Development of a Clinical Lung (Cancer) Screening Program
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Objectives
- Understand clinical implications of NLST
- Present basic concepts for creating a clinical screening program

Lung Cancer into the 21st Century

Requirements for Screening
- Common disease
- Effective treatment
- Sensitive test
- Decrease disease specific mortality
- Inexpensive and easily performed

Natural History of Lung Cancer

Disclosures
- BWH is an ACRIN NLST Site
- BWH Center for Advanced Medical Imaging receives support for CT lung nodule research from Toshiba Corporation

Decreased Mortality
Improved outlook
Increased survival

Detectable by Test

Signs and Symptoms

Pre clinical
Clinical

DPCP = detectable preclinical phase
X = therapy more effective or less invasive

1900 Machine-made cigarettes
1910 Lung Cancer Rare Disease
1915 Tobacco smoking
1920-19 WWI increased popularity of cigarettes
1930 Pneumonectomy
1950 Cigarettes associated with lung cancer
1964 Tobacco warning on cigarette
1968-1970 Intensive study of low-dose screening CT
1987 Lung cancer limited to dead in women
1973 Lobectomy with bronch node sampling
1989 Introduction of CT scan in single breath-hold
2011 NLST Screening CT decreased deaths
Screening makes no difference...

- If you die at the same time
- If you know you have disease longer
- If you never knew you had the disease
- If the tumor is too aggressive to be found early or treated successfully

NLST Primary Results

- Lung cancer mortality decreased 20% in CT screened group
- CT group had 7% decrease in all cause mortality – 56% due to lung cancer

Clinical CT Screening Influences

- Breast cancer screening
- Patient advocacy
- IASLC recommendation to consider low-dose CT screening for individuals with same profile as participants in NLST

NLST Eligibility Criteria

- Age 55-74
- 30 pack-year history of smoking
- Current smoker or
  - Former smoker quit < 15 years ago
- No history of lung cancer
- No chest CT within 18 months

NLST 3 Annual Screens

- Nodules < 4 mm in diameter Negative
- Nodules ≥ 4 mm minimum f/u 6 mo in addition to annual screening exams
- 24.2% CT screens positive
- 39.1% CT had at least 1 positive screen

Clinical Lung Screening Program

- Emulate controlled trials
- Establish guidelines for screening
- Standardize low-dose CT examination
- Communicate with patient and physician
- Strive to balance risks and benefit
**Emulate Clinical Trial**

- Lung Cancer Screening Program
- Community-Based fee for Service
- Referral guidelines for physicians
- Risk assessment and education for patients
- Report to physician (may also go to patient)
- Recall letter to patient

**Guidelines for Screening**

- Recommended for individuals who are most similar to NLST participants
  - 55-75 years of age smoker or former smoker
  - 30 Pack-years of cigarette smoking
  - Accept referrals more broadly
  - Longer duration of smoking and abstinence
  - Significant environmental exposure
  - Family history of lung cancer

**Standardize Low-dose CT Examination**

- Optimize protocol for specific scanner
- Aim for radiation dose ≤ 1.5 mS
- Dose modulation can be used
- FOV limited to lungs
- Interleaved thin section reconstruction
- Soft tissue reconstruction for calcification

**Communicate with Patient and Clinician**

- Support patient-physician decision to screen
- Risk assessment with self-reporting form for relevant history
- Report risk assessment, findings, impression, and recommendation with basis such as NLST or Fleischner Criteria
- Document communication of critical findings
- Provide follow-up reminder for next screen

**Risk Assessment**

**Risk Assessment Form Elements**

- Determine patient in usual health
- Past medical history of respiratory diseases
- Personal history of cancer
- Family history of lung cancer
- Exposure history
  - second hand smoke, asbestos, radon

Thank you for taking the time to fill out this form. Risk assessment is an integral part of our screening service. It will help to guide your health care correctly as guidelines are developed and refined.
Lung Screening Report

- Stylized report
- Risk Assessment
- List nodules
- Describe lung parenchyma
- Coronary artery calcifications and incidental findings
- Impression with positive or negative screen followed by recommendation

Fleischner Society Small Nodule Followup

<table>
<thead>
<tr>
<th>Nodule Size</th>
<th>Low Risk Pt</th>
<th>High Risk Pt</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 4 mm</td>
<td>None</td>
<td>12 mo</td>
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<tr>
<td></td>
<td>No Δ - stop</td>
<td></td>
</tr>
<tr>
<td>4 – 6 mm</td>
<td>12 mo</td>
<td>6-12 mo; No Δ then 18-24 mo</td>
</tr>
<tr>
<td></td>
<td>No Δ - stop</td>
<td></td>
</tr>
<tr>
<td>6 – 8 mm</td>
<td>6-12 mo</td>
<td>3-6 mo</td>
</tr>
<tr>
<td></td>
<td>If no Δ then 18-24 mo</td>
<td>If no Δ then 18-24 mo</td>
</tr>
<tr>
<td>&gt; 8 mm</td>
<td>CT 3, 9, 24 mo, PET-CT, biopsy</td>
<td></td>
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</tbody>
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Screening Beyond Lung Cancer

- Describe airways
- Describe lung parenchyma
- Note coronary artery calcifications
- Incidental findings as on any CT scan
- Discuss critical findings with clinician and document the communication

Lung Cancer Screening Will Evolve

- Stay abreast of evolving guidelines and recommendations
- Evaluate and re-evaluate your program and patient outcomes in your community
- Provide education for patients and clinicians

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References