Lung Cancer Screening Programs: How do we take it to the next level to improve Lung Cancer Outcomes

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NEW YORK, NY

2024 NOSCM JULY 20, 2024
THORACIC ONCOLOGY SESSION I

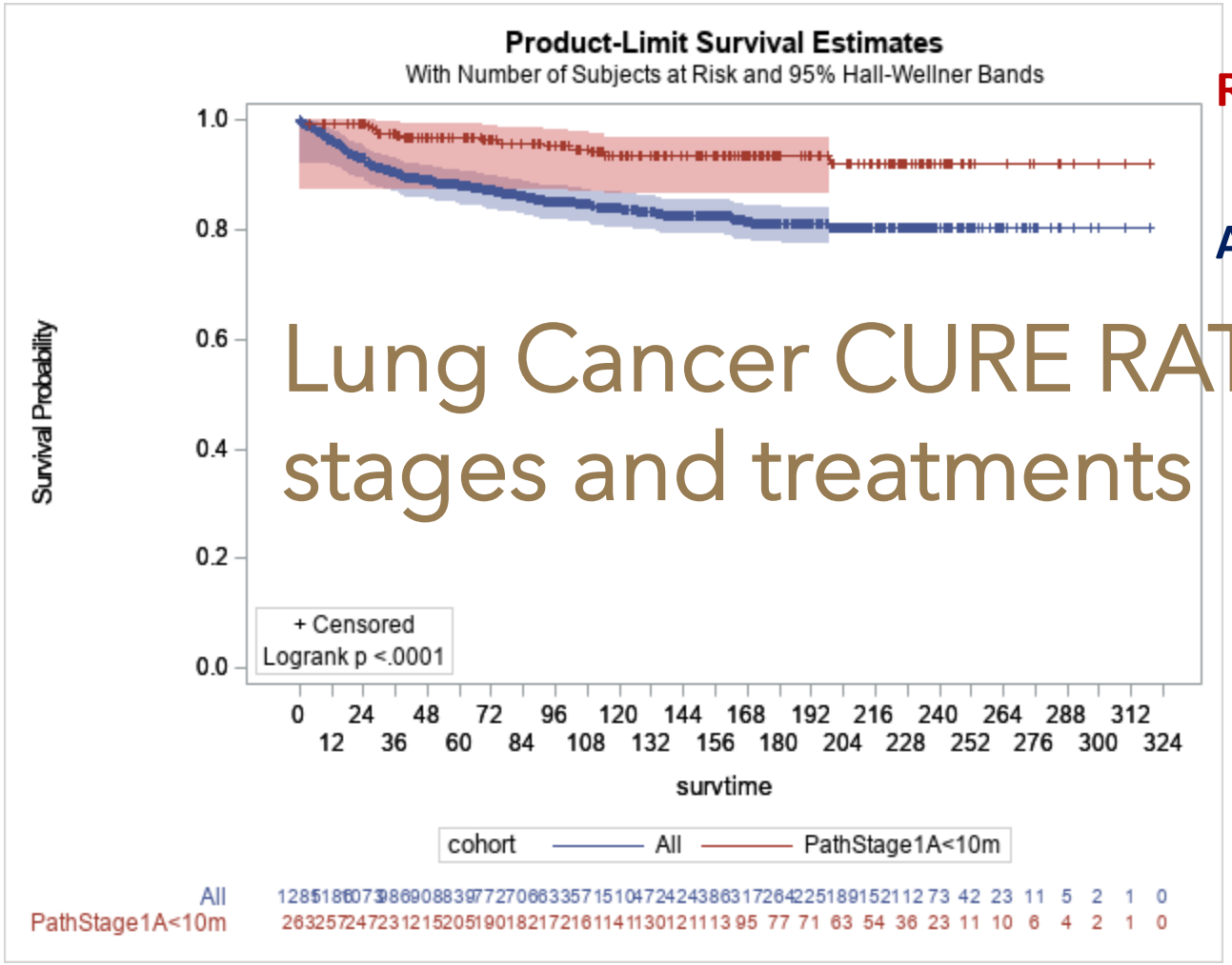
Global Lung Cancer Statistics in 2020

- 2.2 million people were diagnosed with lung cancer
- One fifth (1/5) of all deaths from cancer were due to lung cancer
  - Almost twice as many deaths as 2nd most (colorectal cancer) or 3rd most (liver cancer) cancer
- Lung cancer has a higher economic burden than any other cancer
- Without LDCT screening, the cure rate for lung cancer is low

How to Improve Lung Cancer Outcomes

- Find the lung cancer when it is smaller using the latest generation of CT scanners
- Development of optimal protocol for accurate growth assessment
  - Enhanced automated accurate methods for determining growth rates of pulmonary nodules and their probability of malignancy
  - Integrate AI in the screening protocol and in the future blood biomarkers when available
- Integrate management systems to continuously reevaluate and update the workup protocol
- Develop Heart and Lung protocols
  - Integrate new software tools for comprehensive health checks of cardiac illness, lung illness and personalized measures of health
- Expand outreach to the at risk population
  - Improve with natural language processes making reports more specific and easier to understand
  - Translation to other languages

2024: I-ELCAP reported on the 20-Year Lung Cancer Survival Rate in 1285 Participants



Resected Path T1a N0M0<10mm 95%

All cases **80.5%**

Lung Cancer CURE RATE: 80%, inclusive of all stages and treatments

RSNA Oral Presentation 2022

I-ELCAP International Early Lung Cancer Action Program

Morgan et al. What is the definition of cure in non-small cell lung cancer? Oncol Ther 2021; 9:365-371

IELCART Initiative for Early Lung Cancer Research on Treatment

Radiology

REVIEWS AND COMMENTARY • EDITORIAL

Cure Rate of Lung Cancer Diagnosed at Annual CT Screening

Philippe A. Grenier, MD

Dr Philippe A. Grenier is a former professor of radiology and chaiman at Sorbonne University in Paris, France. He currently works at Foch Hospital in Suresnes, France, in affiliation with Versailles-Saint Quentin University. His main interests are lung cancer imaging and diffuse lung disease. Dr Grenier is past president of the Fleischner Society and European Society of Thoracic Imaging. He has received the European Congress and Association of Radiology Gold Medal.

participants enrolled in the prospective I-ELCAP from 1992 through 2022. Eligible participants were aged at least 40 years and were current or former cigarette smokers or had never smoked but had been exposed to secondhand tobacco smoke. Among 89 404 participants, 1257 (1.4%) were diagnosed with a first primary lung cancer at baseline and annual screenings. The median age at diagnosis was 66 years, with a median smoking history of 43 pack-years. Of the 1257 cases of lung cancer, 1008 (80.2%) were solid and 249 (19.8%) were subsolid. The median tumor diameter was 14 mm, and 81% of all cancers (1017 of 1257)

"This study is the first to report on 20-year lung-cancer–specific survival for low-dose CT screening programs."

"The primary outcome reported in this study was that for all these categories of lung cancers, the lung cancer–specific survival reached a plateau after 10 years of followup. **Hence, Henschke and Yip et al confirm the results of their previously published study (3), where they estimated the 10-year cure rate of patients diagnosed with lung cancer during annual screening to be 80%.** They also confirm with real data the estimates provided by empirical demonstrations published in the literature, **that is, 8–10 years of follow-up after diagnosis is sufficient to estimate cure rates for lung cancer (5–7).**"

Radiological Society of North America (RSNA) Alexander R. Margulis Award 2024

THE 20-YEAR FOLLOW-UP OF THE INTERNATIONAL EARLY LUNG CANCER ACTION PROGRAM (I-ELCAP)

I-ELCAP International Early Lung Cancer Action Program

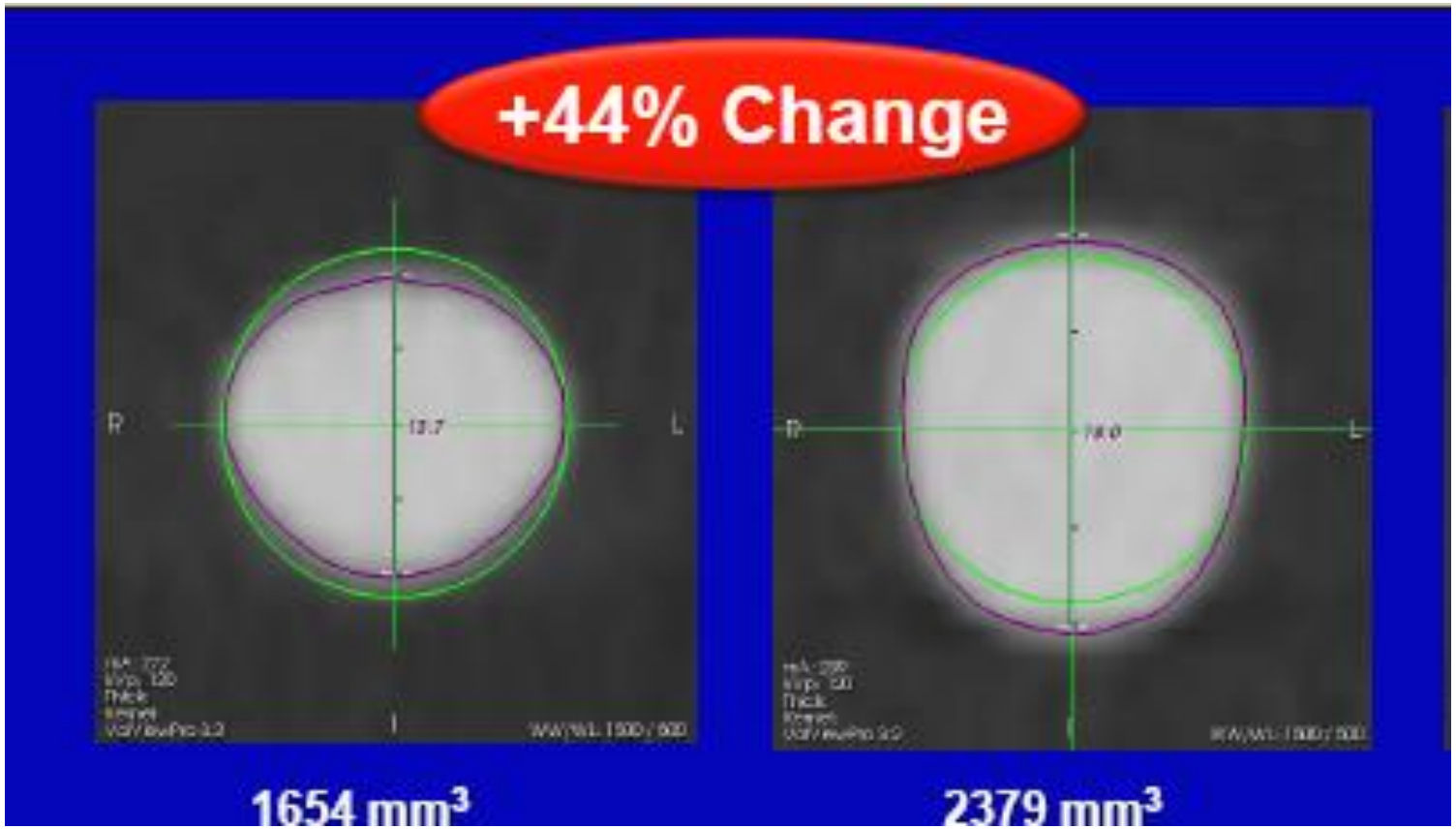
I-ELCAP AIRS Automated Image Reading System

IELCART Initiative for Early Lung Cancer Research on Treatment

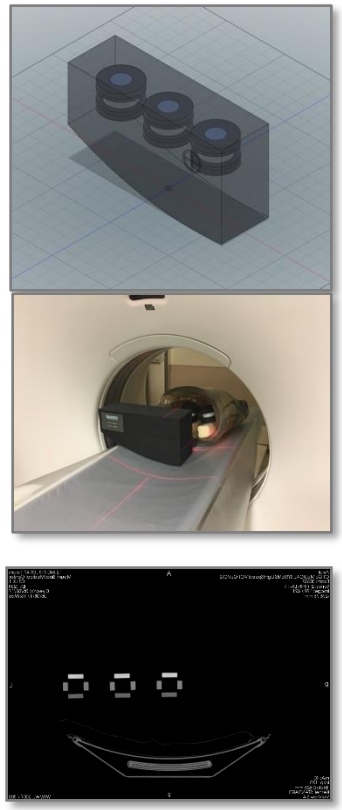
Key Components of Screening Program Protocol

- Screening intervals
- Separate the protocols for baseline and repeat screenings
- Nodule definitions
  - Solid, part-solid, nonsolid
  - Peri-fissural and costal pleural nodules
- Measurement of nodules
- Nodule growth assessment
- Thresholds for noninvasive and invasive diagnostic workup
- Management System for the entire screening process

Today Nodule Growth Assessment Still Limited by Measurement Accuracy: Needs CT table phantoms



Within seconds of repeat CT, 44% change at a VDT rate of 172 days



RSNA/QIBA Performance Certification

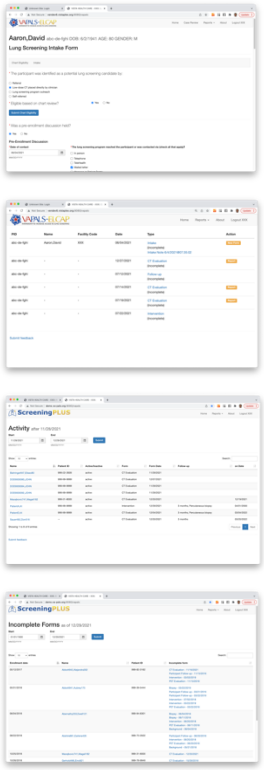
Check Each Time Scanner or Protocol Changes and Once Per Year

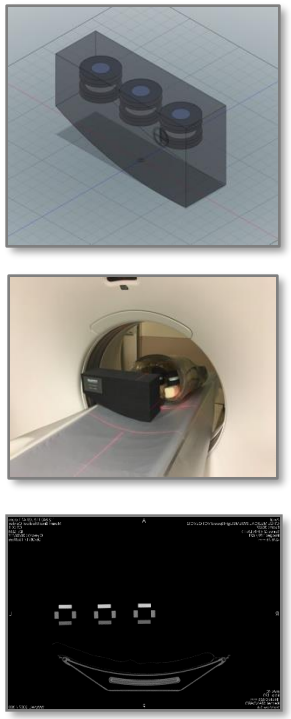
Henschke CI, Yankelevitz DF, Yip R, Archer V, Zahlmann G, Krishnan K, Helba B, Avila R. Tumor volume measurement error using computed tomography imaging in a phase II clinical trial in lung cancer. J Med Imag 2016; 3:035505

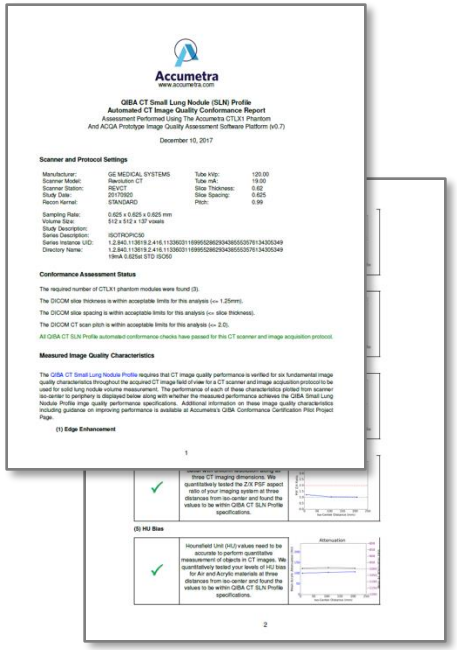
Updated I-ELCAP Management System Optimizes Screening Efficiency and Quality

+ Screening Performance Reports For National & Local Administrators

Nurse Navigator → CT Technologist → CT Scanner → Acquisition Protocol → Diagnostic Radiologist → Interventional Radiologist → Surgeon

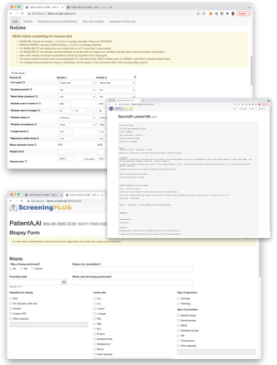






Pulmonologist

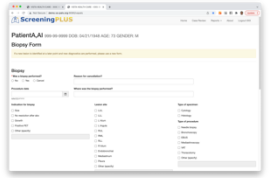
Teaching Files



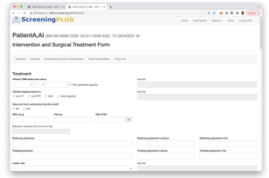
AI

Pathologist

Oncologist

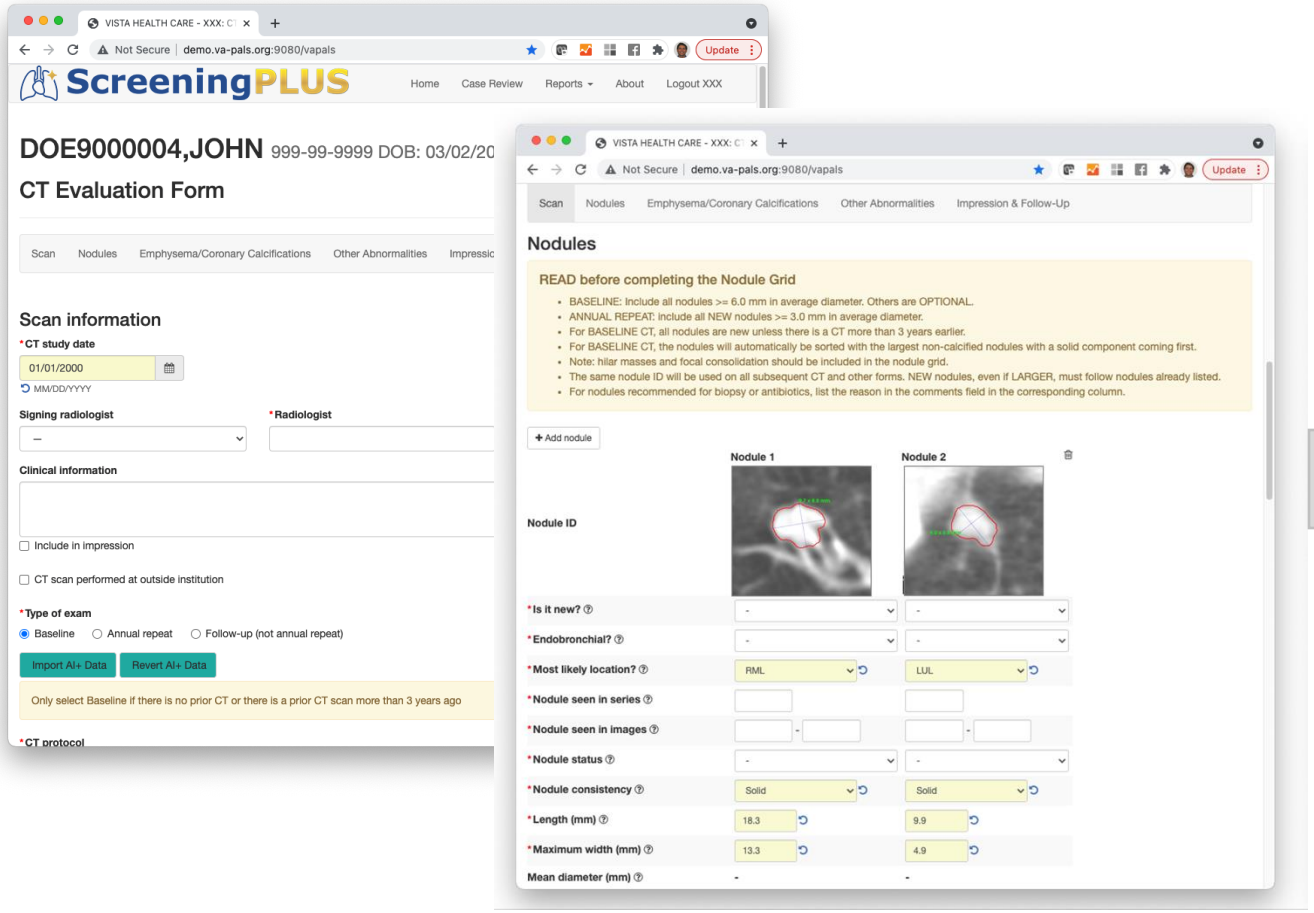


Radiation Oncologist



RSNA | American Lung Association

CT Evaluation Form

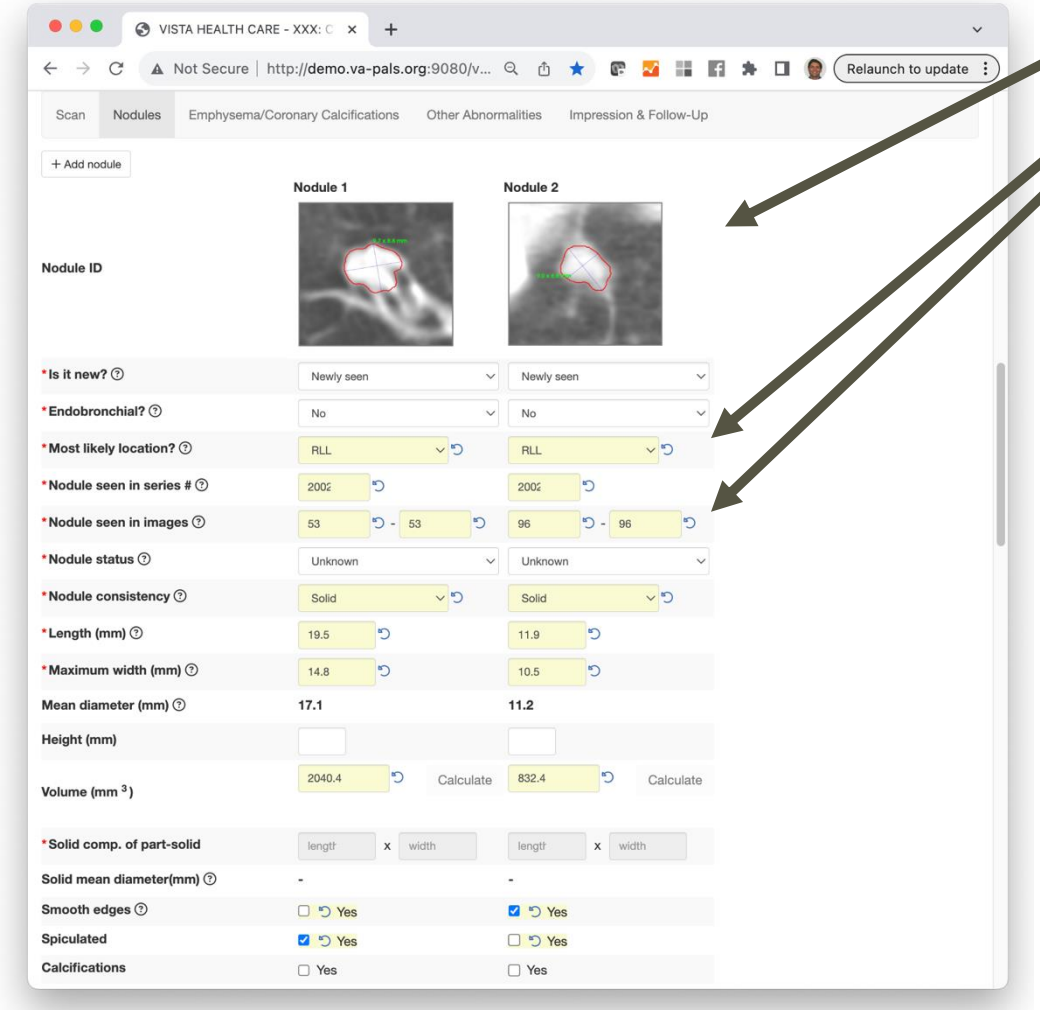


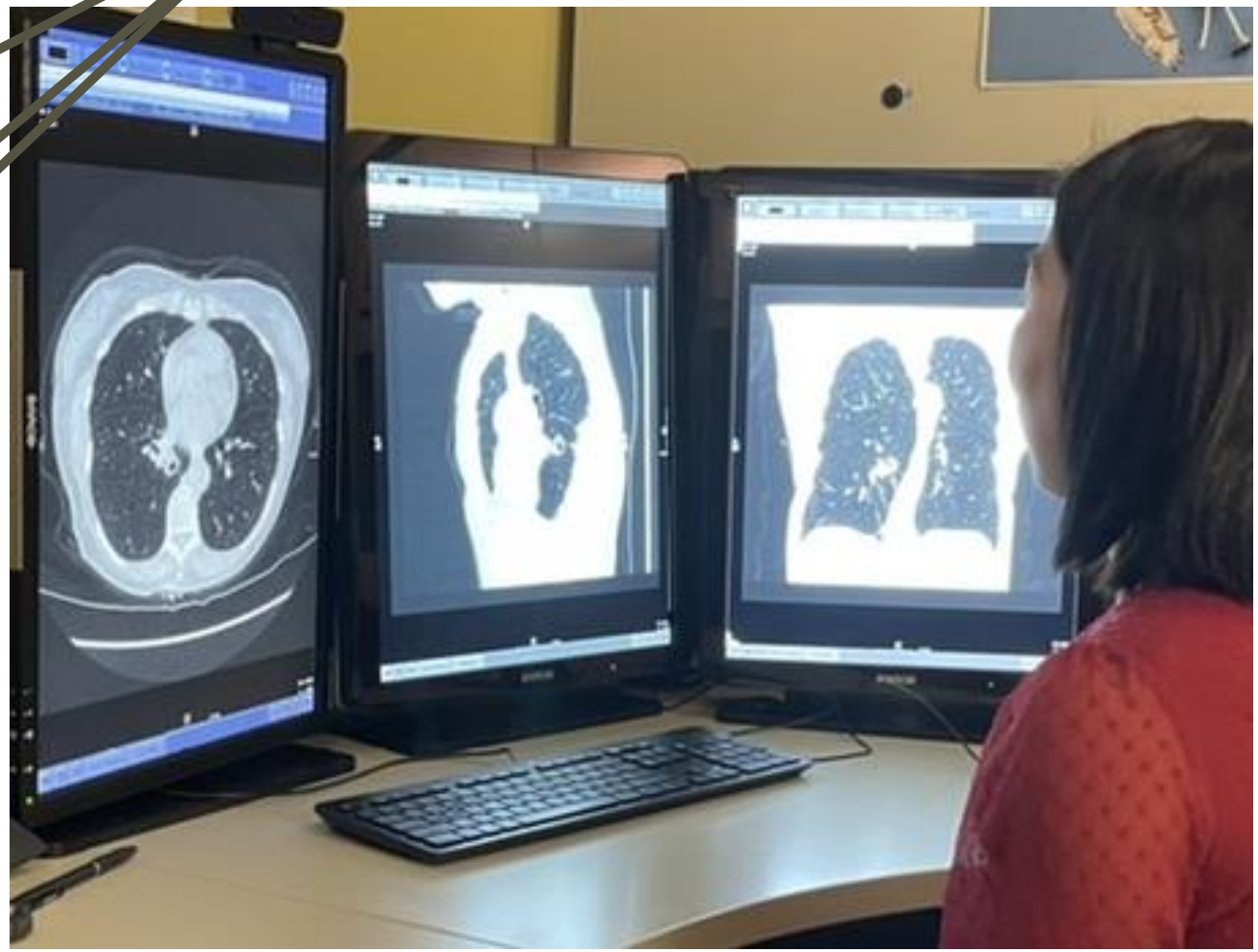
Structured Report Form Is Auto Filled In By A FDA Cleared CT Lung Nodule AI System

Translated into a Radiology Report

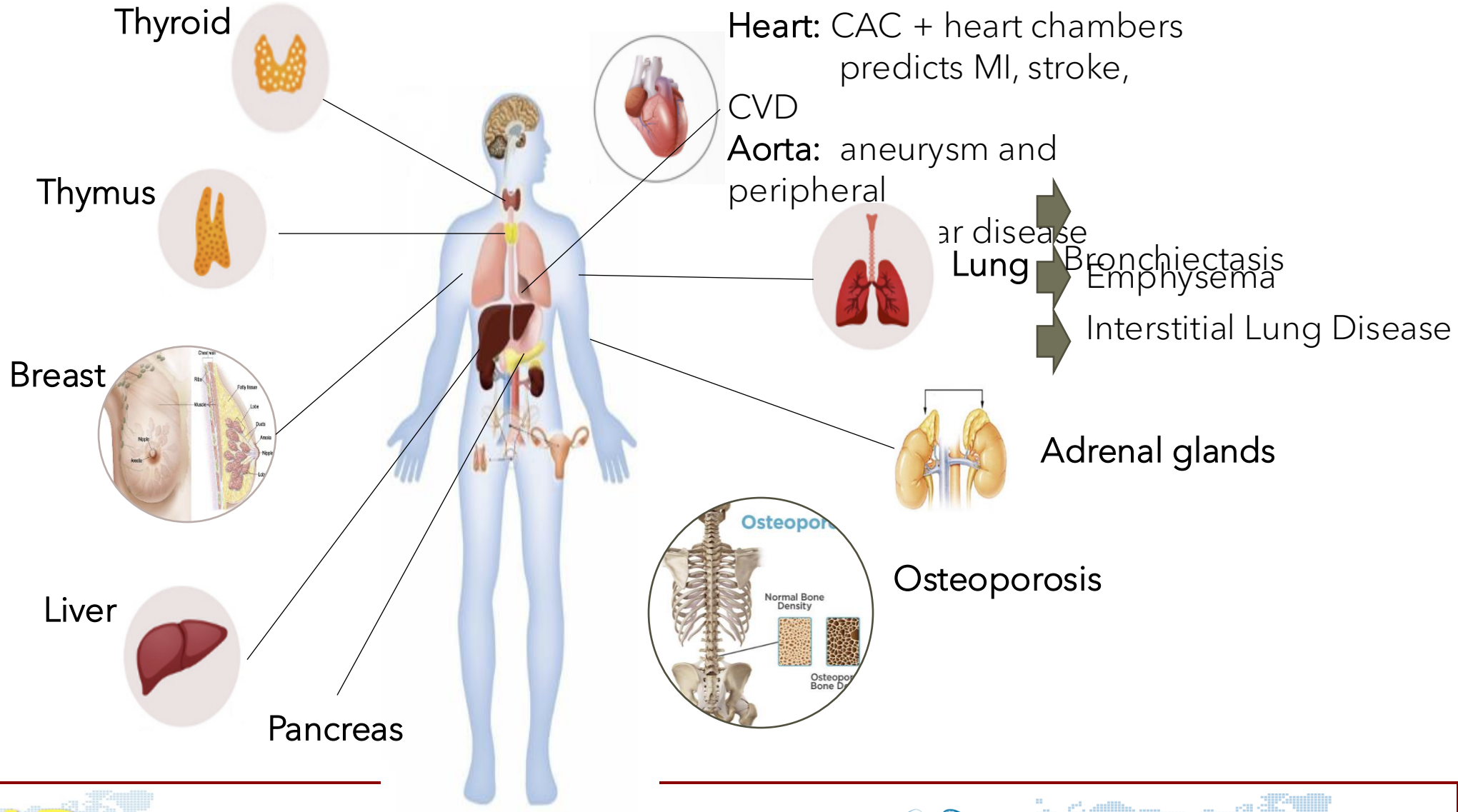
Editable Report That Is Automatically Sent To The EHR and PACS Via HL7

SCREENINGPLUS: updated I-ELCAP Mgt System: AI Results Now Auto-Fill The Nodule Grid





LDCT is an Annual Health Check



1st Conference on Integrating Early Detection of Heart and Lung Disease through Low-Dose CT

"Scientific Think-Tank Event Exploring New Frontiers in Averting Preventable Premature Deaths through AI-enabled Early Detection"

Together with

46th International Conference on Screening for Lung Cancer

14th Conference on Early Lung Cancer Research on Treatment

Integrating Cardiac and Lung Screening

September 19-21, 2024

New York Academy of Medicine in New York City

European Heart Journal (2014) **35**, 2792–2796
doi:10.1093/eurheartj/ehu296

CURRENT OPINION

Combined detection of coronary artery disease and lung cancer

Harvey S. Hecht*, Claudia Henschke, David Yankelevitz, Valentin Fuster, and Jagat Narula

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Introduction

Coronary artery disease (CAD) and lung cancer have several important features in common. First, their dramatic increases are in large part attributable to societal ills, including worsening dietary patterns, obesity, and tobacco use. Secondly, as these behaviours permeate the world, the diseases are disproportionately increasing in the poorer societies with limited resources for healthcare. Consequently, it is necessary to develop cost-effective strategies. Both disease states may be amenable to early detection by a single low radiation dose CT scan.

In an attempt to simplify cholesterol treatment, the 2013 ACC/AHA Guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults[6] restricted the use of CAC to the patients who did not fall into four designated conventional risk factor-based categories. Coronary artery calcium was downgraded to a Class IIb status (recommendation's usefulness/efficacy less well established),[7] ignoring the robust CAC literature that initially engendered the Class IIa recommendation, and the more recent data from three prospective, population-based outcome trials that the CAC Net Reclassification Index of the FRS is extremely high, particularly for the intermediate-risk group (52–66%) (*Table 1*).[8–10] The guide-

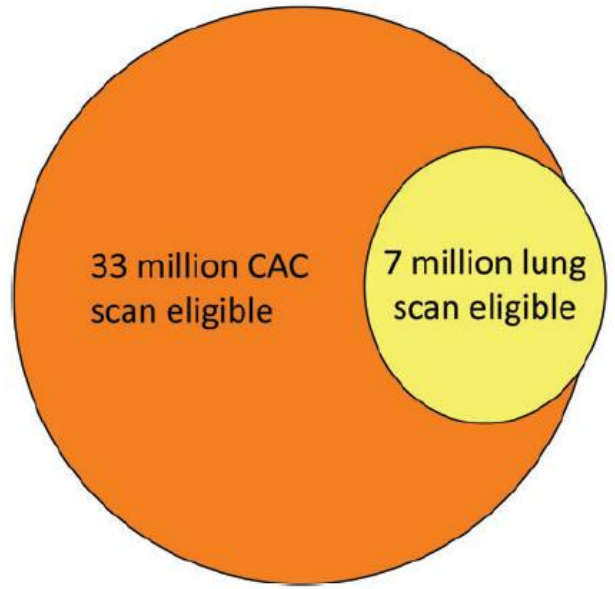
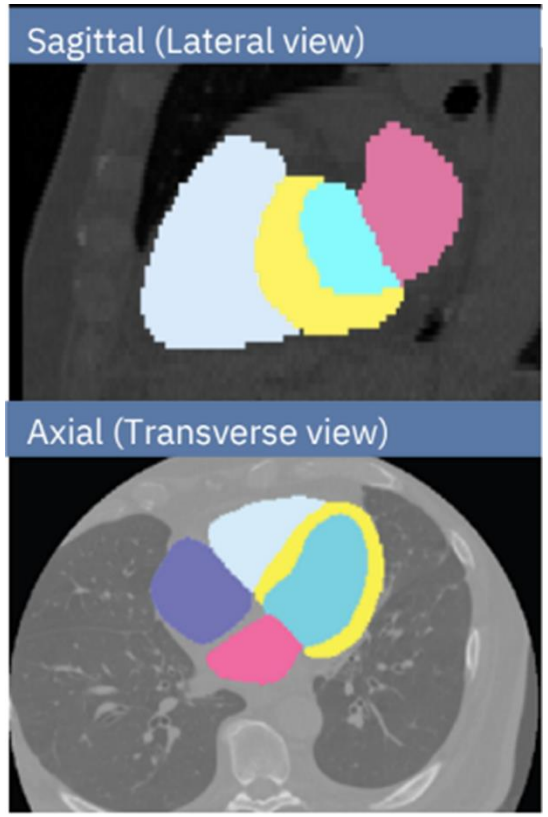
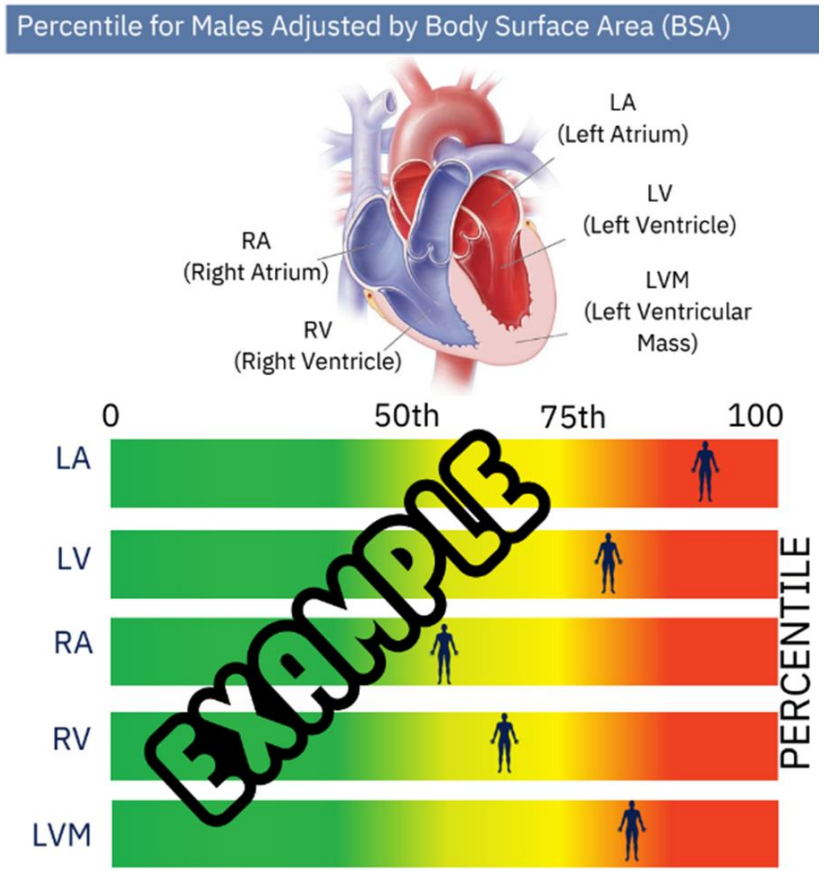


Figure 1 USA estimates, and overlap, of coronary artery calcium and lung scan eligible patients. The number of eligible patients in the USA is estimated at 33 million for coronary artery calcium scanning (orange)[28] and 7 million for lung scanning (yellow).[27] Excluding lung scan eligible patients who have established coronary disease (5.3%, unpublished data from the I-ELCAP database) yields an overlap of 6.6 million lung scan patients who would be expected to benefit from coronary artery calcium scanning.

CARDIAC CHAMBER ANALYSIS





AI-CARDIAC CHAMBER ASSESSMENT ON NONCONTRAST CT
A Strong Predictor of Atrial Fibrillation and Heart Failure

1. Naghavi M, Yankelevitz DF, Reeves AP, Budoff MJ,et al. Ai-enabled left atrial volumetry in coronary artery calciums scans (AI-CACTM) predicts atrial fibrillation as early as one year, improves CHARGE-AF and outperformed NT-proBNP: The multi-ethnic study of atherosclerosis. J of Cardiovasc Comput Tomogr. 2024; 18:383-391. PMID: 38653606 PMCID: PMC11216863

2. Naghavi M, Budoff M, Greenland P, et ak, AI-enabled auto mated cardiac chambers volumetry in coronary calcium scans outperforms NT-proBNP for prediction of health failure: the multi-Ethnic Study of Atherosclerosis. J Cardiovasc Comput Tomogr 2024; 18:392-400. PMID: 38664073 PMCID: PMC11216890

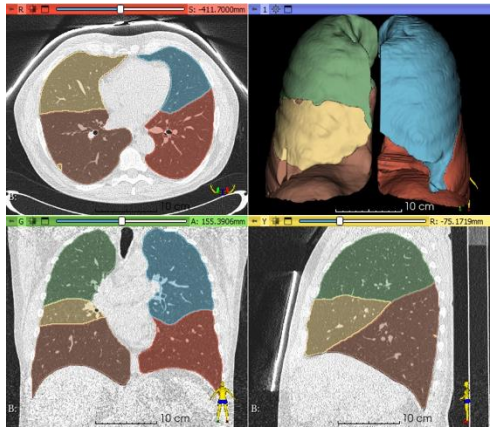
3. Naghavi M, Reeves, Atlas K, Zhang C, Atlas T, **Henschke C**, Yankelevitz D, Budoff M, et al. AI-enabled cardiac chambers volumetry and calcified plaque characterization in coronary artery calcium (CAC) scans (AI-CAC) significantly improves on Agatston CAC score for predicting all cardiovascular events: The multi-ethnic study of atherosclerosis. Res Sq 2024; 20;rs-4433105. PMID: 38947043 PMCID: PMC11213177

4. Naghavi M, Reeves AP Atlas K, Li D, Zhang C, Atlas T, Roy SK, Budoff MJ, **Henschke CI,** Yankelevitz DF, Wong ND. AI-powered coronary artery calcium scans (AI-CAC) cardiac volumetry predicts heart failure comparable to cardiac JACC In press 2024.

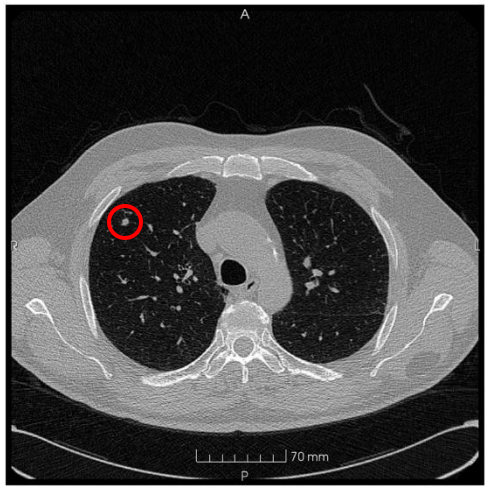
An Open Source automated image reading system (AIRS) that determines no clinical change has occurred –
no new nodules and
no nodule size change

Imagine What Could be Accomplished

If sites around the world had access to this tool it would:



- Dramatically reduce the burden on radiologists, especially in low and moderate income countries
- Allow for automation of the entire screening process by connecting to a management system, such as the open source VAPALS-ELCAP / ScreeningPLUS system
- Standardize quality of scan interpretations

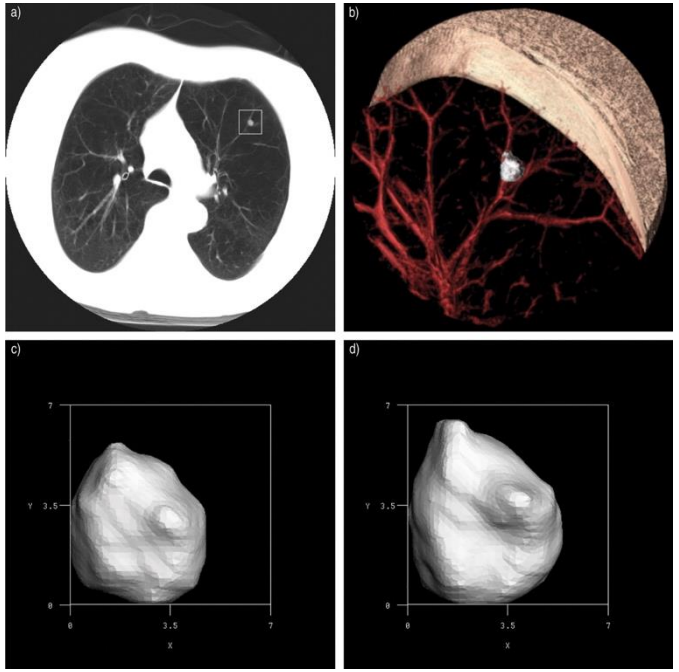


The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 OCTOBER 26, 2006 VOL. 355 NO. 17

Survival of Patients with Stage I Lung Cancer Detected on CT Screening

The International Early Lung Cancer Action Program Investigators*



Why I-ELCAP Because…

We have the **largest database** of **lung screening CT scans: > 100k participants, 300k CT scans worldwide**

We are **leaders in lung screening**
(started in 1992!)

We are **leaders in automated medical imaging** – first patent on volumetric analysis of nodules

I-ELCAP International Early Lung Cancer Action Program

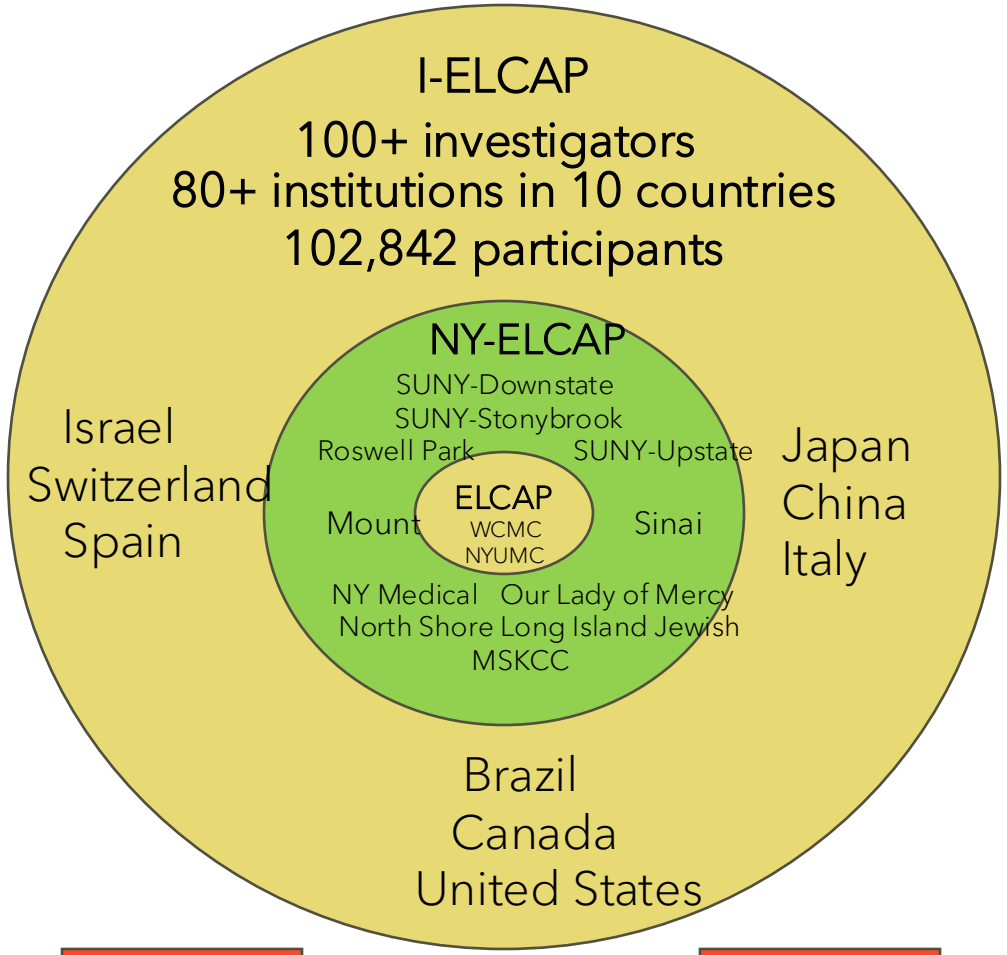
I-ELCAP ars Automated Image Reading System

IELCART Initiative for Early Lung Cancer Research on Treatment

ELCAP to NY-ELCAP to I-ELCAP: 1992-2024

Individualized CT screening depending on indicators of risk, e.g., current smokers, former smokers, never smokers

- Study design
- Screening protocol
- Pathology protocol
- Regimen of screening
- Lung cancer size, stage, cure rate



- Nodule growth and detection
- Mediastinal masses
- Emphysema
- Coronary Artery Ca++
- Breast Diseases

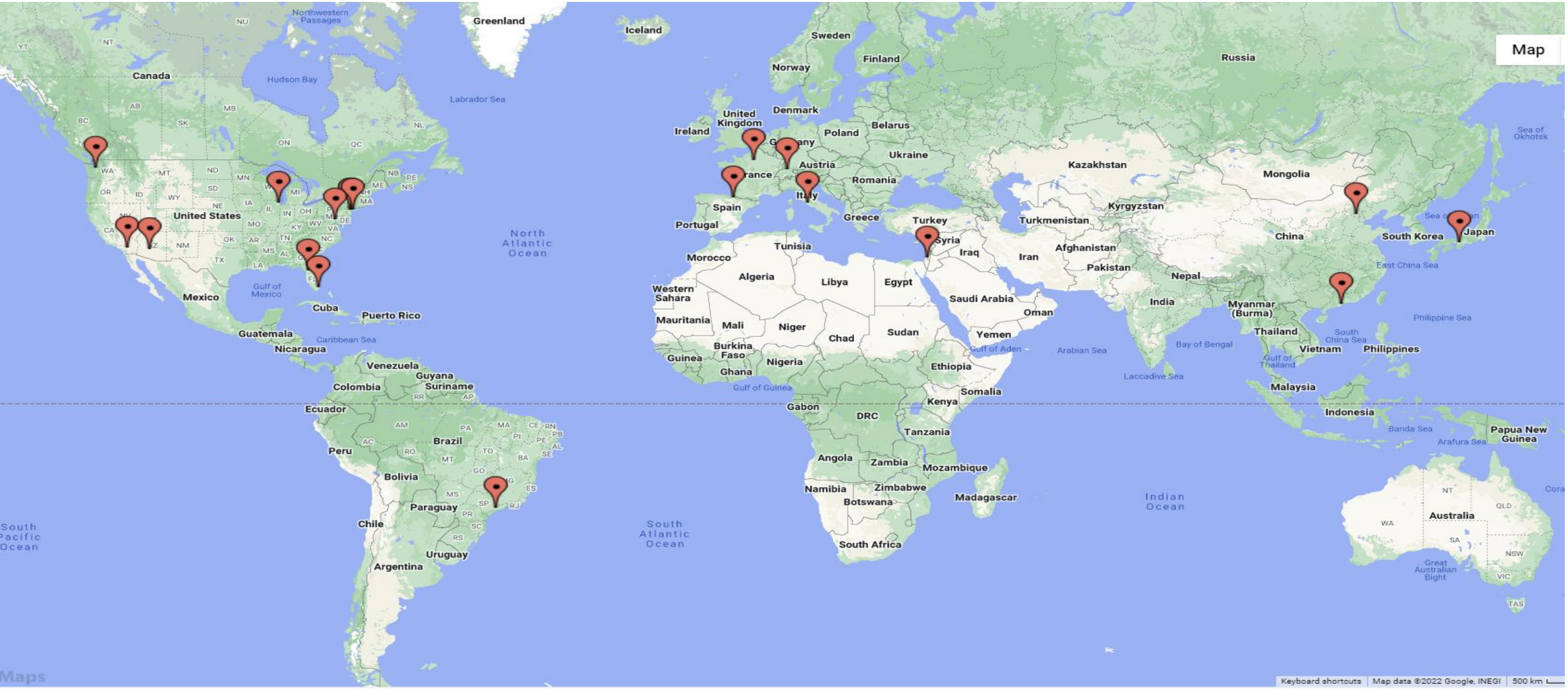
- Computer Analytics
- Conferences @ 6 months
- Continuous Quality Improvement

I-ELCAP International Early Lung Cancer Action Program

Lung Cancer 2002;35:143-8 & www.IELCAP.org

IELCART Initiative for Early Lung Cancer Research on Treatment

I-ELCAP Held International Conferences on Screening for Lung Cancer Every 6 Months



I-ELCAP International Early Lung Cancer Action Program

21 held in New York City, 25 at other sites
IELCAP.org

IELCART Initiative for Early Lung Cancer Research on Treatment

SAVE THE DATES

April 3rd – 5th , 2025 in BANGKOK, THAILAND

2nd AGILE DxRx Conference

47th International Conference on Screening for Lung Cancer & **15th Conference on Research for Early Lung Cancer Treatment**

Princess Srisavangavadhana College of Medicine

Host: Natthaya Triphuridet, MD, PhD

EARLY DIAGNOSIS AND EARLY TREATMENT

A new era in Preventive Health

Thanks and Acknowledgements

- **The efforts of all the I-ELCAP Investigators and their teams**

  We express our deepest gratitude to the many physicians, nurses, patient coordinators, academicians, and technical and administrative staffs whose dedicated and meticulous work over the past decades has provided the platform on which I-ELCAP research is built.

- **Our very, very special thanks to the thousands of screening participants** who have allowed us to follow their progress over the years so that others could benefit from the information gleaned from their experiences. We greatly appreciate their generosity of spirit.

I-ELCAP International Early Lung Cancer Action Program

I-ELCAP AIRS Automated Image Reading System

IELCART Initiative for Early Lung Cancer Research on Treatment