

Pulmonary Medicine in Endoscopy

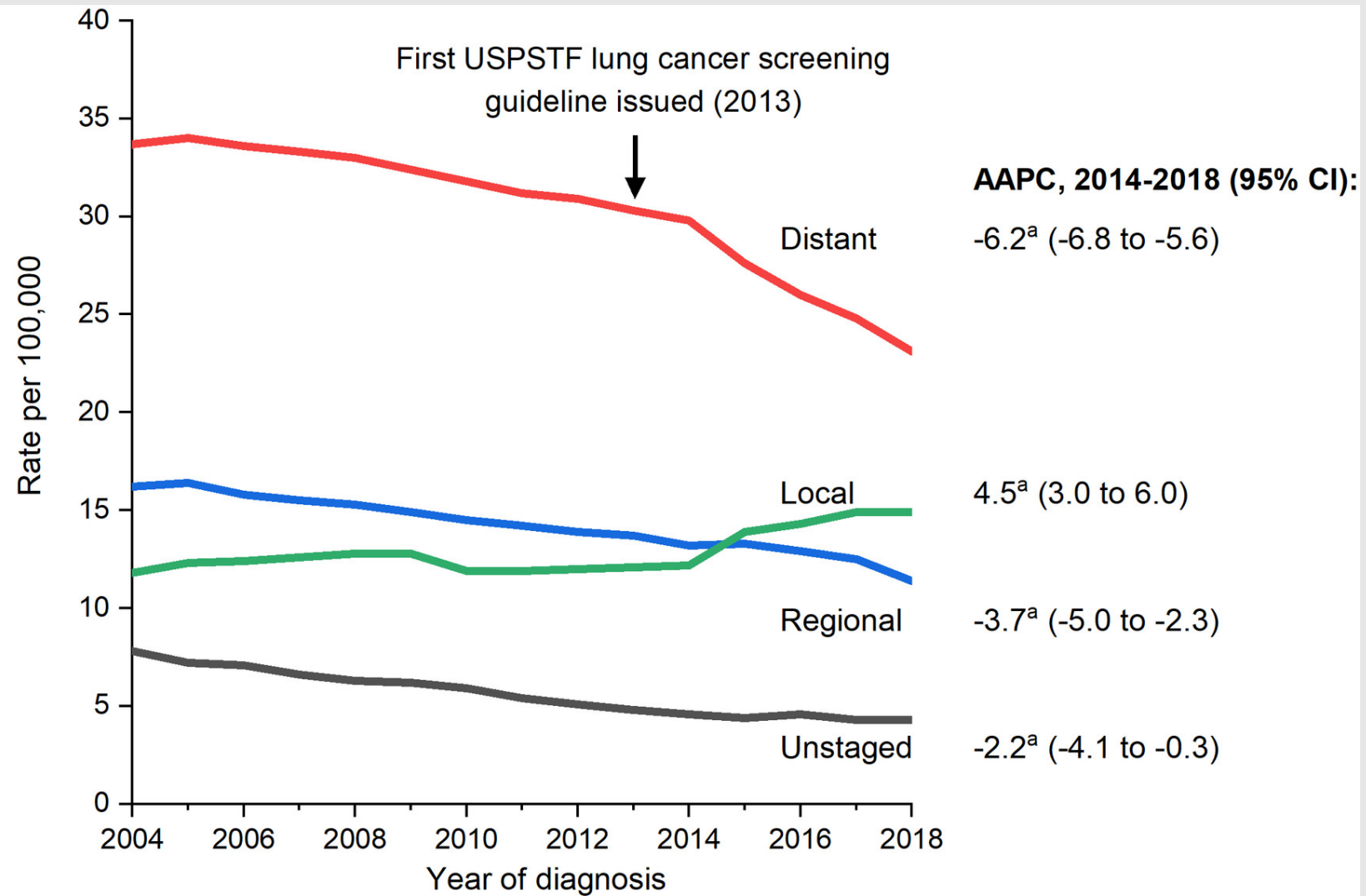
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Financial Disclosures

- No financial disclosures as related to this topic

Goals

- Learn lung cancer basics
- Go over general pulmonary procedures
- Discuss common complications related to procedures



Percent localized stage:	↑	17%	↑	20%	↑	28%
All stages, 3-yr survival:		21%		31% ^b		

Lung Nodules and Lung Cancer

North Carolina is ranked #7 for the number of new lung cancer cases in 2022 (8,760)

#1

cause of cancer-related death in the United States¹

**KILLS
MORE PEOPLE
EACH YEAR**

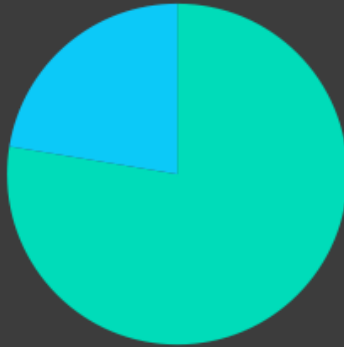
than breast, prostate, and pancreatic combined¹

236,740

estimated new cases in 2022¹

21.4%

of estimated cancer deaths are attributed to lung or bronchus cancer¹



**350 per
day**

lung cancer deaths¹

12.3%

of all new cancers identified in 2022 will be lung or bronchus¹



1. Siegel, RL, Miller, KD, Fuchs, HE, Jemal, A. Cancer statistics, 2022. *CA Cancer J Clin*. 2022. <https://doi.org/10.3322/caac.21708>

2. State of Lung Cancer, Medtronic

5 Year Survival Combined is 22%

5-year relative survival rates for non-small cell lung cancer

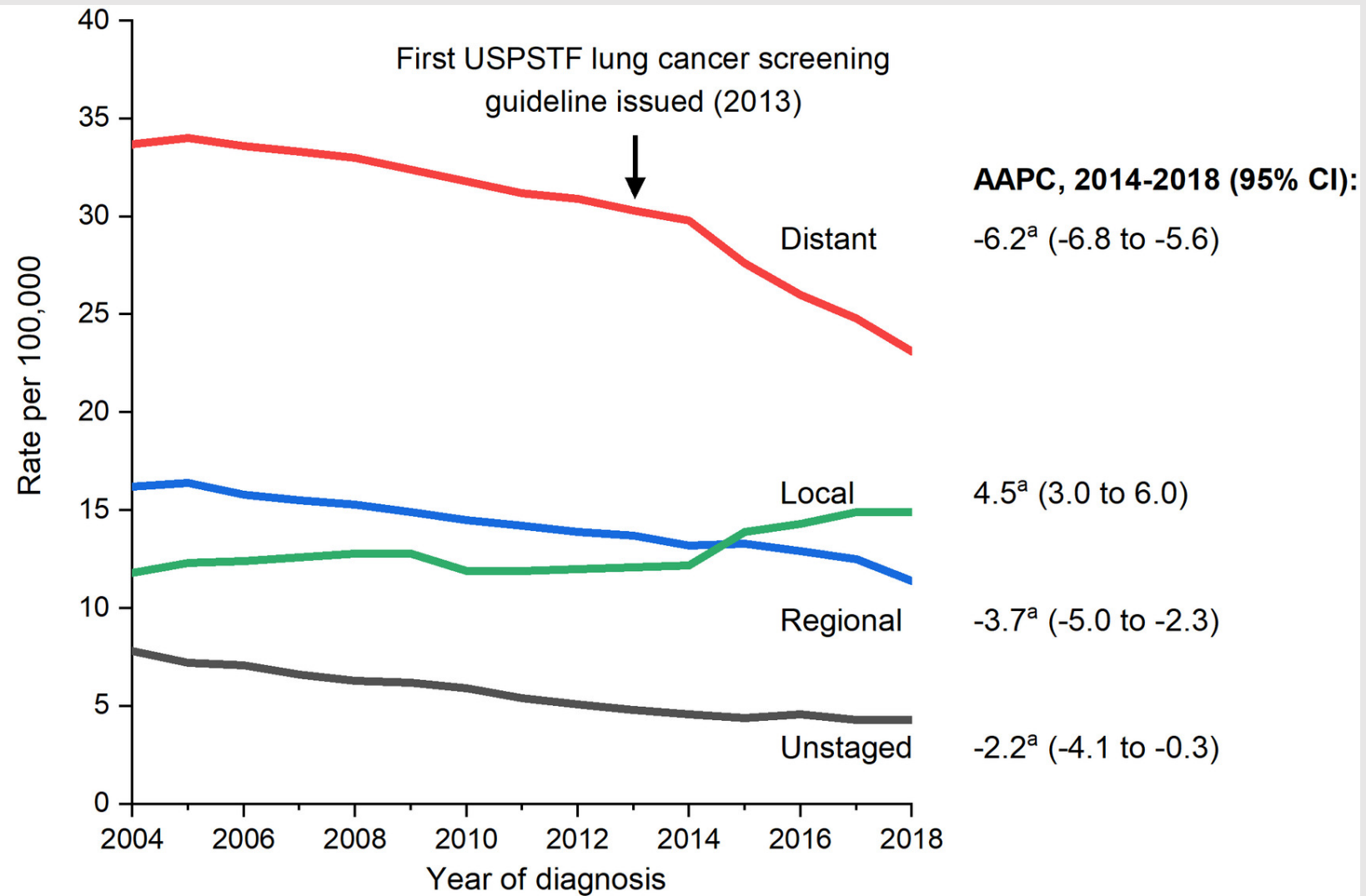
These numbers are based on people diagnosed with NSCLC between 2012 and 2018.

SEER stage	5-year relative survival rate
Localized	65%
Regional	37%
Distant	9%
All SEER stages combined	28%

5-year relative survival rates for small cell lung cancer

These numbers are based on people diagnosed with SCLC between 2012 and 2018.

SEER stage	5-year relative survival rate
Localized	30%
Regional	18%
Distant	3%
All SEER stages combined	7%



Percent localized stage:	↑	17%	↑	20%	↑	28%
All stages, 3-yr survival:		21%		31% ^b		

“-if curative treatment is the goal, the diagnostic process should proceed without needless delay to avoid a situation in which curable disease becomes incurable.”¹

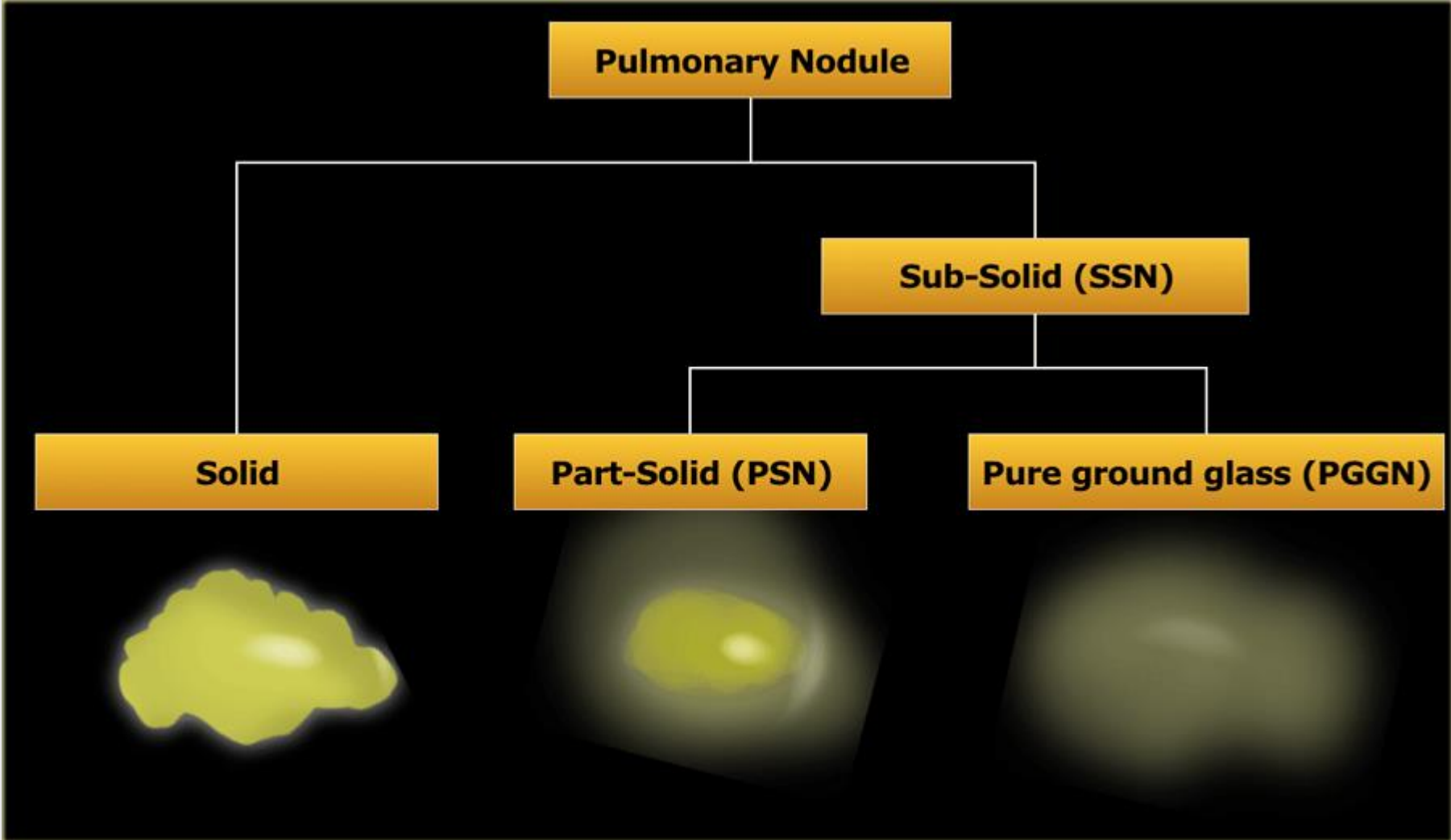
- Lungs do not have pain receptors
- 14 days
 - Time from first symptoms of CA to seeing PCP
- 16 days
 - PCP concern for CA and referral made to specialist
- 15 days
 - Specialist appointment to tissue diagnosis
- Median delay from symptom onset to treatment was 4 months!¹
- Delays in care did not adversely affect patients with advanced disease at presentation¹

Low Dose CT for Lung Cancer Screening

- First introduced in 2013 and updated in 2021
- **Beneficiary eligibility criteria¹:**
 - Age 50 – 77 years;
 - Asymptomatic (no signs or symptoms of lung cancer)
 - Tobacco smoking history of at least 20 pack-years
 - Current smoker or one who has quit smoking within the last 15 years
- US Preventative Services Task Force grade B evidence¹
- NNT 219²

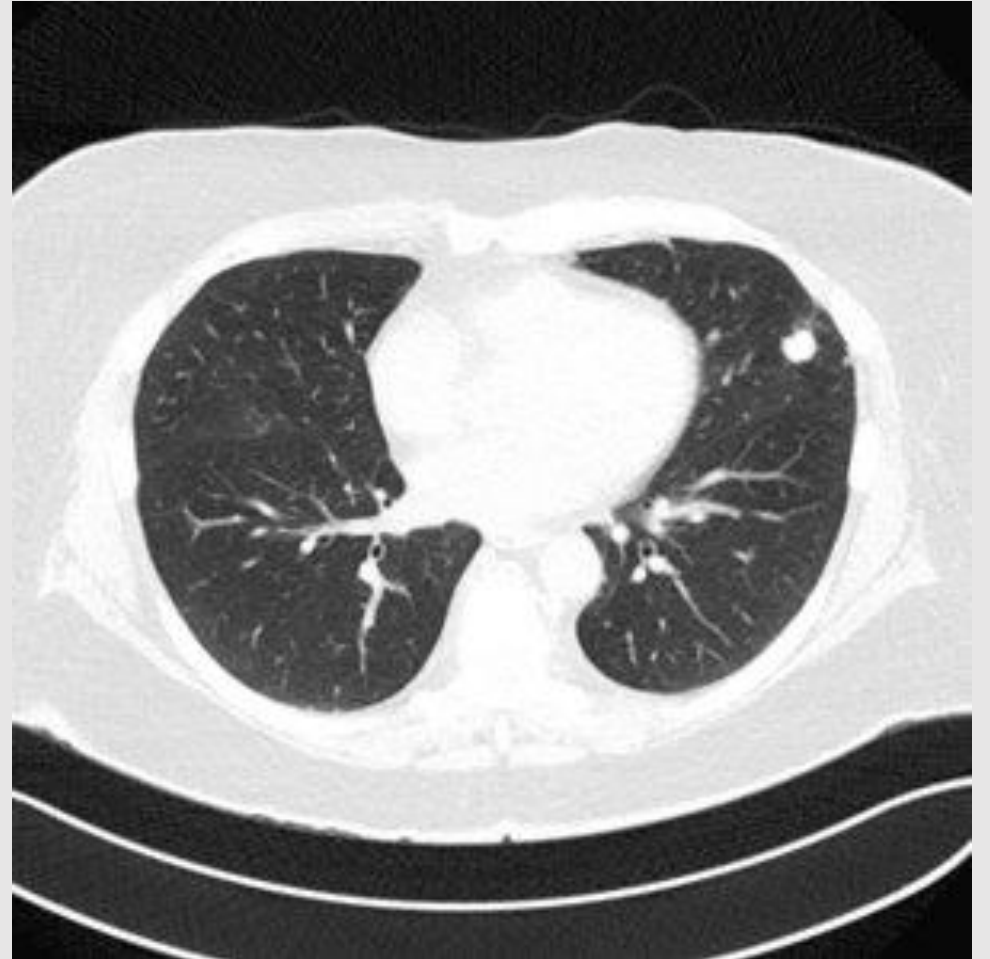
1. Lung Cancer Screening. 2021. <https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/lung-cancer-screening#fullrecommendationstart>

2. Usman Ali M, Miller J, Peirson L, et al. Screening for lung cancer: A systematic review and meta-analysis. *Prev Med.* 2016 Aug;89:301-314. PMID: 27130532.



My Approach to Nodules

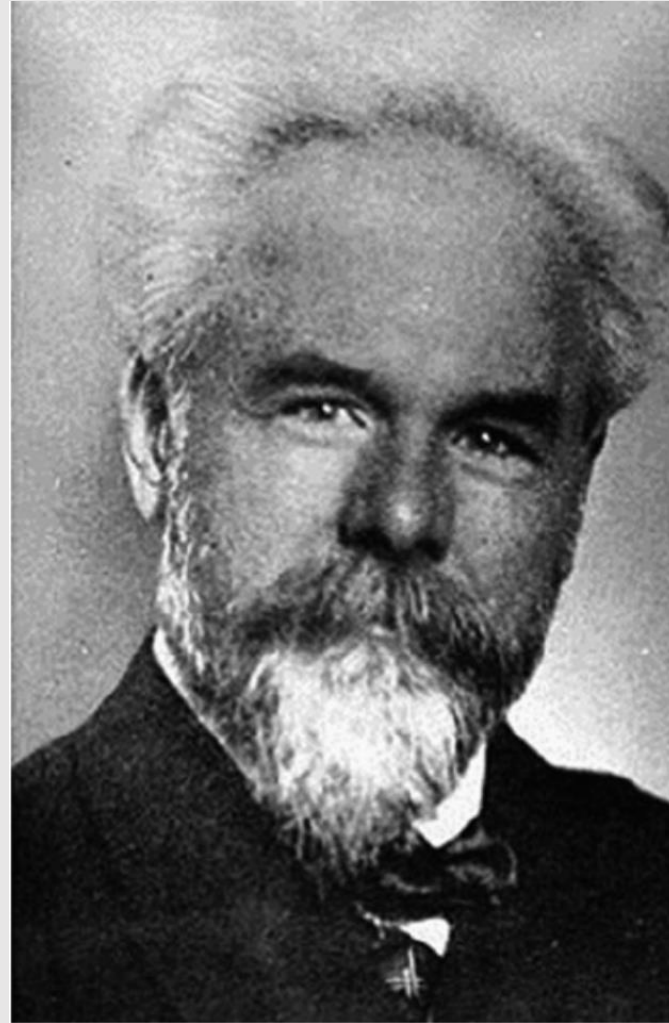
- What type of nodule is this?
- What are the patient risk factors for a malignant nodule?
- Is it localized?
 - PET/CT
- Is the patient a surgical resection candidate?
- If I cannot do surgery, how am I going to obtain tissue?



Endoscopic Pulmonary Procedures

Dr. Gustav Killian

- 1876
- Grandfather of modern day bronchoscopy
- German otolaryngologist
- Using direct visualization via a laryngoscope he was able to remove a pork bone from a farmer



Dr. Chevalier Jackson

- 1904
- Philadelphia based otolaryngologist
- Direct laryngoscope with suction and illumination
 - Precursor to modern day rigid bronchoscopy

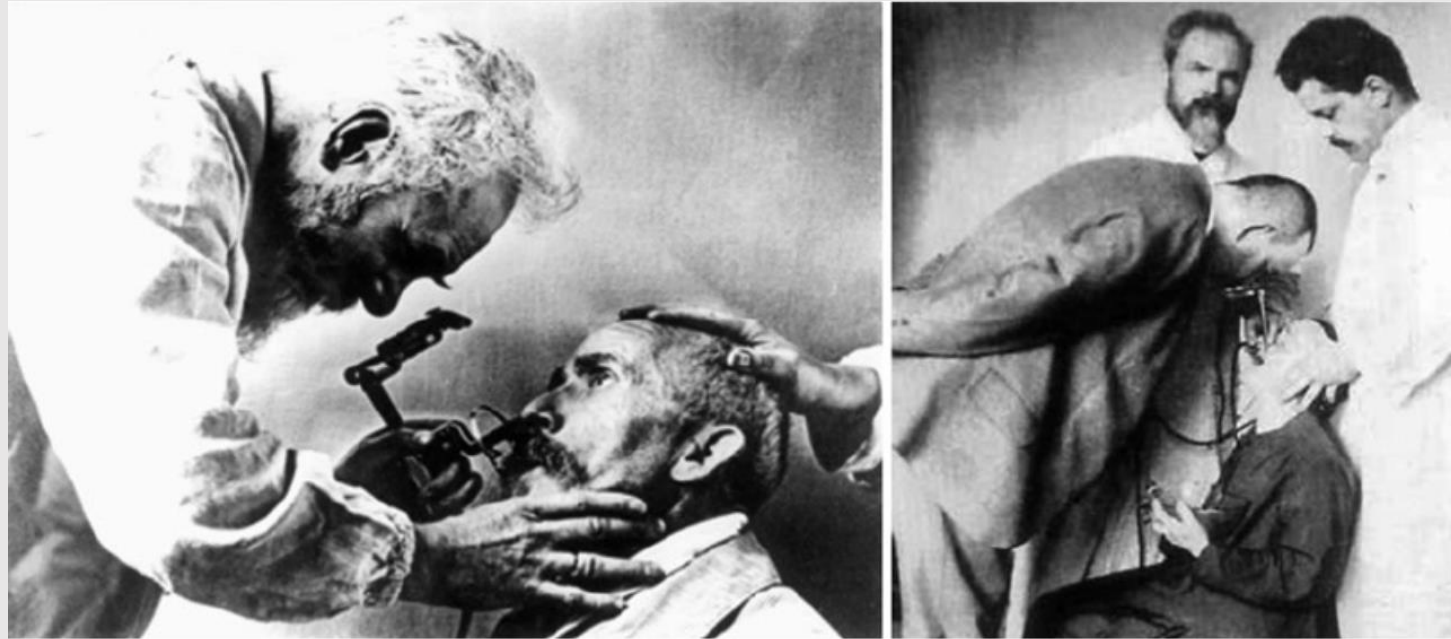


Fig. 39.2 Gustav Killian performing bronchoscopy

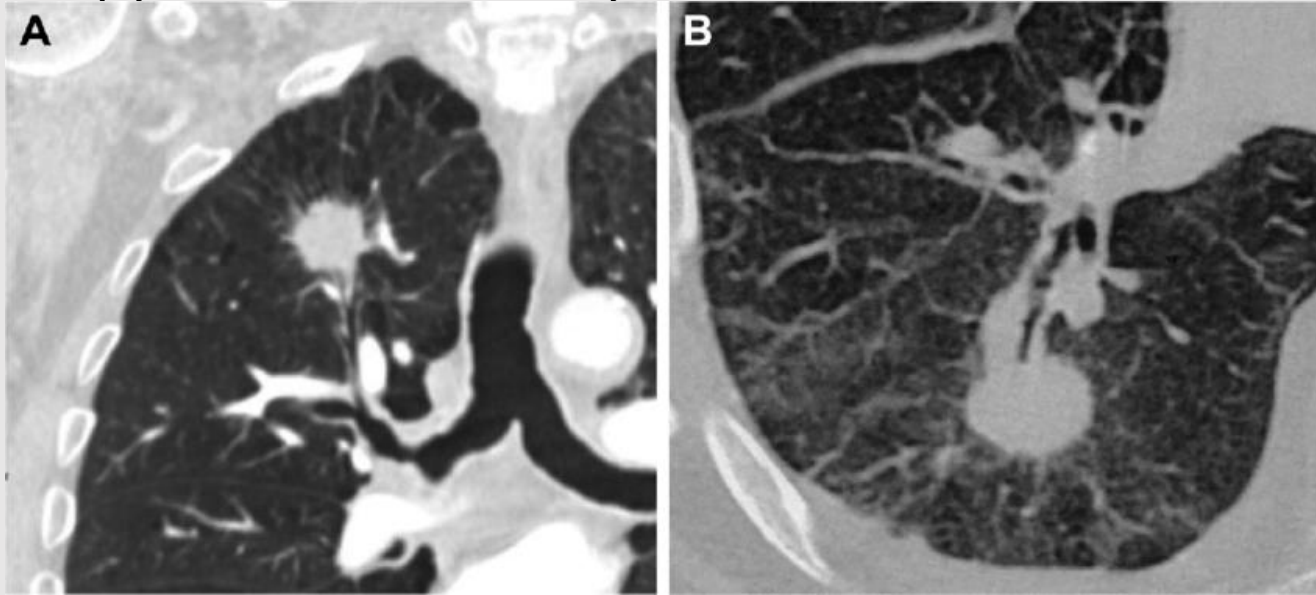
- 1968
 - Flexible bronchoscopy is introduced
- 1972
 - Transbronchial lung biopsy
- 1978
 - Transbronchial needle aspiration of lymph nodes using flexible bronchoscope
- 1992
 - Radial endobronchial ultrasound
- 2004
 - Linear endobronchial ultrasound
- 2006
 - Electromagnetic navigational bronchoscopy

Bronchoscopy

- Bronchoscopy
- Bronchoscopy with Fluoroscopy and radial ultrasound
- Linear ultrasound guided transbronchial lymph node sampling
- Electromagnetic navigational bronchoscopy and robotic bronchoscopy

Bronchoscopy

- Excellent at obtaining biopsies of central lesions with an airway sign
- Generally cannot reach beyond the 4th-5th airway generation
- Reliant on fluoroscopy to reach lesions that cannot be visualized directly
 - Fluoroscopy cannot accurately detect lesions less than 10mm

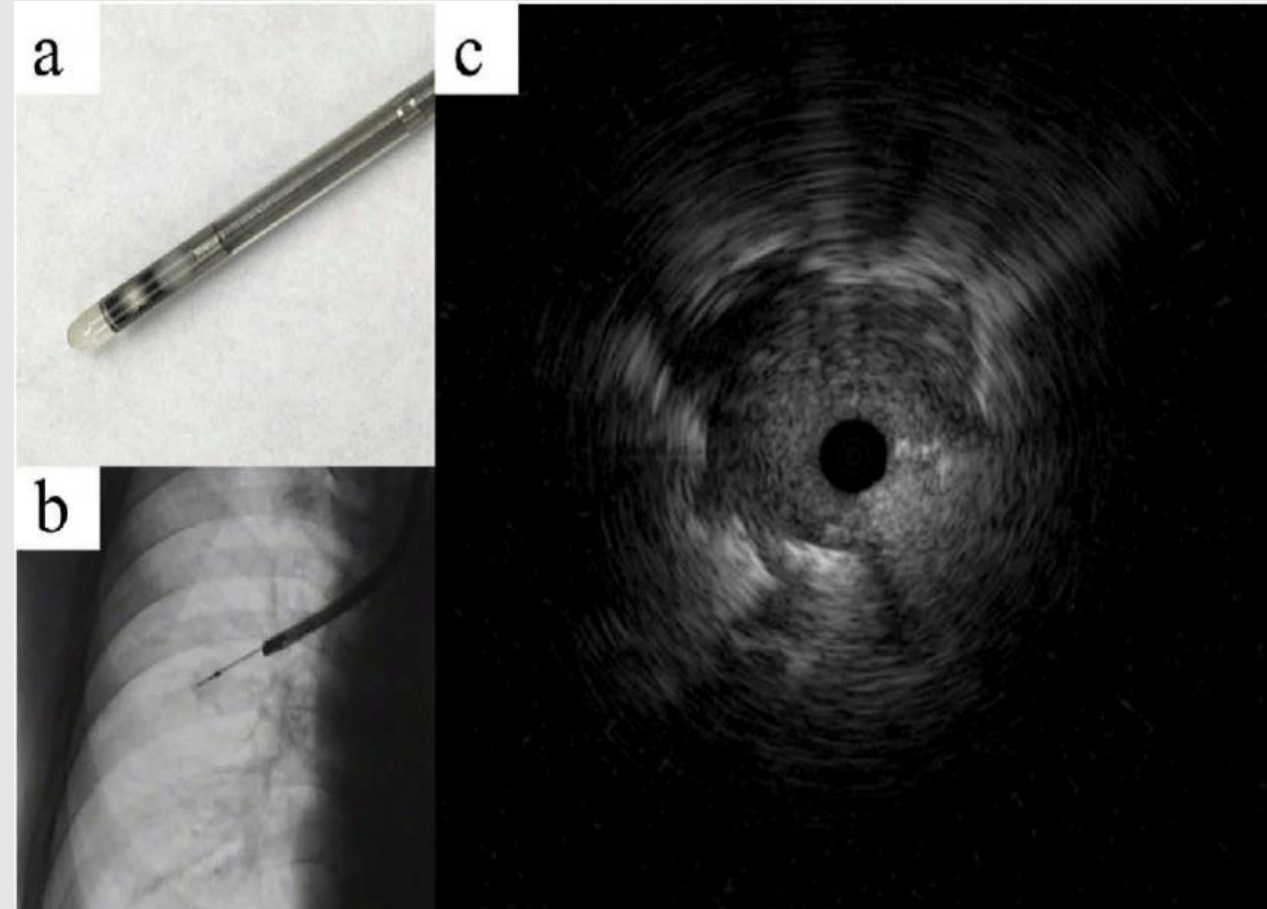


Bronchoscopy

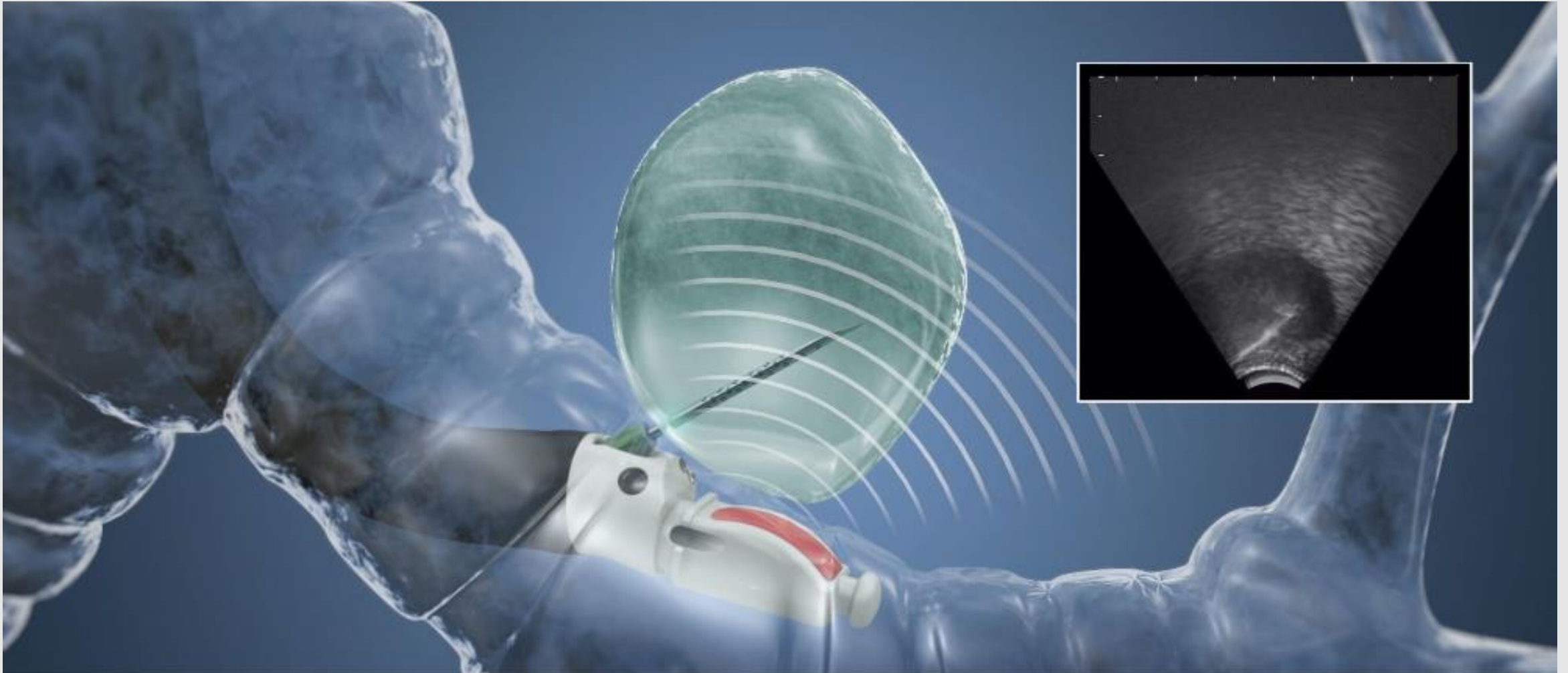
- Diagnostic yield of bronchoscopy biopsy of solitary pulmonary nodules depends on lesion location and distance from the hilum
 - Central – 82%
 - Intermediate 61%
 - Peripheral – 53%
- Complication rate 2.2%
- Transthoracic needle aspiration (CT guided lung biopsy) diagnostic yield was superior at 92.1% but had a larger complication rate of 20.5% for pneumothorax on average
 - PTX rate increases with the number of passes and presence of emphysema

Radial Ultrasound

- Flexible catheter used to guide TBLB with fluro
- Produces a 360° ultrasound image
- Increases diagnostic yield of peripheral lesions¹
 - 53% → 77.7%

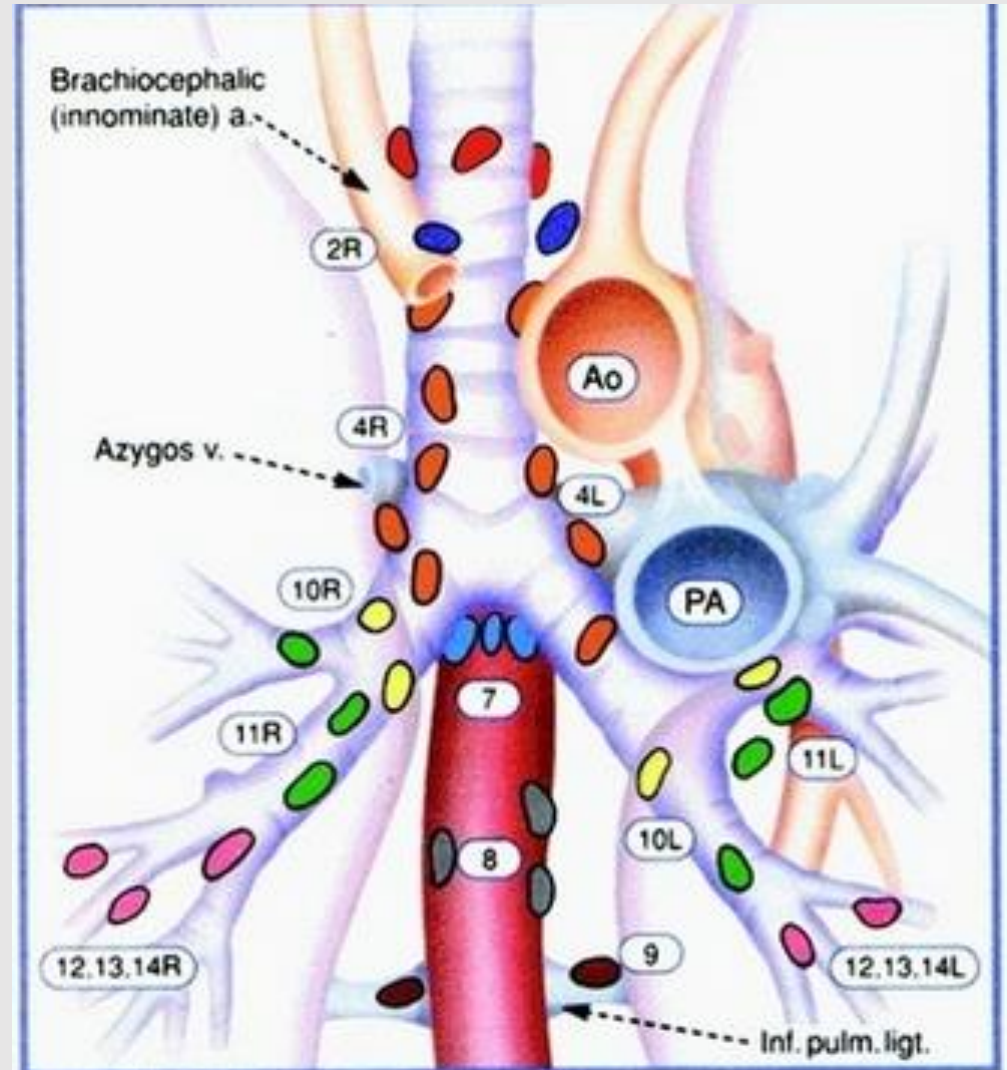


Linear Ultrasound (Linear EBUS)



Linear EBUS

- Used to sample lymph nodes suspected to be malignant
- Lymph node stations
 - N1,N2,N3 – help to designate the stage of malignancy
- Pathologist present to confirm sample adequacy (ROSE)



Linear EBUS

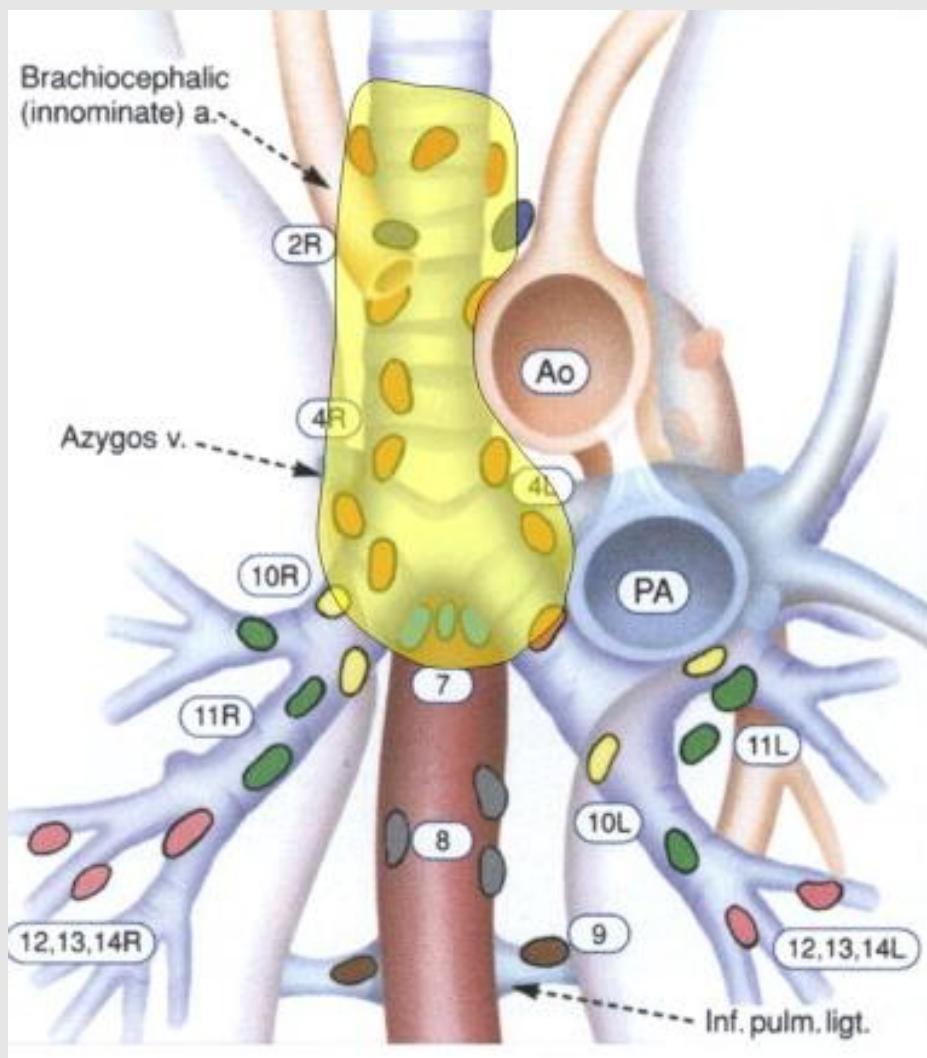
- When used in conjunction with bronchoscopy or navigational bronchoscopy it allows simultaneous diagnosis and staging of lung cancer
 - Goals of care: Less than 30 days from time of imaging to treatment



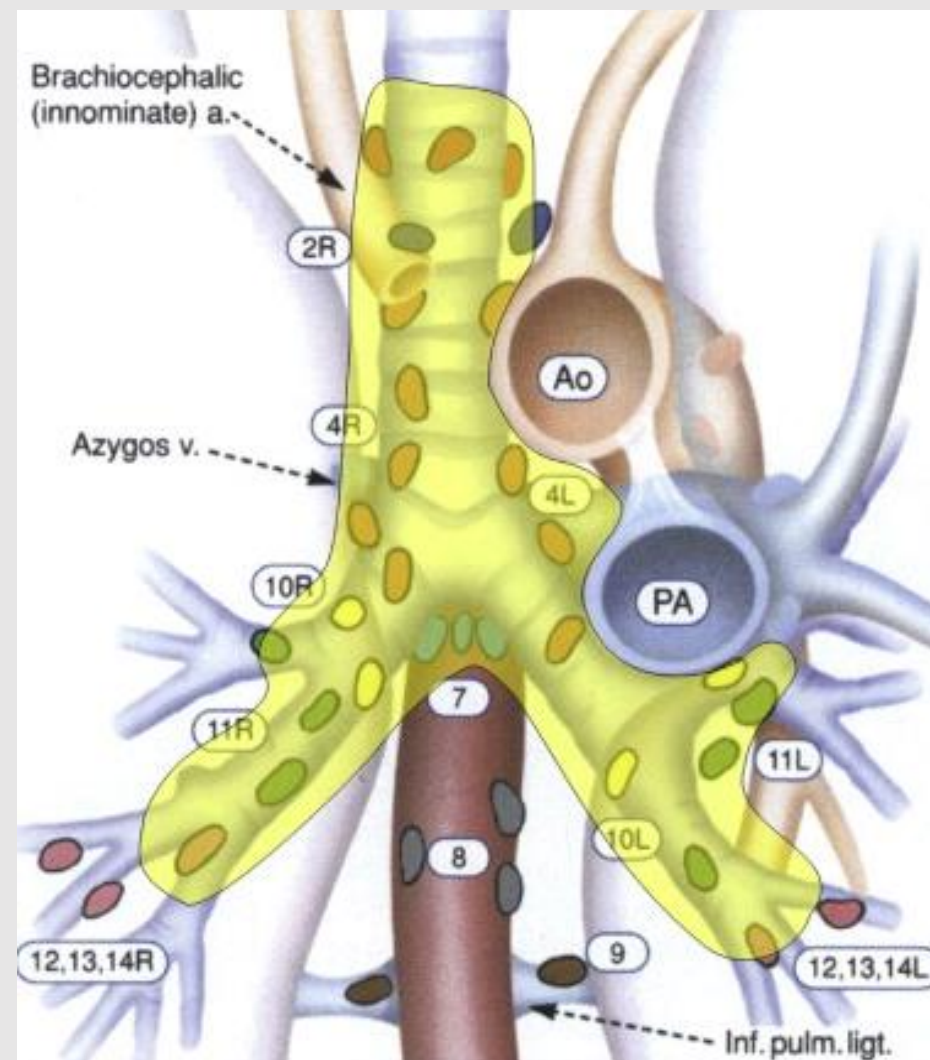
EBUS vs Mediastinoscopy

- EBUS¹
 - Sensitivity – 81%
 - NPV – 91%
 - Diagnostic accuracy – 93%
- Mediastinoscopy¹
 - Sensitivity – 79%
 - NPV – 90%
 - Diagnostic accuracy – 93%

Mediastinoscopy



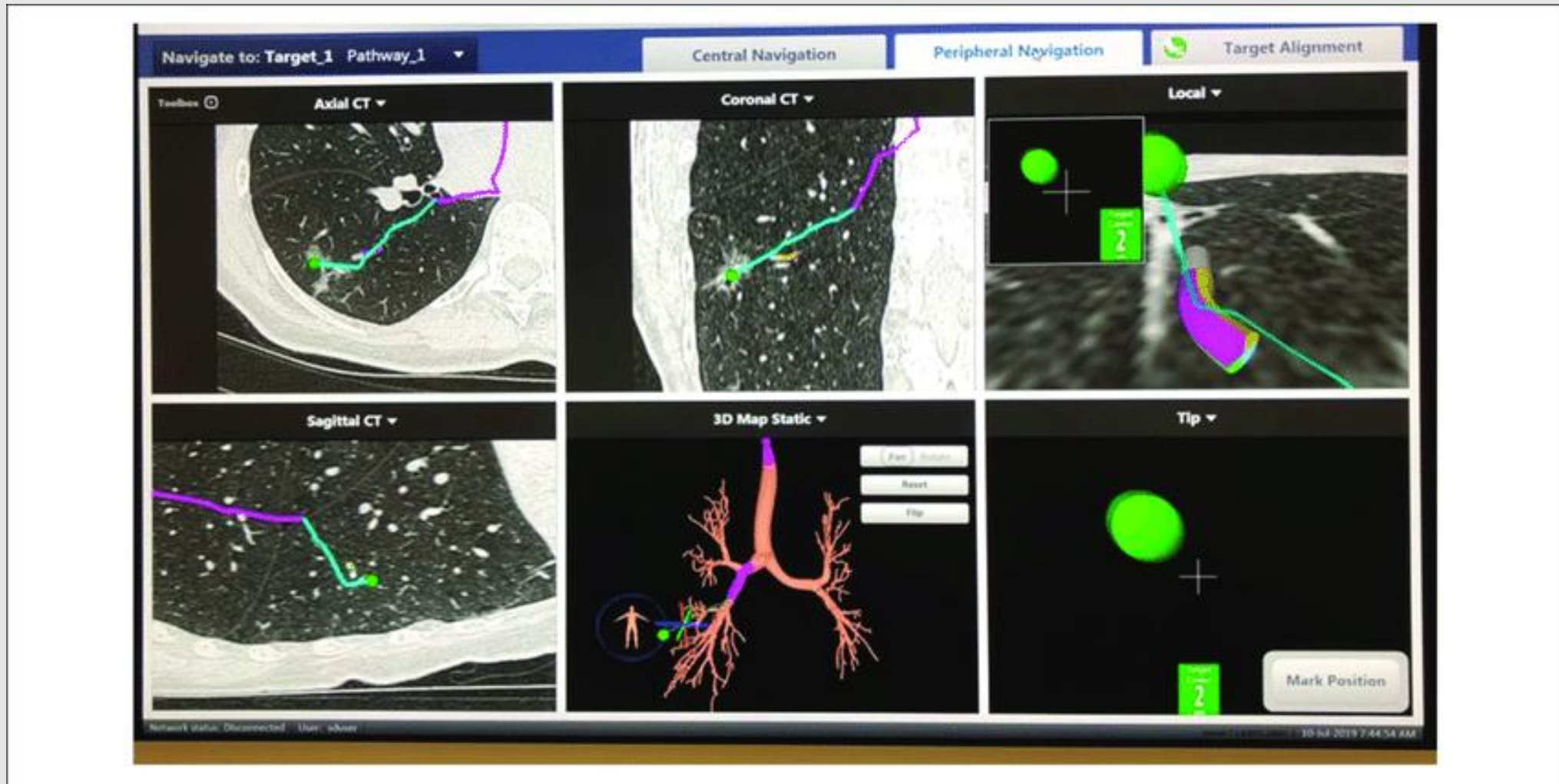
EBUS



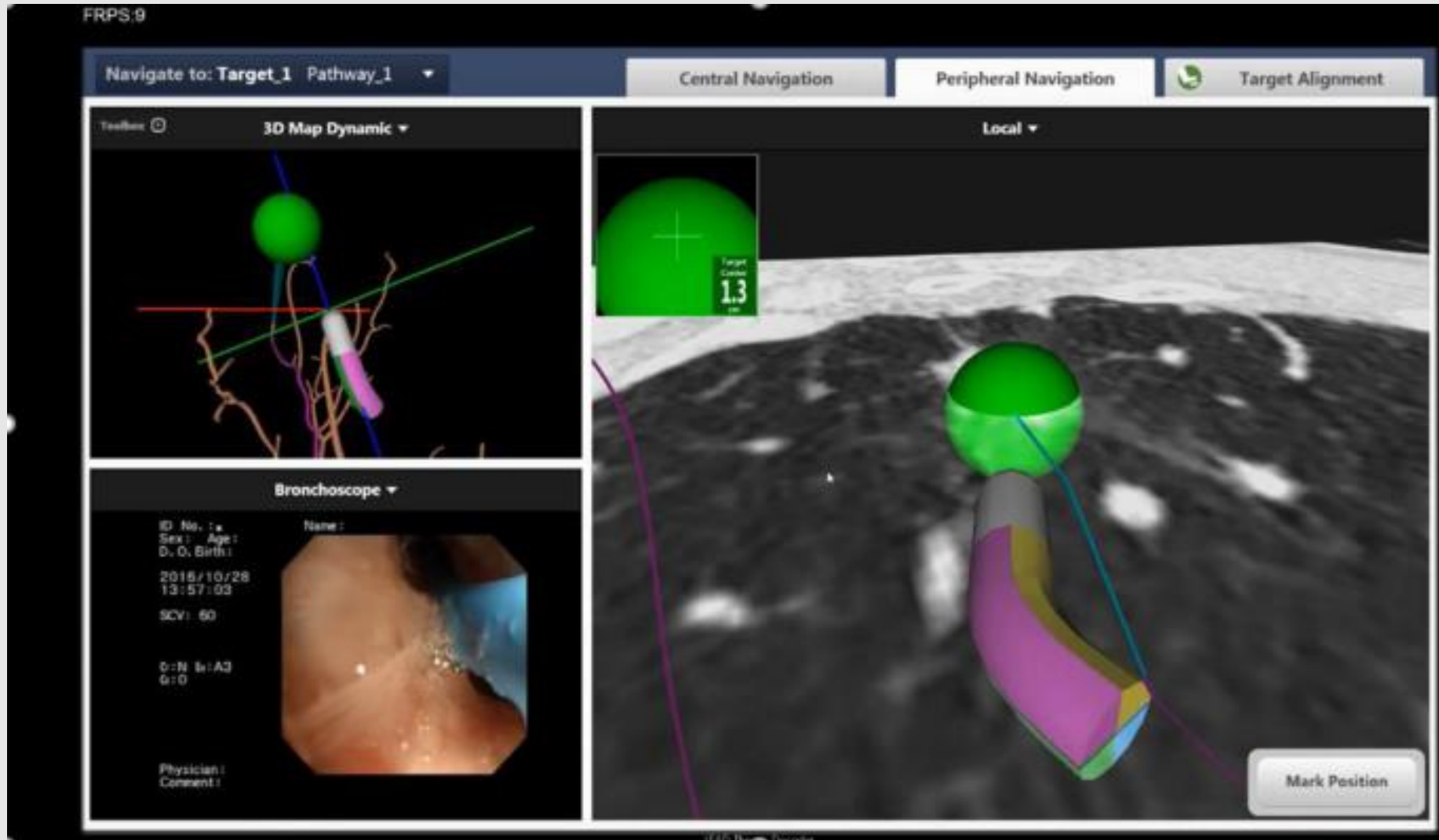
Electromagnetic Navigational Bronchoscopy

- Uses CT imaging, ultrasound imaging, and fluoroscopic views to provide real-time guidance to nodules
- Allows access to peripheral nodules and nodules smaller than 10mm
- Increases diagnostic yield to 87%¹
- Pneumothorax rate remains low at 2.6%¹

Electromagnetic Navigational Bronchoscopy



Electromagnetic Navigational Bronchoscopy



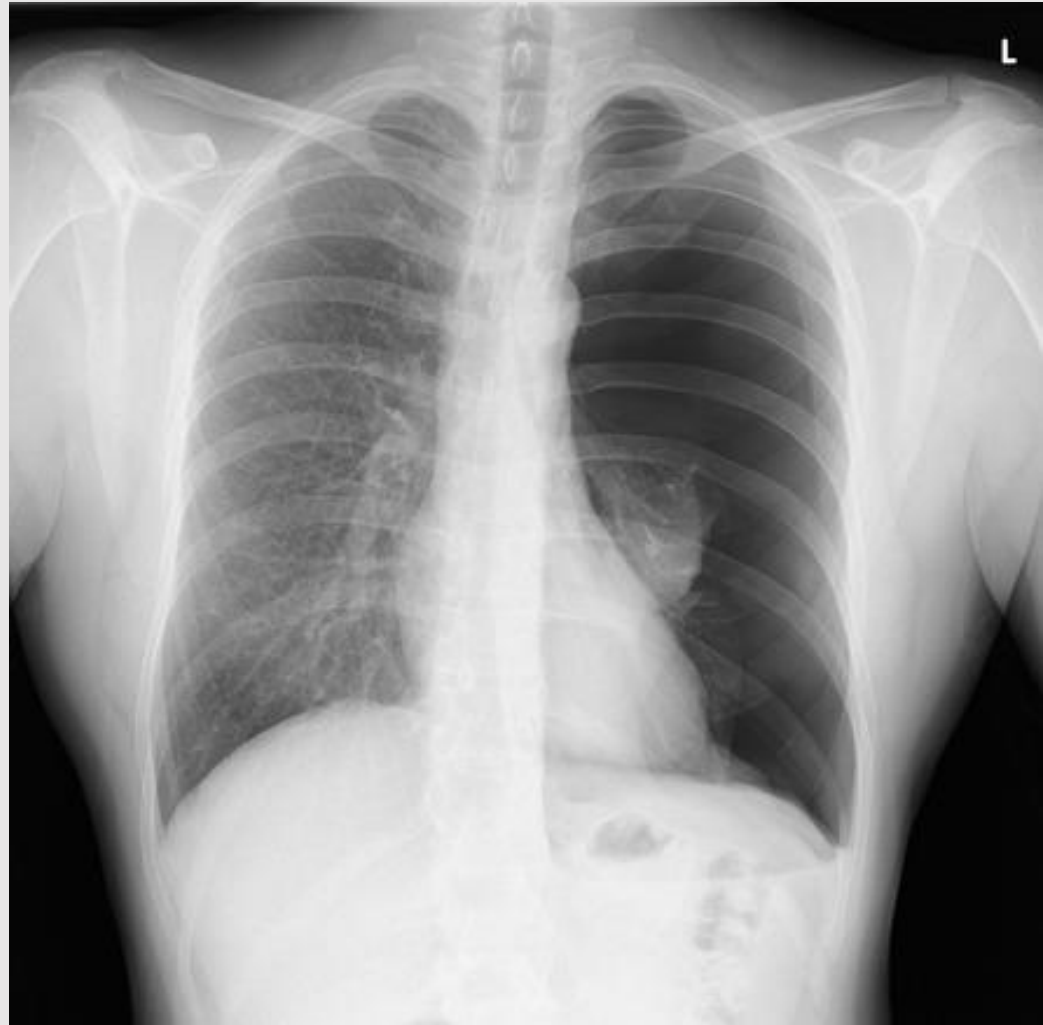
Robotic Bronchoscopy



Caveats and Complications

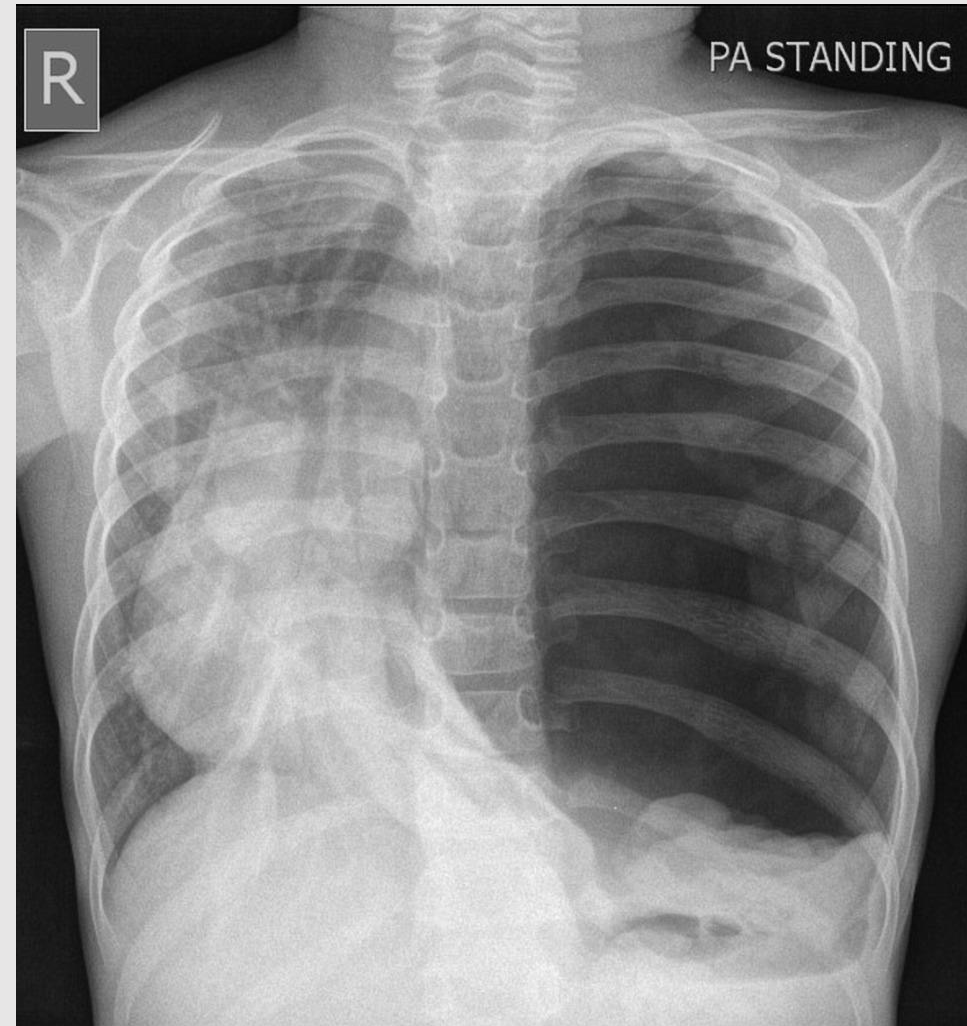
Pneumothorax

- Introduction of air within the pleural space due to disruption of the visceral pleura
- Sudden onset of shortness of breath that is often associated with chest pain
- Suspect this after bronchoscopy if patient is complaining of “lung pain”
- One lung per procedure approach



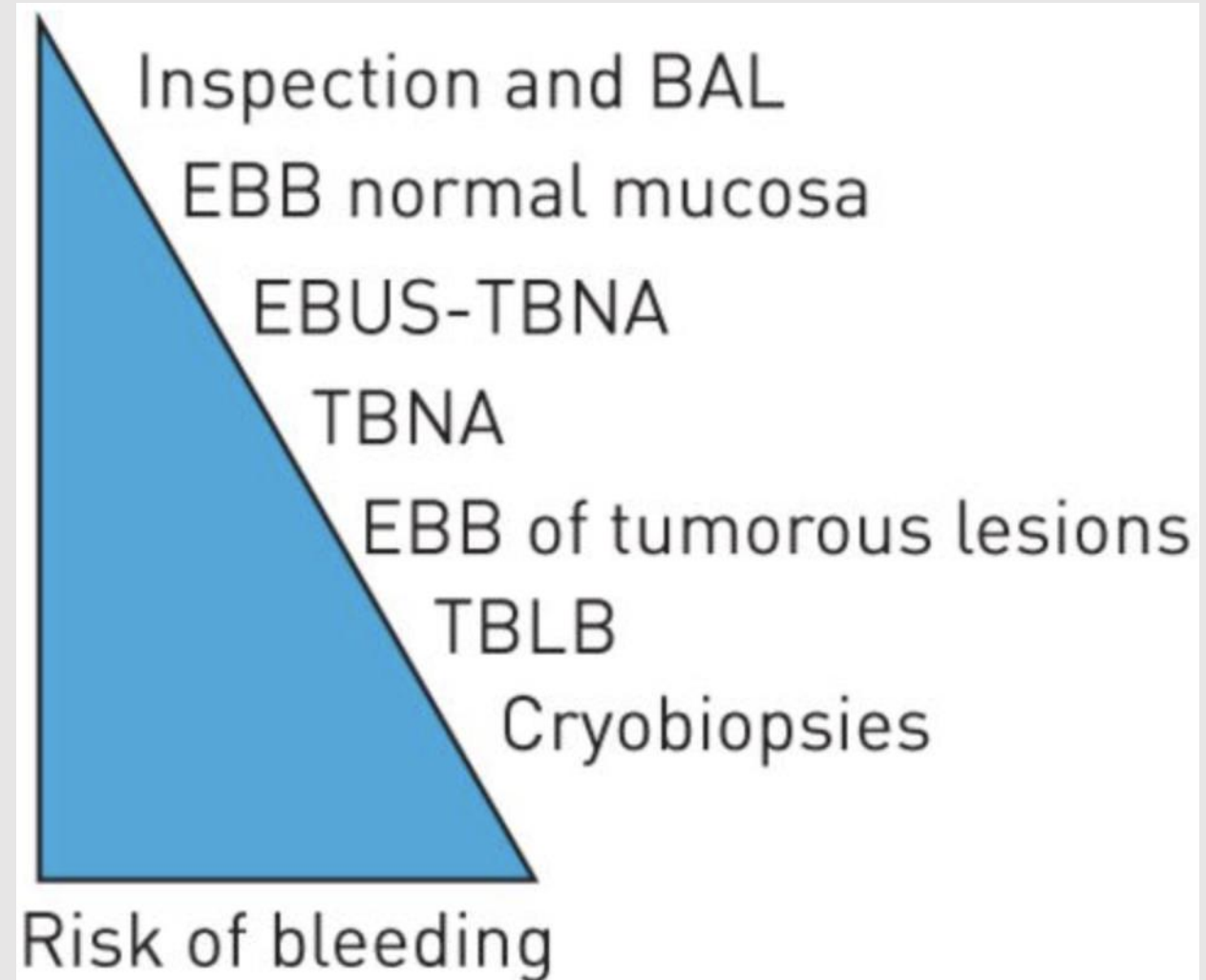
Tension Pneumothorax

- Tracheal deviation
- Crepitus
- Hemodynamic changes
 - Tachycardia
 - Hypotension
 - Cardiac arrest
- Emergent needle decompression
 - 14 or 16-gauge needle
 - Over needle catheter if able
 - 2nd intercostal space, midclavicular line



Bleeding

- Risk differs depending on the procedure performed¹
 - 0.26% - 5%
- Definition of minimal – severe bleeding²
 - Minimal – less than 50mL
 - Moderate – 50-100mL
 - Severe – greater than 100mL
- Transbronchial lung biopsy (TBLB)
 - Most often associated with significant bleeding¹
 - Blind biopsies of the pulmonary or bronchial arteries
- Currently no studies to determine if prophylactic epinephrine helps bleeding in TBLB

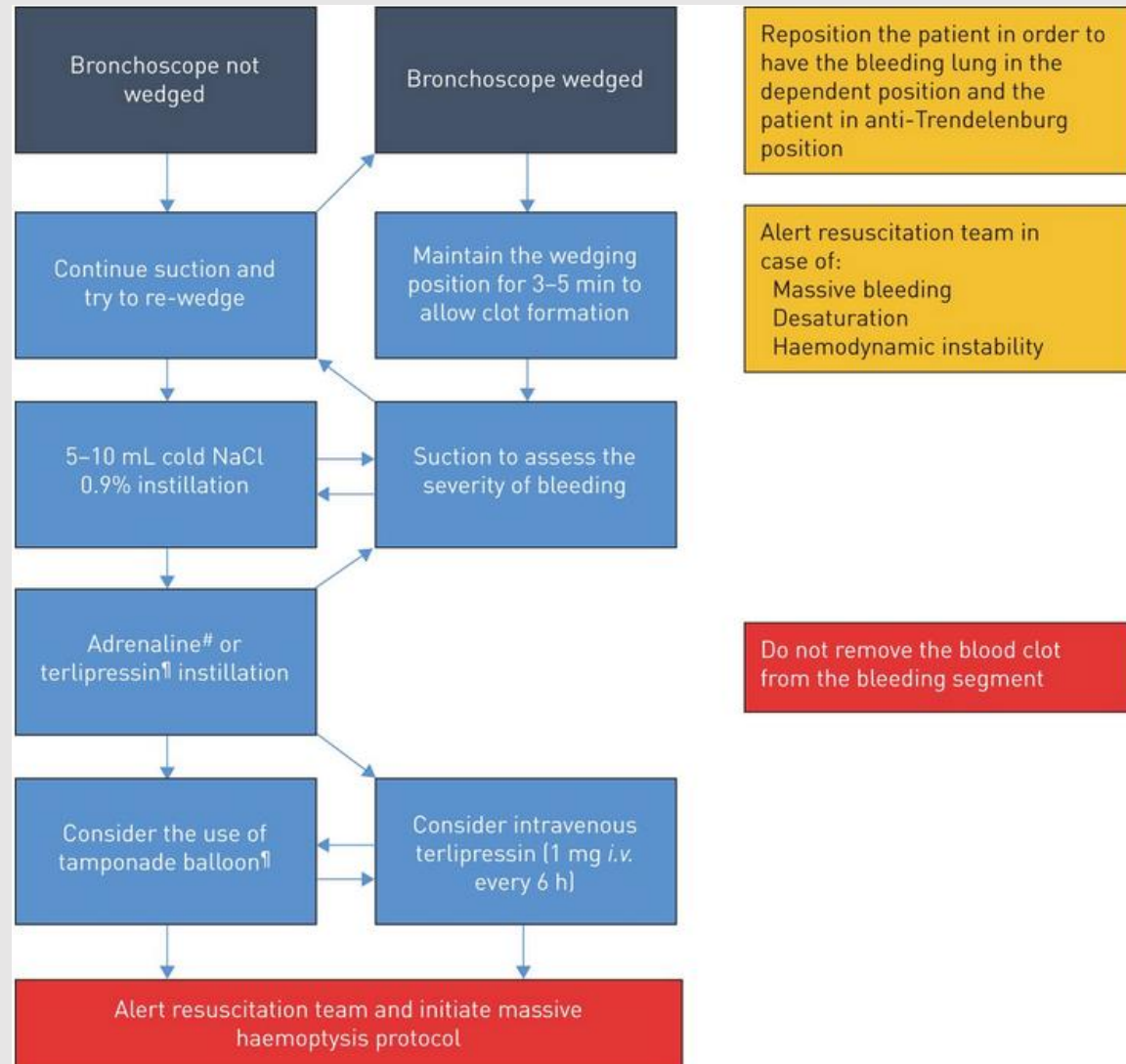


1. Bernasconi, M., Koegelenberg, C. F. N., Koutsokera, A., Ogna, A., Casutt, A., Nicod, L., & Lovis, A. (2017). Iatrogenic bleeding during flexible bronchoscopy: risk factors, prophylactic measures and management. In ERJ Open Research (Vol. 3, Issue 2, pp. 00084–02016). European Respiratory Society (ERS). <https://doi.org/10.1183/23120541.00084-2016>

2. Cordasco EM, Mehta AC, Ahmad M. *Bronchoscopically induced bleeding. A summary of nine years' Cleveland clinic experience and review of the literature. Chest 1991; 100: 1141–1147.*

Bleeding

- HAVE A PLAN!
- Safety position
- Iced saline
- Establish an airway
- Epinephrine 1:100,000 2mL for central tumors

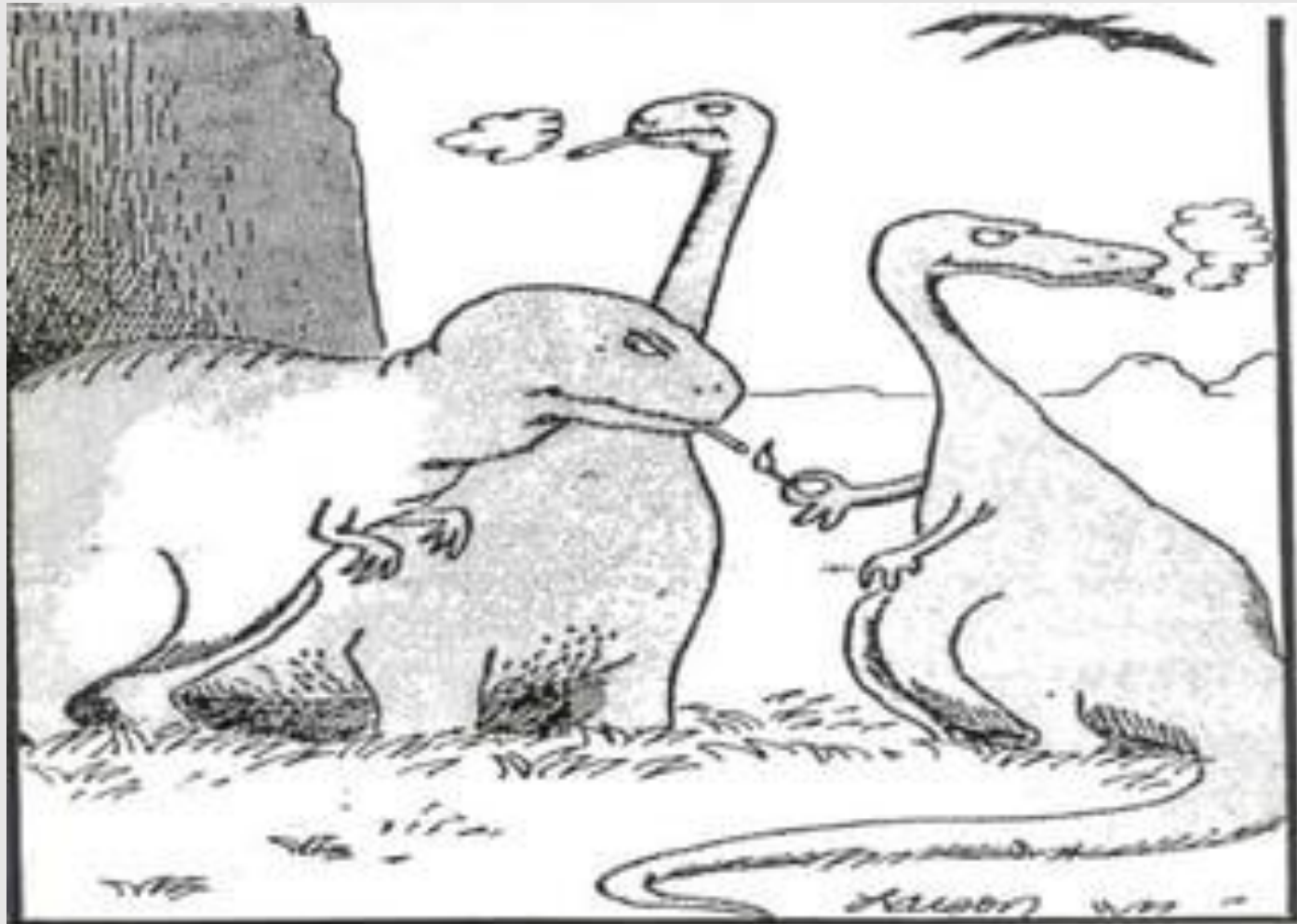


Bleeding

- Epinephrine 1:100,000. 2mL
 - Cardiac arrhythmia can occur at doses as low as 100 mcg¹
- My approach
 - If biopsy is necessary then 2mL epinephrine
 - Call out safety position
 - Take small samples from non-vascular areas
 - If alternative site available to establish diagnosis then biopsy those first



Questions?



The real reason dinosaurs became extinct.