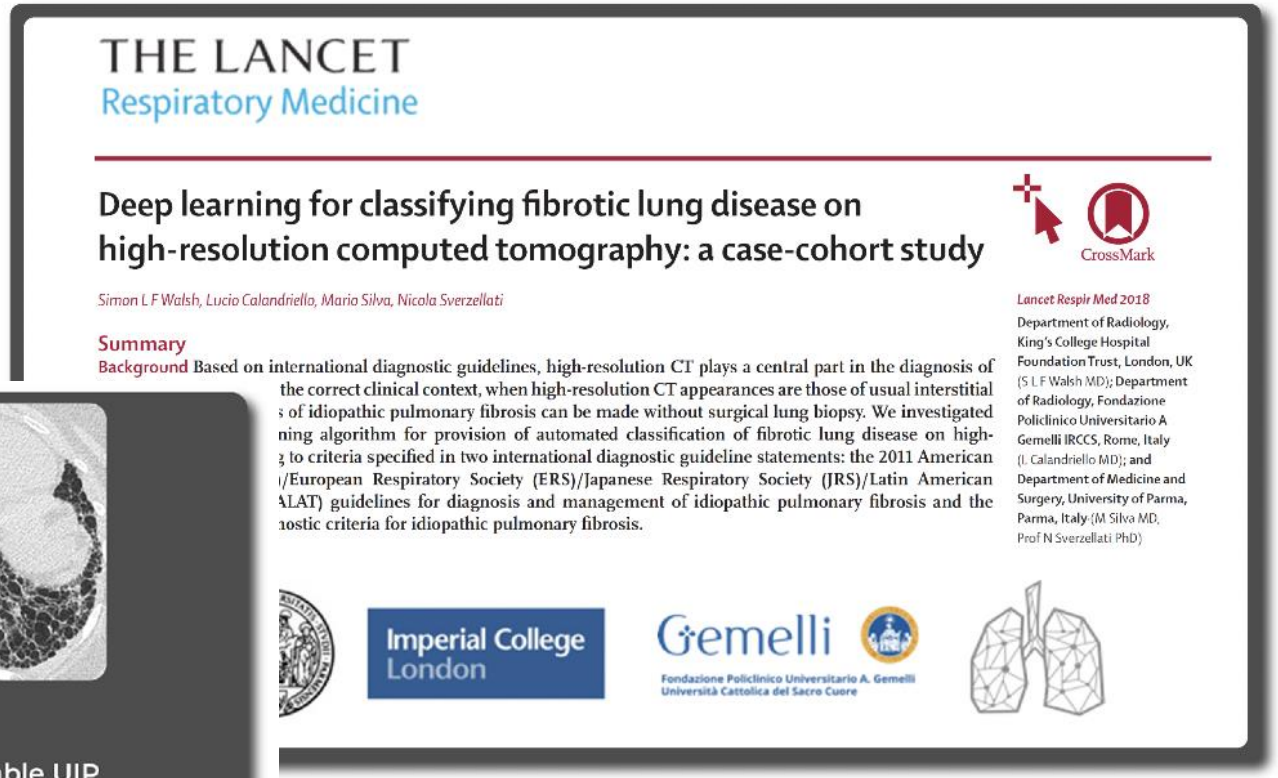
Ganesh Raghu, Martine Remy-Jardin, Jeffrey L. Myers, Luca Richeldi, Christopher J. Ryerson, David J. Lederer, Juergen Behr, Vincent Cottin, Sonye K. Danoff, Ferran Morell, Kevin R. Flaherty, Athol Wells, Fernando J. Martinez, Arata Azuma, Thomas J. Bice, Demosthenes Bouros, Kevin K. Brown, Harold R. Collard, Abhijit Duggal, Liam Galvin, Yoshikazu Inoue, R. Gisli Jenkins, Takeshi Johkoh, Ella A. Kazerooni, Masanori Kitaichi, Shandra L. Knight, George Mansour, Andrew G. Nicholson, Sudhakar N. J. Pipavath, Ivette Buendía-Roldán, Moisés Selman, William D. Travis, Simon L. F. Walsh, and Kevin C. Wilson; on behalf of the American Thoracic Society, European Respiratory Society, Japanese Respiratory Society, and Latin American Thoracic Society

THIS OFFICIAL CLINICAL PRACTICE GUIDELINE OF THE AMERICAN THORACIC SOCIETY (ATS), EUROPEAN RESPIRATORY SOCIETY (ERS), JAPANESE RESPIRATORY SOCIETY (JRS), AND LATIN AMERICAN THORACIC SOCIETY (ALAT) WAS APPROVED BY THE ATS, JRS, AND ALAT MAY 2015, AND THE ERS JUNE 2015

Subpleural and basal predominant; distribution is often heterogeneous*	Subpleural and basal predominant; distribution is often heterogeneous	Subpleural and basal predominant	Findings suggestive of another diagnosis, including:
Honeycombing with or without peripheral traction bronchiectasis or bronchiolectasis†	Reticular pattern with peripheral traction bronchiectasis or bronchiolectasis	Subtle reticulation; may have mild GGO or distortion ("early UIP pattern")	• CT features: ° Cysts ° Marked mosaic attenuation ° Predominant GGO ° Profuse micronodules ° Centrilobular nodules ° Nodules ° Consolidation
	May have mild GGO	CT features and/or distribution of lung fibrosis that do not suggest any specific etiology ("truly indeterminate for UIP")	• Predominant distribution: ° Peribronchovascular ° Perilymphatic ° Upper or mid-lung
			• Other: ° Pleural plaques (consider asbestosis) ° Dilated esophagus (consider CTD) ° Distal clavicular erosions (consider RA) ° Extensive lymph node enlargement (consider other etiologies) ° Pleural effusions, pleural thickening (consider CTD/drugs)

Definition of abbreviations: CT = computed tomography; CTD = connective tissue disease; GGO = ground-glass opacities; RA = rheumatoid arthritis; UIP = usual interstitial pneumonia.
*Variants of distribution occasionally diffuse, may be asymmetrical.
†Superimposed CT features: mild GGO, reticular pattern, pulmonary ossification.





THE LANCET
Respiratory Medicine

Deep learning for classifying fibrotic lung disease on high-resolution computed tomography: a case-cohort study

CrossMark

Simon L F Walsh, Lucio Calandriello, Mario Silva, Nicola Sverzellati

Lancet Respir Med 2018

Summary

Background Based on international diagnostic guidelines, high-resolution CT plays a central part in the diagnosis of
the correct clinical context, when high-resolution CT appearances are those of usual interstitial
s of idiopathic pulmonary fibrosis can be made without surgical lung biopsy. We investigated
ning algorithm for provision of automated classification of fibrotic lung disease on high-
g to criteria specified in two international diagnostic guideline statements: the 2011 American
/European Respiratory Society (ERS)/Japanese Respiratory Society (JRS)/Latin American
ALAT) guidelines for diagnosis and management of idiopathic pulmonary fibrosis and the
nostic criteria for idiopathic pulmonary fibrosis.

Department of Radiology, King's College Hospital Foundation Trust, London, UK (S L F Walsh MD); Department of Radiology, Fondazione Policlinico Universitario A Gemelli IRCCS, Rome, Italy (L Calandriello MD); and Department of Medicine and Surgery, University of Parma, Parma, Italy (M Silva MD, Prof N Sverzellati PhD)

Imperial College London

Gemelli
Fondazione Policlinico Universitario A. Gemelli
Università Cattolica del Sacro Cuore

OSIC

OSIC - Solving ILD Real World Diagnostic Problem #1

Experts Often Can't Agree

- **Prior Limitations**
  - Insufficient number of CT scans available
  - Databases were primarily homogeneous
  - Limited collaborations
  - Generative AI needs lots of data

- **OSIC Approach**
  - Build the largest, most diverse and curated real-world dataset
    - From every region in the world
  - Cloud-enabled data handling and distribution
    - New OSIC Cloud launching November 13th
  - Help remove variability from image analysis
  - Search for novel biomarkers

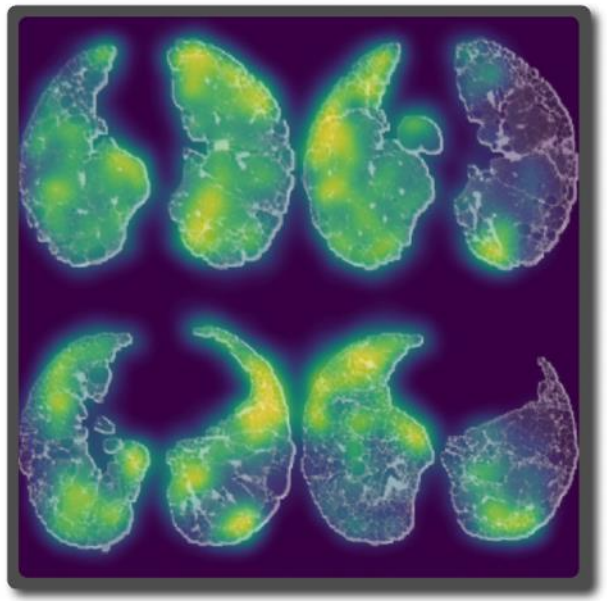
- **Learnings**
  - Images alone are not enough. Curated datasets are vital for algorithm development
  - Real world data is important vs. pristine only
  - The front-end ecosystem needs more standards
    - Radiology
    - EMR
  - Pulmonologists need to be at forefront of understanding the input needs of the tools

ILD Real World Diagnostic Challenge #2

Identifying Progressive Disease

Once disease is established
It is currently not possible to reliably predict which patients will develop progressive fibrosis or remain stable using BASELINE information.

Stable disease



SOFIA-based probabilities

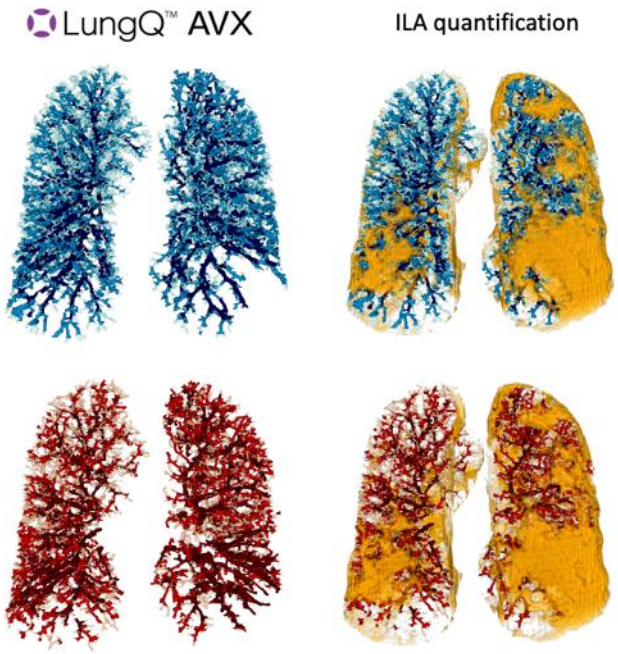
UIP:	0.9963
PROB:	0.0036
INDETER:	0.0001
OTHER:	0.0000

- Precious time wasted (more than 1 year)
- More lung biopsies (2%, 30-day mortality)
- Patient exposure to harmful medications
- Increased healthcare costs

Progressive fibrotic phenotype

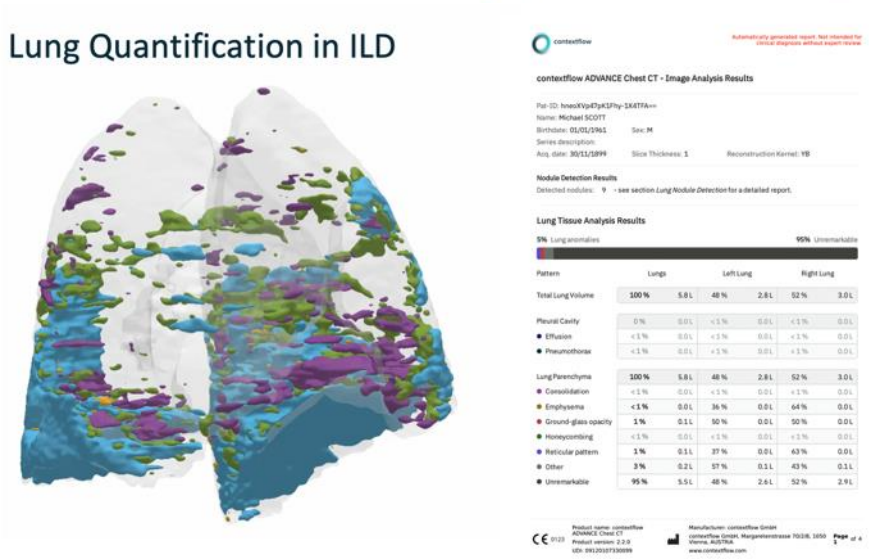
OSIC - Solving ILD Real World Diagnostic Problem #2

Identifying Progressive Disease



- **OSIC Approach**
  - Ongoing refinement of clinical data needed for best algorithm output
    - Share, test, debate…..repeat
  - Drive collection of longitudinal scans and data
  - Artificial intelligence models for quantification of progression

- **Path Forward**
  - Begin more annotation of data
  - Add other forms of data
    - Sound
    - Blood biomarkers
    - Clinical notes – NLP
    - Project OPUS
  - Test member algorithms against a similar cohort



ILD Real World Diagnostic Challenge #3

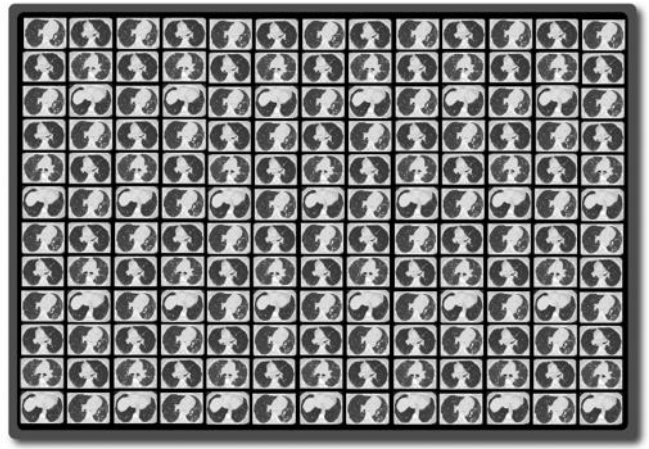
Early detection of progressive fibrosing lung disease – symptom based diagnosis

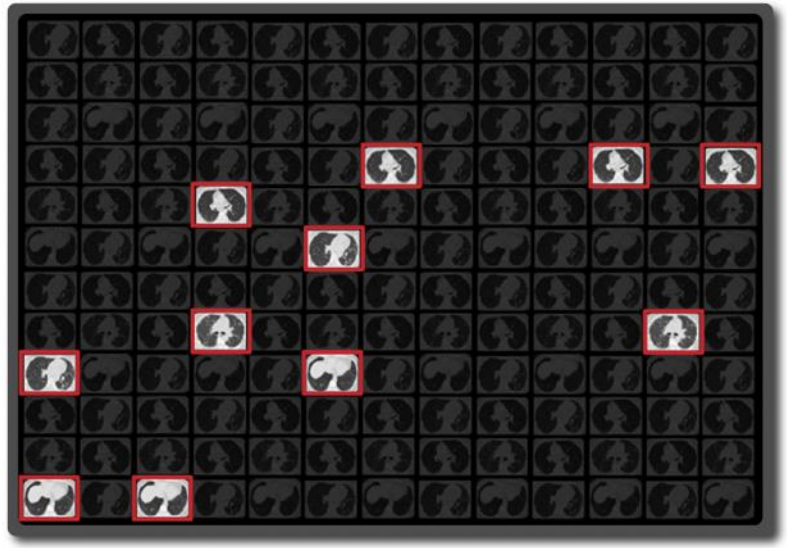
- **Symptom Based Diagnosis**
  - Symptoms alert clinician
  - Established fibrosis on HRCT
  - Early intervention “opportunity” missed
  - Irrevocable lung function loss

- *“It’s like diagnosing coronary artery disease after someone had a heart attack”*

ILA’s 7-9 per 100

IPR: 1-63 per 100,000





OSIC - Solving ILD Real World Diagnostic Problem #3

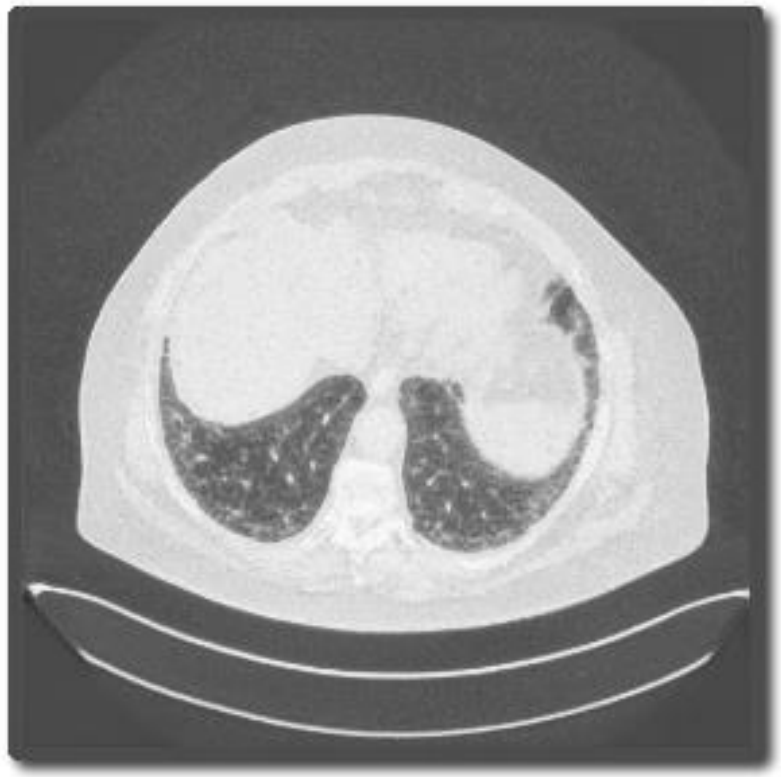
Early detection of ILD – symptom based

- **OSIC Approach**
  - Including lung cancer screening data into our cloud database for the purpose of ILA and ILD
  - Categorize the abnormalities and create algorithmic based biomarkers for ILA's and progressive ILD's

- **Path Forward**
  - 10,000 Lung cancer screenings to be added by end of 2023 with ILA and ILD follow ups
  - Goal is 100,000 in 2024 with 40,000 committed

Something To Think About

The Data Scarcity Problem in Rare Disease – The Need for Generative AI and Synthetic Data



Thank you for inviting us to be here.

eestes@osicild.org
www.osicild.org