LUNG CANCER SCREENING: REAL WORLD PERSPECTIVES

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DISCLOSURES

• NONE

AGENDA FOR THIS TALK

• Background
• Lung Cancer Statistics
• Review of Cancer Screening Modalities
• Review of the National Lung Screening Trial (NLST)
• Lung Cancer Screening at Kaiser Permanente
• Summary
• References
Case details:

- 87 YO male with a PMHx of OA, severe OSA, HLP, Afib on warfarin, CVA is referred after rib XR after a fall suggested a lung lesion.
- Former 30 pack year smoking history.
- CT: 2.6 x 2.1 cm spiculated nodule in the left upper lobe, suspicious for lung cancer. Mild precarinal lymphadenopathy.
- PET: 1. Intensely hypermetabolic spiculated LUL mass is suspicious for lung cancer.
  2. Mildly hypermetabolic mediastinal and bilateral hilar nodes are nonspecific. This nodes may be inflammatory or metastatic in nature.

NSCLC accounts for ____ % of all cases of lung cancer.

- 25%
- 55%
- 85%
- 95%

PATHOLOGY:

Adenocarcinoma
ADENOCARCINOMA

- Foreign born > US born risk of NSCLC
- Larger proportion of Bronchioalveolar Carcinoma in Asians than Caucasians
- Elevated risk of Adenocarcinoma compared to other NSCLC in Asians
- +EGFR mutations
- Vietnamese > Filipino > Chinese > Korean > Japanese > South Asian

PATHOLOGY:

Squamous cell carcinoma

SQUAMOUS CELL CARCINOMA

- Smoking is the major risk factor.
- 30% of all lung cancer cases.
- TP53, NFE2L2, CDKN2A are upcoming genetic targets.
- African Americans disproportionately affected.

LUNG CANCER RISK FACTORS

1. Current or history of tobacco use: cigarettes, pipes, and cigars.
2. Exposure to cancer-causing substances in secondhand smoke.
3. Radiation exposure from any of the following:
   1. Radiation therapy to the breast or chest.
   2. Radon exposure in the home or workplace.
   3. Medical imaging tests, such as computed tomography (CT) scans.
4. Occupational exposure to asbestos, arsenic, chromium, beryllium, nickel, and other agents.
5. Living in an area with air pollution.
7. Human immunodeficiency virus infection.
8. Beta carotene supplements in heavy smokers.
1. For smokers, the risk for lung cancer is on average 10X higher than in lifetime nonsmokers (defined as a person who has smoked <100 cigarettes in his or her lifetime).
2. Former smokers continue to have an elevated risk for lung cancer for years after quitting.
3. Asbestos exposure may exert a synergistic effect with cigarette smoking on lung cancer risk.

SMOKING IN CHINA

- China is the largest consumer of tobacco in the world with over 300 million current smokers
- >50% of Chinese men are smokers
- <3% of Chinese women
- Estimated 422,000 males and 175,000 females in China died of lung cancer in 2012 alone

LUNG CANCER STATS

<table>
<thead>
<tr>
<th>Est. New Cases in 2017</th>
<th>% of All New Cancer Cases</th>
<th>% of All Cancer Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>222,500</td>
<td>13.2%</td>
<td>25.9%</td>
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</table>

<table>
<thead>
<tr>
<th>Estimated Deaths in 2017</th>
<th>% of All Cancer Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>155,870</td>
<td>25.9%</td>
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</table>

Percentage of new lung cancer cases: 18.1%

<table>
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<tr>
<th>Common Type of Cancer</th>
<th>Estimated New Cases 2017</th>
<th>Estimated Deaths 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Breast Cancer (female)</td>
<td>232,316</td>
<td>40,910</td>
</tr>
<tr>
<td>2. Lung and Bronchus Cancer</td>
<td>222,500</td>
<td>155,870</td>
</tr>
<tr>
<td>3. Prostate Cancer</td>
<td>118,300</td>
<td>25,370</td>
</tr>
<tr>
<td>4. Colon and Rectum Cancer</td>
<td>135,630</td>
<td>52,760</td>
</tr>
<tr>
<td>5. Melanoma of the Skin</td>
<td>87,130</td>
<td>9,710</td>
</tr>
<tr>
<td>6. Bladder Cancer</td>
<td>79,300</td>
<td>14,470</td>
</tr>
<tr>
<td>7. Non-Hodgkin Lymphoma</td>
<td>72,740</td>
<td>20,140</td>
</tr>
<tr>
<td>8. Kidney and Renal Pelvic Cancer</td>
<td>61,900</td>
<td>14,400</td>
</tr>
<tr>
<td>9. Leukemia</td>
<td>52,130</td>
<td>24,500</td>
</tr>
<tr>
<td>10. Endometrial Cancer</td>
<td>81,180</td>
<td>10,920</td>
</tr>
</tbody>
</table>
WHO GETS LUNG CANCER?

WHO DIES OF LUNG CANCER?

SMOKING RATES BY ETHNICITY

REFERRANCES FOR ALL OTHER LUNG CANCER SCREENING TRIALS

• Early Chest Radiographic Screening RCTs
  • Memorial Sloan-Kettering Study
  • Johns Hopkins Study
  • Mayo Lung Project
  • Trial Conducted in Czechoslovakia

• The Prostate, Lung, Colorectal and Ovarian Cancer Screening Trial

• Single-Arm Studies Evaluating Low-Dose CT Screening
**Patient Population Under Consideration**

- Age: 55-74
- ≥ 30 pack-year CIGARETTE smoking history
  - 1 pack/day x 30 years
  - 2 pack/day x 15 years
  - ½ pack/day x 60 years
- Current smoker - OR - quit within the last 15 years
- No new symptom that suggests underlying malignancy

**Criteria for Considering Exclusion/Discontinuing Screening:**

- Symptoms that warrant cancer workup
- Active cancer other than non-melanoma skin cancer, or history of cancer within the last 5 years
- Recent lung infection (back to pre-illness baseline for at least 1 preferably 2 months)
- On supplemental oxygen
- Health problem that substantially limits life expectancy or limits their ability or willingness to have curative lung cancer surgery
- Screening of eligible former smokers should stop once they reach 15 years from their quit date or age 74, whichever comes FIRST
National Lung Screening Trial (NLST): Details

- Over 3 rounds of LDCT screening, an absolute reduction in lung cancer mortality of 3 per 1000 compared with 3 rounds of CXR.
  - 20% relative reduction in death ≈ often communicated as 20% reduction.
- 2/3 of NLST participants <65 years of age
- NLST trial participants healthier, fewer co-morbidities in general compared with community
- Thoracic surgery mortality rate ~1% in NLST
  - National rate ~ 3-4%

KP EXPERIENCES WITH LDCT

Demographics - Gender, Race, Age (n=111)

Potential Benefits and Harms of Three Rounds of Annual Screening with Low-Dose CT, as Compared with Chest Radiography or No Screening

Table 1: Potential Benefits and Harms of Three Rounds of Annual Screening with Low-Dose CT, as Compared with Chest Radiography or No Screening

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Benefit/No Harm</th>
<th>Harm</th>
</tr>
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<tbody>
<tr>
<td>CT vs. chest radiography</td>
<td>3.1% fewer</td>
<td>0.2% more</td>
</tr>
<tr>
<td>Death from lung cancer (CT vs. no screening)</td>
<td>0.6%</td>
<td>0.1%</td>
</tr>
<tr>
<td>False positive result from low-dose CT</td>
<td>0.7% more</td>
<td>0.0%</td>
</tr>
<tr>
<td>Invasive biopsy for benign nodule</td>
<td>0.0% more</td>
<td>0.0%</td>
</tr>
<tr>
<td>Surgical resection for benign nodule</td>
<td>0.0% more</td>
<td>0.0%</td>
</tr>
<tr>
<td>Complication from invasive procedure for benign nodule</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Radiation-induced cancer</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Cessation of smoking</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

* Estimates are based on data from the National Lung Screening Trial.1

Average Age = 65.5 years
Smoking Profile \( (n=137) \)

Q2 - Do you currently smoke?

- **Every day**: 48%
- **Not at all**: 40%
- **Some days**: 9%
- **No response**: 3%

Q3 - How many cigarettes do / did you smoke on average per day?

- **< 10**: 9%
- **10-19**: 25%
- **20-29**: 36%
- **30-39**: 6%
- **40-49**: 7%
- **50+**: 1%
- **No response**: 16%

Q6 - How interested are you in talking about quitting smoking? \( (n=17) \)

- **1**: Very willing
- **2**: Somewhat willing
- **3**: Not willing at all

SUMMARY

- Lung cancer is the leading cause of cancer related death.
- Smoking cessation is likely to have a larger impact on overall mortality than is screening.
- Screening with low-dose CT has been found to reduce lung cancer mortality in high risk patients.
SUMMARY

• Centers nationwide, including Kaiser Permanente, have successfully launched lung cancer screening programs.

• On-going studies will determine the further reach of screening.

• Patient education must be tailored for Asian populations.

REFERENCES


Speaker Information

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**BACKGROUND**
- A cancer prevention trial conducted by the U.S. National Cancer Institute (NCI) and the National Institute for Health and Welfare of Finland from 1985 to 1993.

**PURPOSE**
- To determine whether certain vitamin supplements would prevent lung cancer and other cancers in a group of 29,133 male smokers in Finland.

**CONCLUSION**
- No reduction in the incidence of lung cancer among male smokers after five to eight years of dietary supplementation with alpha-tocopherol or beta-carotene. In fact, this trial raises the possibility that these supplements may actually have harmful as well as beneficial effects.

**VETERANS ADMIN EXPERIENCE WITH NLST**
- VA study:
  - 8 academic VHA hospitals among 93,833 primary care patients who were assessed on screening criteria; 2,106 patients underwent LCS between July 1, 2013, and June 30, 2015.
  - Of the 4,046 patients who met the criteria for LCS, 2,042 (50.7%) agreed to undergo screening and 2,106 (2028 men and 78 women; mean [SD] age, 64.9 [5.1] years) underwent LCS. Wide variation in processes and patient experiences occurred among the 8 sites.
  - Of the 2,106 patients screened, 1,257 (59.7%) had nodules; 1,184 of these patients (557 required 126) required further evaluation but the findings were not cancer, and 31 (1.5%) had lung cancer.
  - A variety of incidental findings, such as emphysema, other pulmonary abnormalities, and coronary artery calcification, were noted on the scans of 857 patients (40.7%).
What is the average annual death rate per 100,000 for breast cancer?

A. 15  
B. 20  
C. 25  
D. 45  

What is the average annual death rate per 100,000 for colon cancer?

A. 15  
B. 20  
C. 25  
D. 45
What is the average annual death rate per 100,000 for prostate cancer?

A. 15
B. 20
C. 25
D. 45

What is the average annual death rate per 100,000 for lung cancer?

A. 15
B. 20
C. 25
D. 45
### Q7, 8, 9 - Knowledge of Benefits / Harms
**(n=111)**

<table>
<thead>
<tr>
<th>Statement</th>
<th>True</th>
<th>False</th>
<th>Unsure</th>
<th>No Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>All smokers should be screened for lung cancer</td>
<td>51.4%</td>
<td>28.8%</td>
<td>15.3%</td>
<td>4.5%</td>
</tr>
<tr>
<td>It lowers your chances of getting lung cancer</td>
<td>22.5%</td>
<td>63.1%</td>
<td>6.3%</td>
<td>8.1%</td>
</tr>
<tr>
<td>It can cure cancer</td>
<td>9.9%</td>
<td>74.8%</td>
<td>6.3%</td>
<td>9.9%</td>
</tr>
<tr>
<td>It lowers your chances of dying from lung cancer</td>
<td>60.4%</td>
<td>23.4%</td>
<td>8.1%</td>
<td>8.1%</td>
</tr>
<tr>
<td>It lowers your chances of developing lung cancer (n=17)</td>
<td>17.7%</td>
<td>32.9%</td>
<td>29.4%</td>
<td>0%</td>
</tr>
<tr>
<td>You may find some things in your lungs that are not cancer but would need an extra test to check</td>
<td>86.5%</td>
<td>0.9%</td>
<td>6.3%</td>
<td>6.3%</td>
</tr>
<tr>
<td>You may need to get an extra test which can cause complications</td>
<td>77.5%</td>
<td>8.1%</td>
<td>5.4%</td>
<td>9.0%</td>
</tr>
<tr>
<td>There are no harms associated with screening</td>
<td>11.7%</td>
<td>67.6%</td>
<td>7.2%</td>
<td>13.5%</td>
</tr>
</tbody>
</table>