Lung Cancer Screening In High Risk Populations:

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NO Lung Cancer Screening Previously Recommended

- Failed trials in 1960's to 1980's
- Mammography, PSA, colonoscopy
- Different disease demographics:

<table>
<thead>
<tr>
<th>Year</th>
<th>Lung CA</th>
<th>TB</th>
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<tbody>
<tr>
<td>1984</td>
<td>84,000</td>
<td>24,000</td>
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<tr>
<td>2012</td>
<td>226,160</td>
<td>11,545</td>
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- But now…. new technologies: LDCT, minimally invasive surgery

Use of Low Dose CT Scan to Screen: ELCAP and I-ELCAP)

- Non-randomized trial 1993: LDCT could screen for lung cancer
- 60 years of age, 10 pack years
- 484 cancers in 31,567 subjects
- 85% stage I
- 88% 5-year survival
- Surgical mortality 0.05% using board certified thoracic surgeons

National Lung Screening Trial (NLST)

- US NCI sponsor 2002, phase III randomized

- 3 eligibility criteria
  - Age 55 to 74 years
  - 30 pack year smoking history
  - If quit, smoked within last 15 years

- Excluded if previous history of lung cancer

Lung Cancer Screening Reduces Lung Cancer Mortality by 20%

- 3 annual screens, then observation for 4 years (LDCT versus CXR)
- Smoking cessation
- 53,454 participants from 8/02 – 4/04
- Trial stopped early: 20% reduction in lung cancer specific mortality

Randomized European Trials

- ItaLung
- Dante
- Nelson
- UK Lung Screen (UKLS)
- Danish Lung Cancer Screening Trial
IASLC Workshop 2011

- “Clearly there will be variable rates of national implementation of screening across various countries.”

- “In light of these positive developments, each nation will decide how to integrate lung cancer screening into its existing healthcare structure.”

Lung Cancer Statistics

- Leading cause of cancer death US / CAN

- 2012 Statistics:
  - Canada: New cases: 24,200, Deaths: 12,600

- Only 16% will survive 5 years

Rationale for AATS Guidelines

- NLST identified 20% lung cancer specific decrease in mortality using LDCT.

- IASLC Workshop recommendation: physician discuss screening with individuals meeting NLST criteria, and Societies to make guidelines within a cultural context.

- AATS has held a leadership role in the understanding, detection, and treatment of lung cancer.

AATS Council Charge to Task Force 2011

1. Recommend evidence-based and best practice guidelines for LDCT Lung Cancer Screening in North America

2. Include long-term lung cancer survivors who require screening for second primary lung cancer

3. Guidelines Completed by April 2011
**Guidelines from Professional Societies in North America**

- NCCN: 2 tier (NLST criteria, then younger if higher risk)
- ASCO/ACCP: Weak recommendation for NLST criteria only
- AATS: Expand beyond NLST for high risk groups (including elderly)

**Recommendation 1**

- Annual lung cancer screening with LDCT from age 55 to age 79 for patients with 30 pack-year history of tobacco.
  - Screening should not be offered if treatment impractical due to co-morbidity or functional status, regardless of age.
  - This recommendation expands the age and the frequency of screening of the NLST.

**Justification for Annual Screens**

1. NLST 20% reduction in mortality with just 3 annual screens, followed by 4 years of observation
2. AATS Task Force: No scientific evidence to stop screening after 3 annual screens
3. Annual increase in risk due to age.
4. Divergence of survival graphs in NLST during screening period, but parallel course of survival during observation. Mortality reduction would have exceeded 20% if continued annual scans

**Justification for Increasing Age of Screening from 74 to 79**

1. Median age of Lung Cancer 74 years.
2. Average life expectancy US 78.6 years
3. Lung Cancer incidence increases beyond 74.
4. Screening should add 7 years of life expectancy

**Lung Cancer Risk is a Function of Age**

Incidence (per 100,000)

<table>
<thead>
<tr>
<th>Age</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>66 – 70 years</td>
<td>336</td>
<td>248</td>
</tr>
<tr>
<td>71 – 75 years</td>
<td>490</td>
<td>350</td>
</tr>
<tr>
<td>&gt; 75 years</td>
<td>517</td>
<td>307</td>
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**Exponential Lung Cancer Risk for Elderly Smokers**

[https://www.atsjournals.org/doi/abs/10.1016/j.jtcvs.2012.05.003](https://www.atsjournals.org/doi/abs/10.1016/j.jtcvs.2012.05.003)
Recommendation 2

- Long-term lung cancer survivors should have annual LDCT to detect second primary lung cancer until the age of 79
  - Surveillance for recurrence for 4 yrs, then annual LDCT
  - 400,000 lung cancer survivors are highest risk of new cancer, but were excluded from previous trials and ignored in other societal recommendations

Recommendation 3

- Annual lung cancer screening with LDCT beginning at age 50 and 20 pack-years IF additional co morbidities produce a cumulative 5% risk of developing lung cancer over the following 5 years.
  - Known risks (FEV1 < 70%, etc) and future refinements (biomarkers, genetic/exposure risks).
  - Screening in women may be deferred until menopause.

Recommendation 4

- Lung cancer screening and treatment of early stage lung cancer by subspecialty qualified teams including board certified thoracic surgeons, thoracic radiologists, pulmonologists and oncologists
  - NLST investigators concluded Board Certified Thoracic Surgeons accounted for low mortality in NLST
Recommendation 5

- AATS to consider developing a web-based application for patient self-risk assessment

  - This recommendation is based upon development of risk calculators such as those used in the Liverpool Lung Project and Prostate Lung Colon Ovarian (PLCO) trial.

Liverpool Lung Project (LLP)

- Purpose: to calculate absolute risk of lung cancer over a defined period, based on:
  
  - age, sex, smoking, family history, history non-pulmonary tumor, history of pneumonia, asbestos

  - LLP risk model validated x3.

Recommendation 6

- Continue AATS engagement with other specialty societies to refine future screening guidelines

  - Screening guidelines will evolve with further analysis of the NLST data and ongoing trials in Europe

  - Biomarkers in breath, blood and urine may join LDCT in screening

Cost of Lung Cancer Screening

- Cost estimate annual lung cancer screening offered as a commercial insurance benefit for high risk Americans aged 50 to 64 years found a screening cost of $1 per insured member per month in 2012 dollars.

- Cost per life-year saved would be below $19,000. This compares favorably to cost per life-year saved in breast ($31,000 to $52,000), colon ($19,000 to $29,000), and cervical cancers ($50,000 to $75,000).

- Authors concluded that lung cancer screening for high risk patients age 50 and older with 30 pack years smoking was high-value coverage.


AAPM Position Statement on Radiation Risks f Medical Imaging Procedures 12/13/2011

The American Association of Physicists in Medicine (AAPM) acknowledges that medical imaging procedures should be appropriate and conducted at the lowest radiation dose consistent with acquisition of the desired information. Discussion of risks related to radiation dose from medical imaging procedures should be accompanied by acknowledgement of the benefits of the procedures. Risks of medical imaging at effective doses below 50 mSv for single procedures or 100 mSv for multiple procedures over short time periods are too low to be detectable and may be nonexistent. Predictions of hypothetical cancer incidence and deaths in patient populations exposed to such low doses are highly speculative and should be discouraged. These predictions are harmful because they lead to sensationalistic articles in the public media that cause some patients and parents to refuse medical imaging procedures, placing them at substantial risk by not receiving the clinical benefits of the prescribed procedures.

http://www.aapm.org/org/policies/details.asp?id=318&type=PP&current=true