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Screening for Lung Cancer

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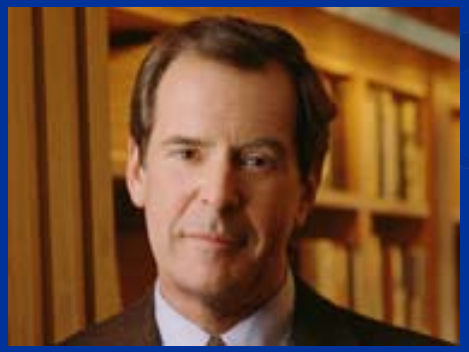

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The Clinical Problem

- Lung cancer accounts for over 150,000 deaths annually in U.S.
- Metastatic spread present in over 75% of patients at time of diagnosis
- Five year survival rates just 15%
- However, 5 year survival rates are >60% for patients with stage I disease
- This suggests (*but doesn't prove*) that screening may improve survival

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Index Patient

- 65 yo woman
- Mild osteoarthritis, otherwise in good health
- Smoked one pack a day for 30 years, but claims to have stopped smoking 10 years ago
- Here for routine health maintenance
- Are you worried about lung cancer?
- Should you screen this patient for lung cancer?

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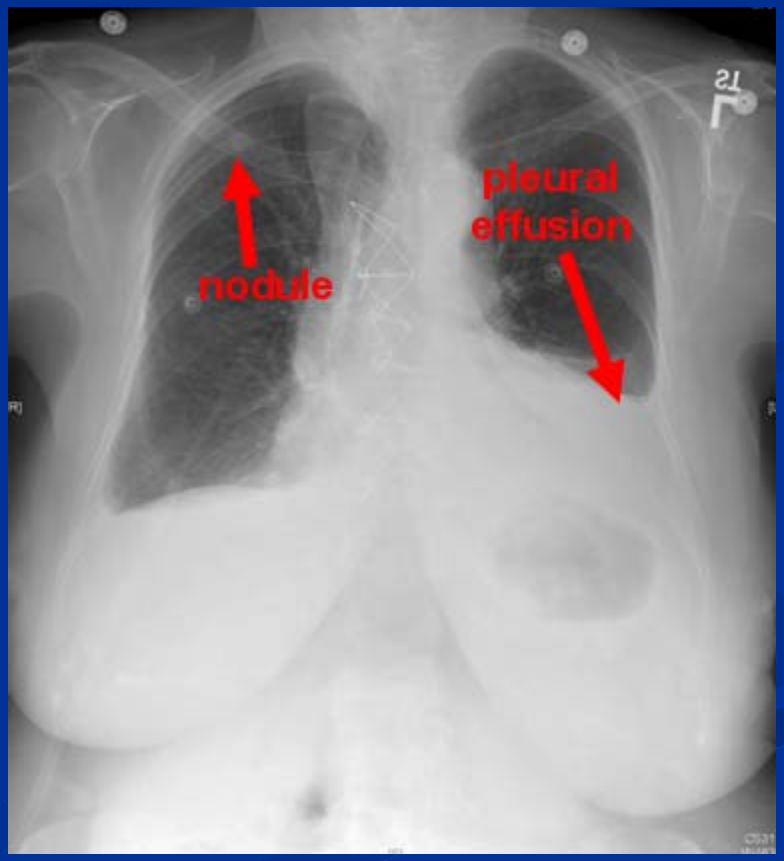
Index Case

- **Such a patient would not be screened**
- **But our patient actually recently underwent a CABG, and has shortness of breath (she's actually not so healthy)**
- **She therefore received a CXR**

Other than a pleural effusion, is there anything else notable on this CXR??



PACS BIDMC, courtesy Dr. Jason Handwerker

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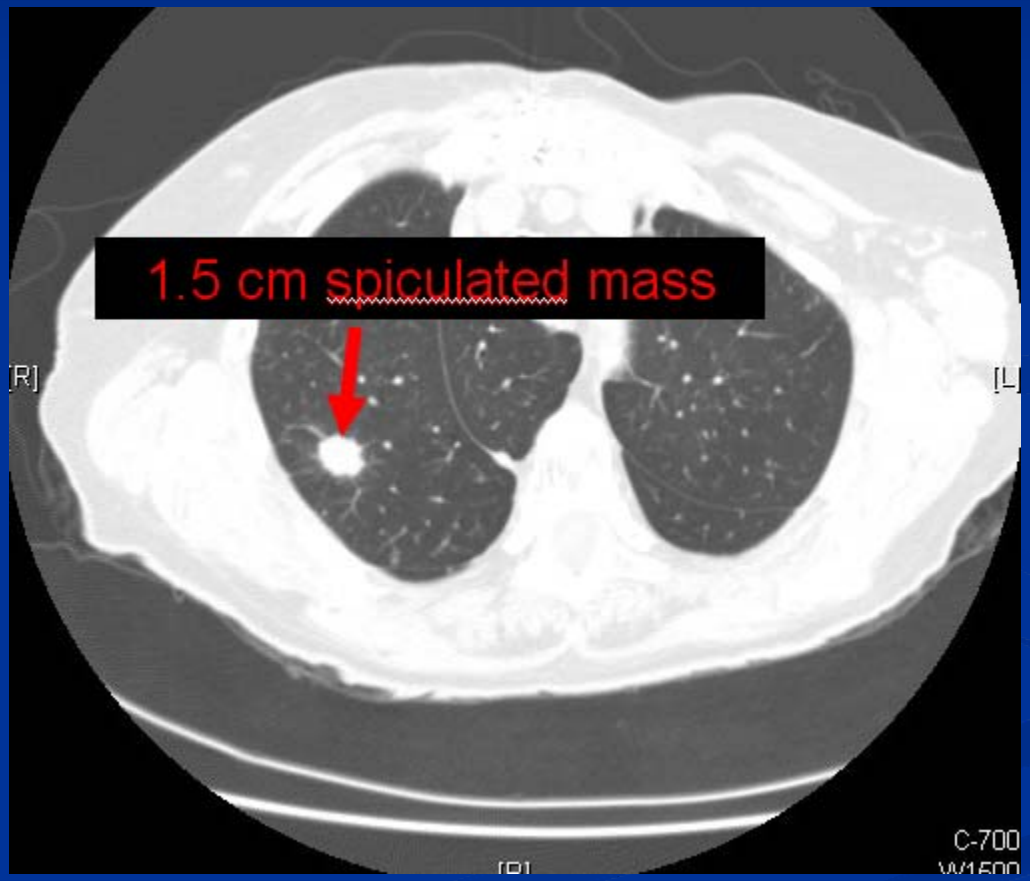
Index Patient

Follow-up CT



PACS BIDMC, courtesy Dr. Jason Handwerker

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Index Patient

- This mass turned out to be non-small cell lung cancer
- The patient received radiation and chemotherapy (she did not undergo surgery because of other medical problems)
- Sadly, the cancer metastasized to her brain
- The incidental finding of a lung cancer did not save our patient

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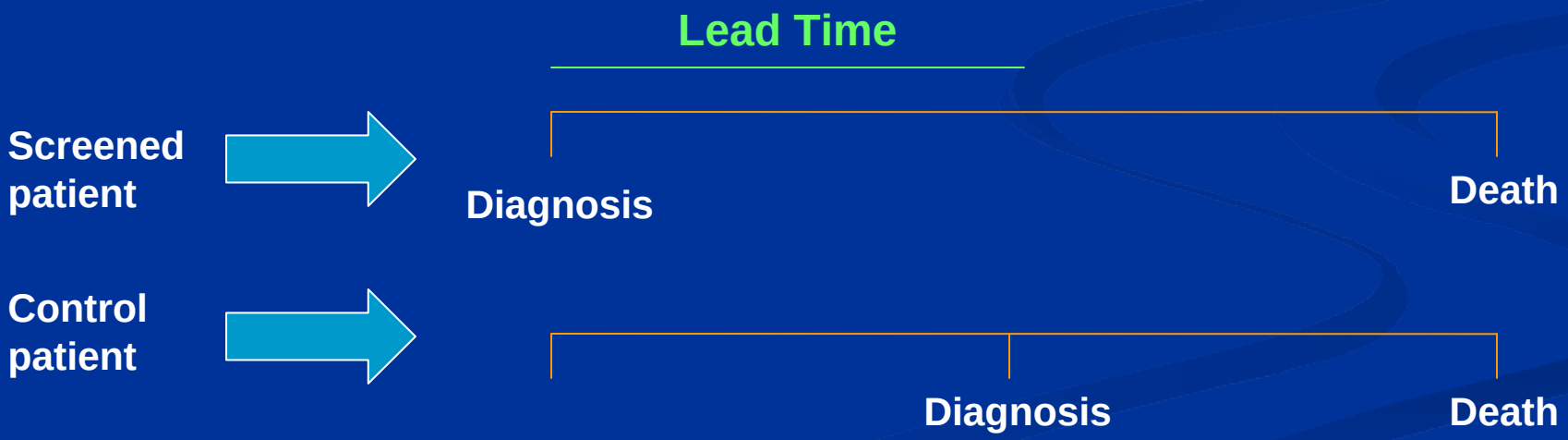
Points to Remember

Just because screening detects early cancers doesn't mean it saves lives!!

1. Lead Time Bias:



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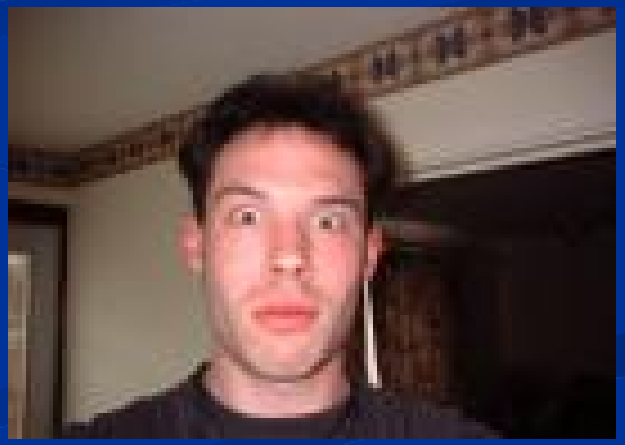
Points to Remember

2. **Length Time Bias: slow-growing tumors preferentially detected by virtue of the fact that they're around longer**
3. **Over-detection**
4. **Unnecessary invasive procedures**
5. **Patient anxiety**



http://www.everafta.co.uk/Photo%20Albums/photo_album_3.htm

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The Goal

To Detect Stage 1 Disease

Stage 1: No invasion, no local or distant spread

Stage 2: Either minor local invasion of primary lesion or local spread

Stage 3: More extensive local invasion or local spread

Stage 4: Distant spread

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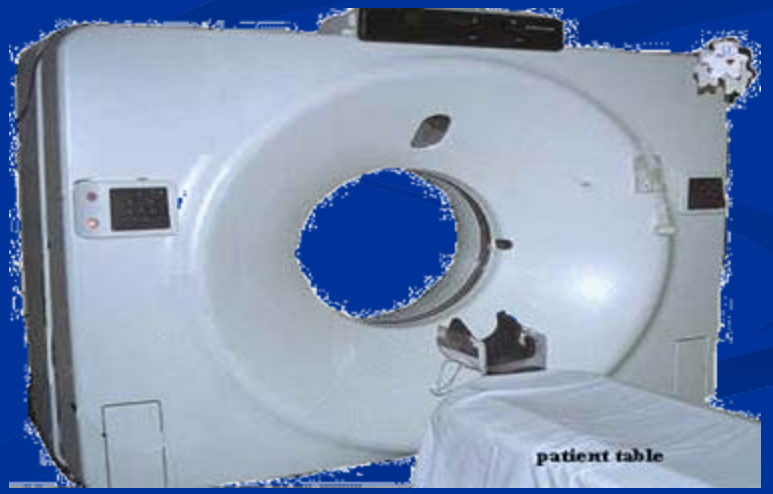
Potential Screening Methods

- Sputum cytology
- CXR
- CT
- Bronchoscopy
- Exhaled breath analysis
- PET
- Combinations

http://www.e-radiography.net/ibase5/5_Equipment/



http://www.uscg.mil/hq/g-w/uscga/services/Radiology/images/ct.gif

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Who should be screened?

- **Adult smokers and former smokers over age 45 at highest risk**
- **Smokers are only group for whom screening is being considered in earnest**

http://www.wikisearch.net/en/wikipedia/c/ci/cigarette.html

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Chest X-Ray

- Regular PA and lateral or just PA
- At least every year
- Some say that CXR is best for detecting peripherally located adenocarcinomas, others don't agree
- Digital CXR with dual-energy subtraction CXR

Dual energy subtraction soft tissue image

MacMahon H. Improvement in Detection of Pulmonary Nodules: Digital Image Processing and Computer-aided Diagnosis. RadioGraphics 2000; 20: 1169-1177.

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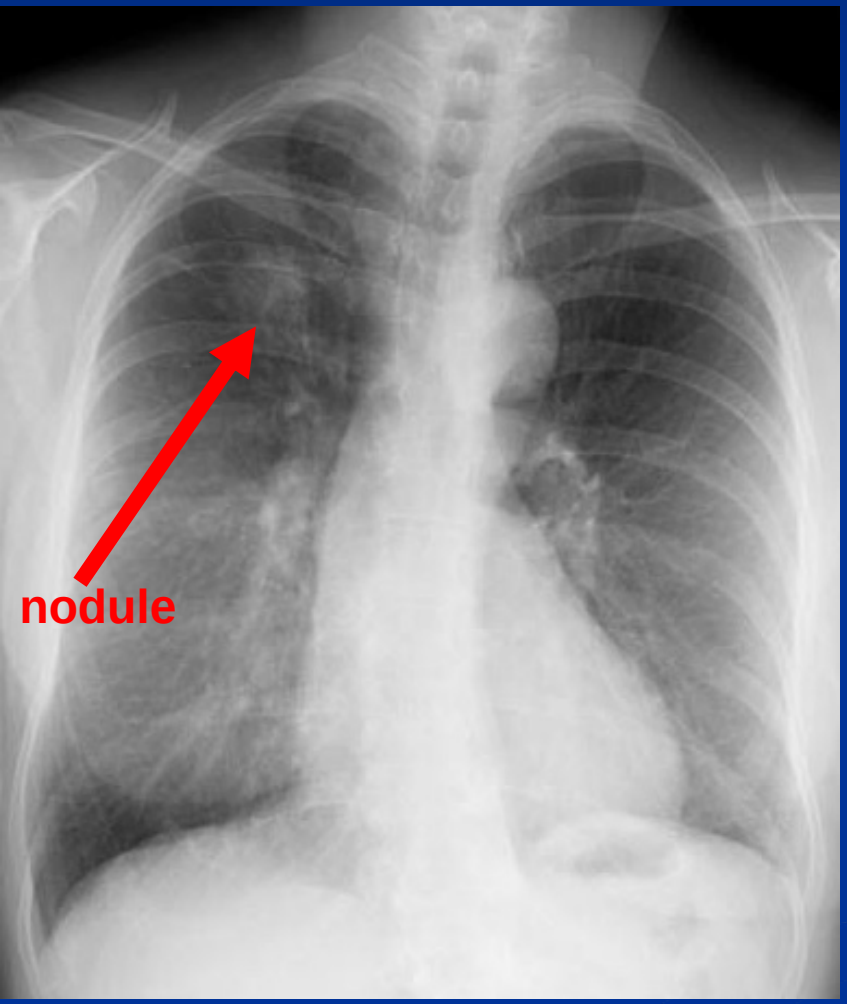
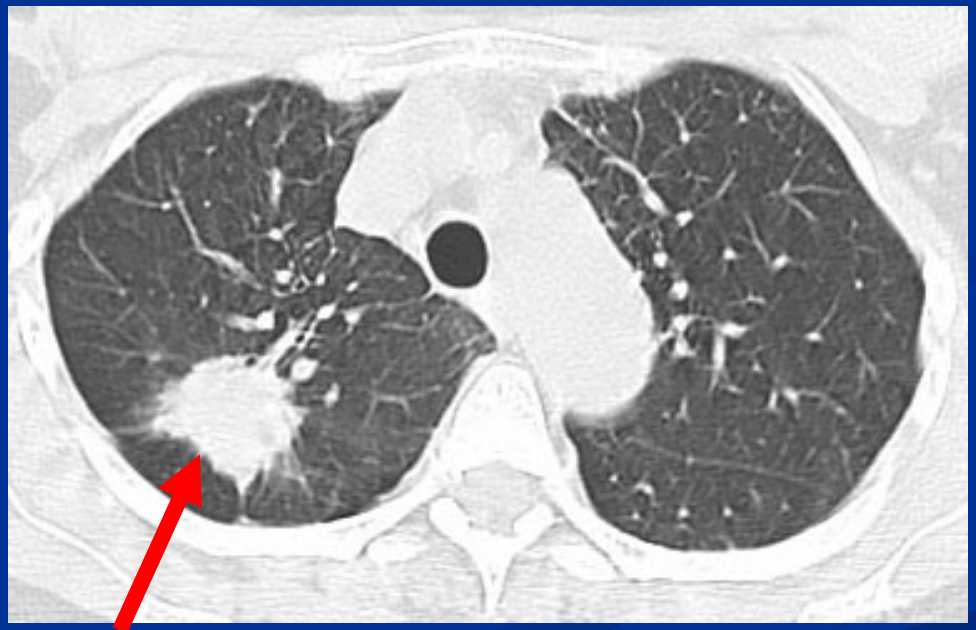
Chest X-Ray: Screening Film of a New Patient



Courtesy Dr. Phil Boiselle

3 cm cancer



Courtesy Dr. Phil Boiselle

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Chest X-Ray

- There have been two large trials – the Mayo Lung Project and Czechoslovakia Lung Screening Study – evaluating CXR to screen for lung cancer
- Both 20 years old
- Results the subject of considerable debate
- Neither showed evidence of mortality benefit from screening

Mayo Lung Project

- Over 4,000 subjects screened with CXR and sputum and over 4,000 controls
- Nine-year follow-up
- All cause mortality actually a bit lower in control group*
- Study criticized because many controls were screened

*not statistically significant

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CT

- Much more sensitive than CXR
- Much more expensive
- More radiation exposure
- 1.3% asymptomatic pts will be diagnosed with cancer, over 50% will have abnormality
- Helical CT best for finding nodules
- Low-dose CT used for screening, which has 1/9 radiation exposure of conventional CT
- After abnormality detected a complex and expensive work-up is initiated

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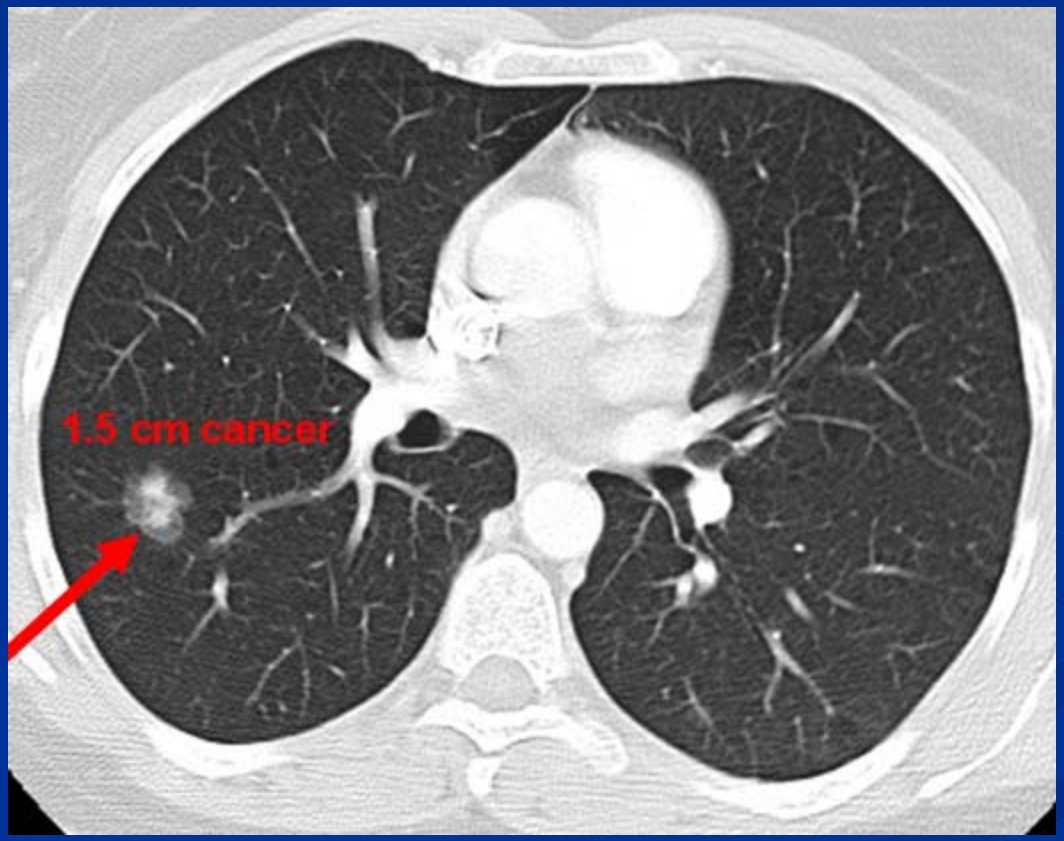
CT: Screening Film of a New Patient



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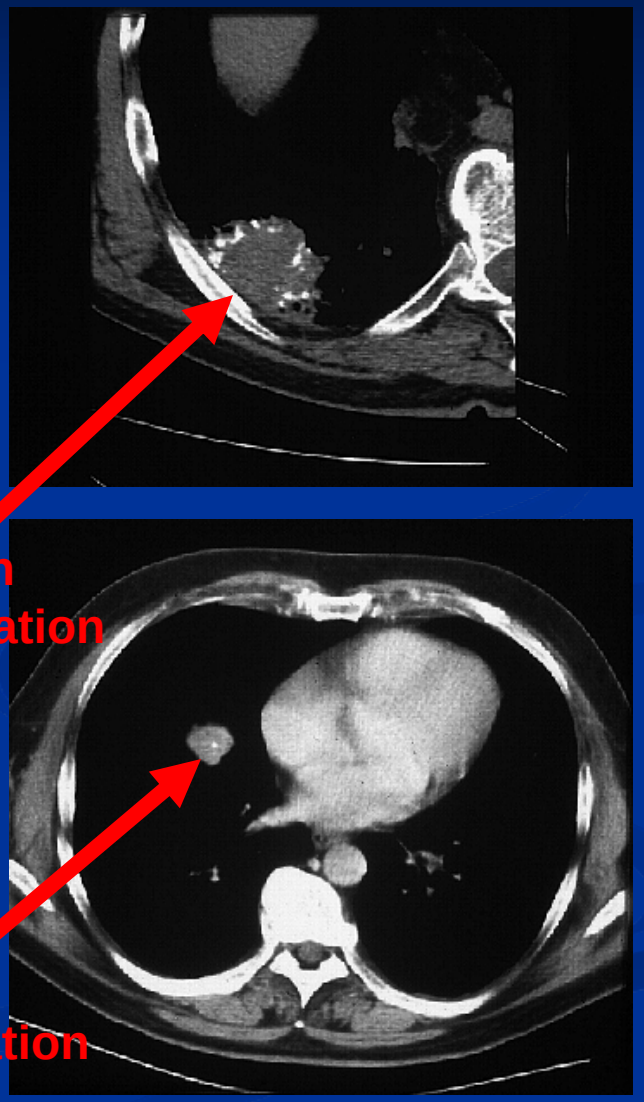
CT

- It's important (and often difficult) to distinguish between benign and malignant appearing nodules
- Benign nodules tend to have recognizable calcification patterns
- Computer programs are starting to be used to aid radiologists



Up-To-Date, Differential diagnosis and evaluation of the solitary pulmonary nodule

CT

- Two important ongoing studies evaluating the use of CT for screening: National Lung Cancer Screening Trial and an RCT in Europe
- Results from NLST expected in 2009, results from European trial expected in 2010

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National Lung Screening Trial

- **Primary aim: to determine whether lung cancer screening using low-dose helical CT reduces lung cancer-specific mortality relative to screening with chest radiographs in a high-risk cohort.**

Slide Courtesy of Dr. Phil Boiselle

For the Time Being

- Screening for lung cancer is not currently recommended, even for long-time, heavy smokers
- American College of Chest Physicians, American Cancer Society, American Academy of Family Physicians, American College of Radiology, American College of Physicians, and American Thoracic Society all recommend against routine screening
- U.S. Preventive Services Task Force says evidence is insufficient either to recommend for or against routine screening

Conclusions

- Lung cancer is very aggressive disease and it probably is beneficial to catch it early
- Routine screening of current and former smokers with CXR has not been shown to improve mortality rates but the data are the subject of controversy
- There are two large trials looking at the use of CT for screening; these trials should be completed by the end of the decade
- For now, routine screening is not recommended

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