

**NMCS Primary Care Symposium:
Lung Cancer Screening**

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May 13, 2016

Prognosis is Poor in Advanced Stage Disease

- The prognosis of advanced stage disease is poor, with less than 20% survival at 5-years for stage III & IV patients. *J Thorac Oncology 2007;2:706.*

Disclosure

I have no financial conflicts of interest related to this topic.

My thanks to CDR Davis who prepared all of these slides.

Lung cancer is lethal

- Lung Cancer is the world's leading cause of cancer-related death (18% of all cancer-related deaths) *Global cancer statistics, Cancer J Clin. 2011;16(1):9-99*
- Lung cancer **KILLS MORE PEOPLE** in the USA than prostate, colon, and breast cancer **COMBINED!** *CA Cancer J Clin. 2012;62:5-9*

Cancer Type	Estimated Deaths	% of Total
Lung & bronchus	16,360	28%
Prostate	29,567	51%
Colon & rectum	26,162	45%
Pancreas	26,710	47%
Low & high-grade melanoma	11,000	19%
Ovary	14,700	26%
Esophagus	15,800	28%
Other bladder	11,000	19%
Non-Hodgkin lymphoma	19,400	34%
Kidney & renal pelvis	9,000	16%
All Sites	572,700	100%

General Epidemiology

- Cancer is the leading cause of death for people in the US under age 85.
- Lung cancer is the most common cancer in the world, with an estimated 1.6 million new cases diagnosed annually. *Global cancer statistics, Cancer J Clin. 2011;16(1):9-99*
- Lung cancer is the 3rd most common cancer in the United States, and an estimated 0.5 – 2.2% of the population born today will develop lung cancer.
 - American Cancer Society estimates 221,000 cases diagnosed in 2015. *Ann Intern Med 2013;159:811.*
- When caught early, treatment success is high (> 75% five year survival for stage IA NSCLC). *Chest 2006;130:1211.*
- A majority (75%) of patients present with advanced stage disease. *Chest 2006;130:1211.*

Lung Cancer and Tobacco

- 85-90% of all lung cancer is associated with tobacco exposure. *Chest 2003;123(1 Suppl):215.*
- Tobacco use by a spouse increases risk by 30% in non-smokers. *JAMA 1994;271(22):1752.*

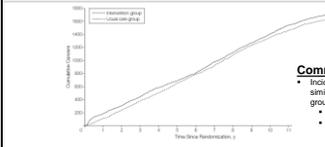


- The military has supported the tobacco industry for decades.
- Tobacco is associated with lung cancer.
- We smoke > than the general population.
- Incidence of lung cancer higher in MHS?




PLCO

Figure 2. Lung Cancer Incidence by Year



Comments:

- Incidence of lung cancer similar in control & intervention groups.
 - Int: 60.6 for 6 years
 - UC: 60.8 for 6 years
- Smokers had higher incidence of cancer (rate per 100,000):
 - Never smokers: 3
 - Former smokers: 23
 - Current smokers: 83

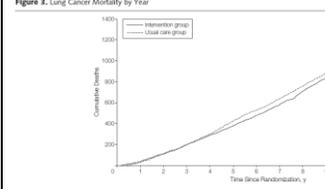
Screening by CXR

- BLUF:
 - 6 randomized controlled trials of using CXR to screen for lung cancer.
 - 1 non-randomized controlled trial
 - None of them demonstrated clear mortality benefit
- Mayo Lung Project
- PLCO Cancer Screening Trial
(NCCN, 2011; 2007; 2005; 2002)



PLCO

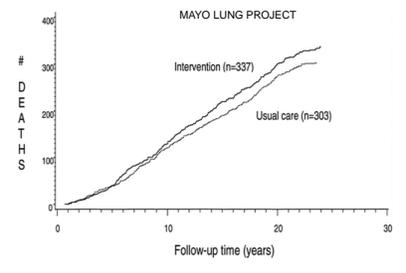
Figure 3. Lung Cancer Mortality by Year



Comments:

- Despite a higher incidence of earlier stage cancers in the screening group, there was no mortality benefit to screening (either initially or during the follow-on period).
- Screening identified cancers only comprised 18% (of intervention group).
- No difference in mortality between the control and intervention group.

MAYO LUNG PROJECT

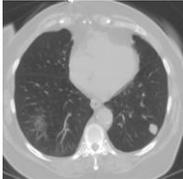


DEATHS

Follow-up time (years)

Screening by CT Scan

- BLUF
 - CT scanning has greater sensitivity (and specificity) for identification of lung cancer relative to CXR.
 - Up to 80% of patients diagnosed with lung cancer by CT have stage I disease. *(Chest Imaging 2004; 28:377-81)*
 - Numerous trials exist, many randomized, most too small to demonstrate mortality benefit.
 - Giangi et al. 2002: 190 patients
 - NELSON 2009: 15,822 patients
 - FALLING 2009: 3,206 patients
 - DANTE 2009: 2,472 patients
 - DLCST 2012: 4,104 patients
 - Largest & highest quality study did demonstrate a mortality benefit.
- National Lung Screening Trial (NLST)



NLST

- Conducted August 2002 through April 2004 with enrollment of 54,454 high risk patients from 33 US medical centers. Funded by NCI.
 - “High Risk” = age 55-74, > 30 pack-year history of tobacco, smoked within last 15 years.
 - Exclusions: previous lung cancer, unexplained weight loss, hemoptysis, CT chest w/ 18 months.
- Randomly assigned to 3 years of annual screening w/ either LDCT or PA/L CXR.
 - CXR was chosen as the “control” method because the PLCO trial compared CXR to “usual care”.
 - Tissue samples (blood, urine, sputum) also collected. Extensive questionnaire performed.
- Primary outcomes was lung cancer related mortality in ITT analysis.

Reduced Lung Cancer Mortality with Low-Dose Computed Tomographic Screening
The National Lung Screening Trial Research Team
N Engl J Med 2011; 365: 859-69

Benefits of LDCT Screening

- Detect lung CA at an early stage
 - Stage I cancers moved from 30% → 60%
 - Intent to cure with surgery
- 160,000 annual deaths from lung CA
 - Fully implemented, could save 20,000 lives per year
- Number needed to save a life for LDCT was << than for colon or breast cancer screening!

Baseline & Progression

- Protocol adherence (95% in LDCT, 93% in CXR)
- Non-calcified nodules ≥ 4 mm on LDCT in any dimension were defined as “positive”.
- CT had a higher rate of positive findings compared to CXR
 - Study 1: 27.3% vs 9.2%
 - Study 2: 27.9% vs 6.2%
 - Study 3: 16.8% vs 5%
- >90% of the “positive” studies on scan 1 lead to a diagnostic test. This diagnostic test was rarely (10%) invasive.
- Overall false positive result rates were high
 - 86.4% for LDCT
 - 84.5% for CXR

Characteristic	Low-Dose CT Group (n=27,226)	High-Dose CXR Group (n=27,228)
Age at randomization (years)	63.0 (SD 5.0)	63.0 (SD 5.0)
Sex		
Male	23,790 (87.3%)	23,792 (87.3%)
Female	3,436 (12.7%)	3,436 (12.7%)
Race or ethnic group†		
White	20,899 (76.7%)	20,899 (76.7%)
Black	2,499 (9.2%)	2,499 (9.2%)
Asian	339 (1.2%)	339 (1.2%)
Hispanic or Latino	360 (1.3%)	360 (1.3%)
Other	749 (2.7%)	749 (2.7%)
Native Hawaiian or other Pacific Islander	76 (0.3%)	102 (0.4%)
White, Hispanic or Latino	333 (1.2%)	344 (1.3%)
Other	189 (0.7%)	209 (0.8%)
Hispanic or Latino group	360 (1.3%)	360 (1.3%)
Hispanic or Latino	476 (1.7%)	498 (1.8%)
Hispanic or Latino not Latino	20,919 (76.8%)	20,919 (76.8%)
Non-Hispanic or Latino	346 (1.3%)	347 (1.3%)
Non-Hispanic or Latino	1,833 (6.7%)	1,833 (6.7%)
Non-Hispanic or Latino	2,666 (9.8%)	2,666 (9.8%)

2013 USPSTF Recommendations

- Low Dose CT (LDCT) screening for patients who are:
 - Asymptomatic patients
 - aged 55-80
 - Have ≥ 30 pack-year history of tobacco
 - Current smokers or have quit in the last 15 years

Population	Recommendation	Grade (Strength of Recommendation)
Adults Aged 55-80 with a History of Smoking	The USPSTF recommends annual screening for lung cancer with low-dose computed tomography (LDCT) in adults aged 55 to 80 years who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years. Screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery.	B

NLST

- Complications rates were relatively low (Table 4).
 - False positive scans = 0.005% major comp.
 - True positive scans = 11.2% major comp.
- On October 20th, 2010, the safety and monitoring board identified a definite result for the primary outcome, and recommended that the results be reported (thus ending the trial).
 - LDCT death rate: 247 / 100K
 - CXR death rate: 309 / 100K
 - 20% relative risk reduction with LDCT (P=0.004)
 - Number needed to save 1 life = 320 LDCT's
 - When deaths from lung cancer were excluded, there was no statistically significant difference between LDCT and CXR.
- LDCT also associated with earlier diagnosis (higher percentage of stage I&II cancers)

Complication	Number of Patients	Rate per 1000 Screenings	Rate per 1000 Screenings	Rate per 1000 Screenings	Total
Low-dose CT group					
No complications	26,874 (98.8%)	98.4	98.4	98.4	98.4
Major complications	352 (1.3%)	1.3	1.3	1.3	1.3
Minor complications	71 (0.3%)	0.3	0.3	0.3	0.3
Major complications classified as major	352 (1.3%)	1.3	1.3	1.3	1.3
Minor complications classified as minor	71 (0.3%)	0.3	0.3	0.3	0.3
Major complications classified as minor	11 (0.04%)	0.04	0.04	0.04	0.04
Minor complications classified as major	60 (0.2%)	0.2	0.2	0.2	0.2
Major complications after non-invasive diagnosis	11 (0.04%)	0.04	0.04	0.04	0.04
Minor complications after non-invasive diagnosis	60 (0.2%)	0.2	0.2	0.2	0.2
High-dose CXR group					
No complications	26,888 (98.8%)	98.4	98.4	98.4	98.4
Major complications	321 (1.2%)	1.2	1.2	1.2	1.2
Minor complications	72 (0.3%)	0.3	0.3	0.3	0.3
Major complications classified as major	321 (1.2%)	1.2	1.2	1.2	1.2
Minor complications classified as minor	72 (0.3%)	0.3	0.3	0.3	0.3
Major complications classified as minor	11 (0.04%)	0.04	0.04	0.04	0.04
Minor complications classified as major	61 (0.2%)	0.2	0.2	0.2	0.2
Major complications after non-invasive diagnosis	11 (0.04%)	0.04	0.04	0.04	0.04
Minor complications after non-invasive diagnosis	50 (0.2%)	0.2	0.2	0.2	0.2

Our experience

- NMCSO began offering low-dose chest CT screening for lung cancer in 2013.
 - 491 scans to date (~ 360 patients)
- Pulmonary Department began keep track of nodules using a home-grown excel file: “Nodule Tracker”
- 2015 NMW endorsed merging programs in the creation of a regional LCSS program.

 **Summary** 

1. Lung Cancer Kills, and screening saves lives.
 - ✓ Breast Cancer: 1339
 - ✓ Colon Cancer: 812
 - ✓ Lung Cancer: **320**
2. Screen using USPSTF Guidelines with Low Dose CT Scan
 - Asymptomatic patients aged 55-80, and
 - Have ≥ 30 pack-year history of tobacco, and
 - Have smoked within the last 15 years
3. Get patients to STOP smoking!
4. Consider DECAMP
 - DECAMP-1: Nodule+ Smoker
 - DECAMP-2: Emphysema/COPD + Smoker

 **Questions?** 



HERE'S WHAT'S LEFT OF THE MARLBORO MAN

IF YOU DON'T SMOKE DON'T START!