CT Screening for Lung Cancer – A Pulmonologist’s Perspective

Gerard A. Silvestri, MD

Oft Quoted References on Screening
An Ounce of Prevention is worth a Pound of Cure
- Letter to the editor penned by an “Old Citizen” February 4, 1735 in the Pennsylvania Gazette.
- Eat an apple on going to bed, and you’ll keep the doctor from earning his bread
  - Welsh Magazine 1886

Outline
- Generalizability
- Patient selection
- Nodules
- Programmatic development

Demographics: NLST vs. US population

<table>
<thead>
<tr>
<th></th>
<th>NLST</th>
</tr>
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<tbody>
<tr>
<td>Male/Female</td>
<td>59/41</td>
</tr>
<tr>
<td>Age 55-59</td>
<td>42.8</td>
</tr>
<tr>
<td>Age 60-64</td>
<td>30.6</td>
</tr>
<tr>
<td>Age 65-69</td>
<td>17.8</td>
</tr>
<tr>
<td>Age 70-74</td>
<td>8.8</td>
</tr>
<tr>
<td>% Black</td>
<td>4.4</td>
</tr>
<tr>
<td>% Hispanic</td>
<td>1.7</td>
</tr>
<tr>
<td>Current smoker</td>
<td>48.2</td>
</tr>
<tr>
<td>College education</td>
<td>31.5</td>
</tr>
</tbody>
</table>

Aberle, et al. NEJM 2010
### LogCTNLST vs. US population

<table>
<thead>
<tr>
<th></th>
<th>NLST</th>
<th>US Census Bureau</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male/Female</td>
<td>90/41</td>
<td>58/541.5</td>
</tr>
<tr>
<td>Age 55-64</td>
<td>42.8%</td>
<td>35.2</td>
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<tr>
<td>Age 65-74</td>
<td>30.6%</td>
<td>29.3</td>
</tr>
<tr>
<td>% Black</td>
<td>17.8%</td>
<td>20.8</td>
</tr>
<tr>
<td>% Hispanic</td>
<td>9.6%</td>
<td>14.7</td>
</tr>
<tr>
<td>Current smoker</td>
<td>48.2%</td>
<td>57.1</td>
</tr>
<tr>
<td>College education</td>
<td>31.5%</td>
<td>14.4</td>
</tr>
</tbody>
</table>

*Source: Aberle, et al. JRCS, 2010*

### Generalizability
- **Healthy volunteer effect**
  - Self-selection
  - Better educated
  - More health-conscious
  - Better access to care

*Source: Edelweiss et al. Am J Epidemiology, 1993*

### Generalizability
- **Location of care**
  - Enrolled in Urban, tertiary care hospitals
  - 82% large academic centers (>400 beds)
  - Expertise in all aspects of cancer care
  - 76% NCI designated cancer centers

- **Radiographic Interpretation**
  - Dedicated chest radiologists
  - Recommendations for follow-up

### Generalizability
- **Surgical mortality**
  - NLST: 1%
  - National average: 3-5% lobectomy

2. Strobel et al. Chest, 1998*

### Summary
- There is a clear benefit to LC screening.
- It is unclear if the benefit will translate.
  - The US population eligible is different from NLST
  - The location of care was specialized
- Mortality benefit may be diminished
  - Radiographic follow-up is incorrect
  - Surgical mortality is > 1%
- Pulmonologists worry that - patients who enter screening programs are not as healthy as in the trial

*Source: Annals of Internal Medicine, Original Research*
Work Since Publication of NLST

- Helping identify those who may gain the most from screening
- Decreasing the number of false positive screens
- Personalizing the choice by providing an individual risk profile

The Screening Sweet Spot

- High risk for cancer
- Good surgical candidate
- Low risk for cancer
- High risk for surgery
- Competing causes of death

PLCo\textsubscript{2012}

- PLCo risk-prediction model modified
  - to apply to the NLST data
  - evaluate if more efficient than NLST criteria
  - added race and personal history of cancer to the model
  - Developed and validated 80,375 in the PLCo ever smokers

Results: NLST\textsubscript{criteria} vs. PLCo\textsubscript{2012}

<table>
<thead>
<tr>
<th></th>
<th>NLST criteria</th>
<th>PLCo\textsubscript{2012}</th>
<th>P-value</th>
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</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>71.1%</td>
<td>83.0%</td>
<td>p&lt;0.0001</td>
</tr>
<tr>
<td>Specificity</td>
<td>62.7%</td>
<td>62.9%</td>
<td>p=0.536</td>
</tr>
<tr>
<td>PPV</td>
<td>3.4%</td>
<td>4.0%</td>
<td>p=0.011</td>
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<tr>
<td>AUC in PLCo</td>
<td>0.67</td>
<td>0.80</td>
<td>p&lt;0.001</td>
</tr>
</tbody>
</table>

www.brocku.ca/cancerpredictionresearch
Methods: NLST re-analysis
- Calculate every NLST participants’ risk of lung cancer and lung cancer mortality
- Divide participants into 5 groups
  - Q1 has the 20% at lowest risk
  - Q5 has the 20% at highest risk
- For each group, calculate
  - % fewer lung cancer deaths in LDCT arm
  - Number of fewer lung cancers in LDCT arm

Kovalchik et al., NEJM, 2013
### Components Necessary for High-Quality Lung Cancer Screening

**American College of Chest Physicians and American Thoracic Society Policy Statement**

- Who is offered Screening – Shared Decision making
- How often and for how long to screen
- How a CT is performed
- Lung nodule identification
- Structured reporting
- Lung nodule management algorithms
- Smoking cessation
- Patient and provider education
- Data Collection
Pulmonologists Perspective Summary

- Pulmonologists are concerned about:
- Generalizability
- Patient selection
- Nodule management
- Smoking cessation
- Programmatic development (the intersection of all of the above)
- MOST of All
  - Will they have support from their institution so that....
  - Patients don’t fall through the cracks

"In the first Place, as an Ounce of Prevention is worth a Pound of Cure, I would advise 'em to take care how they suffer living Coals in a full Shovel, to be carried out of one Room into another, or up or down Stairs; unless in a Warningpan shut; for Scraps of Fire may fall into Chinks and make no Appearance until Midnight; when your Stairs being in Flames, you may be forced, (as I once was) to leap out of your Windows, and hazard your Necks to avoid being oven-roasted."