The effect of surgeon volume on procedure selection in non-small cell lung cancer surgeries

Dr. Christian Finley MD MPH FRCSC
McMaster University
Disclosures

• I have no conflict of interest disclosures to report
Background


- Pneumonectomy Mortality = 6.2%
- Lobectomy Mortality = 2.9%
- 25% Pneumonectomy rate
Background


- Pneumonectomy Mortality = 11.5%
- Lobectomy Mortality = 4.0%
- 18% Pneumonectomy rate
Background


- **Pneumonectomy Mortality = 4.4%**
  - 90 day = 10.8%
- **Lobectomy Mortality = 1.4%**
  - 90 day = 3.3%
Decision making

- Large geographical variation in the surgical resection rate for NSCLC
  - 3-18%
- A high frequency of resection was strongly inversely associated with overall mortality
  - HR 0.88, 95% CI 0.86-0.91
- Moderately associated with mortality amongst the resected patients
  - HR 1.15, 95% CI 0.98-1.36
- 5420 deaths could be avoided whereas about 146 more deaths could be expected amongst the resected patients

Objective

This study aims to examine surgeon choices for non-small cell lung cancer (NSCLC) and if surgeon volume predicts the type of procedure chosen. Controlling for patient demographics, co-morbidity, year of surgery and institutional factors.
Methods

- The dataset was constructed from the population-based linked databases accessed via the Institute for Clinical Evaluate Sciences
  - Ontario Cancer Registry
  - Ontario Health Insurance Plan claims
  - Canadian Institutes for Health Information Discharge Abstract Database (CIHI-DAD)
  - National Ambulatory Care Reporting Service database (NACRS)
Methods

- **Population:** All pulmonary resections for primary NSCLC
- **Time period:** 2004 - 2011
- **De-identified information collected on:**
  - **Patient Factors**
    - Gender, age, income quintile, location of residence (rural vs. urban), comorbidity
  - **Procedural details**
    - Year of procedure, institution volume, surgeon volume
  - **Outcomes**
    - Length of stay, in-hospital mortality and 90-day post-discharge mortality
Outcomes Analysis

- Multilevel logistic regression analyses were performed to examine factors that influence a surgeon’s choice of surgery
  - A three-level random effects model was used to control for the cluster effect of physician nested within institution

- Ninety-day mortality for each procedure was calculated
Outcomes Analysis - Stage Data

• Due to limited availability, stage data could not be included as a predictor variable in the regression model

• Accurate stage data was available for the only the last two years of study, 2010 and 2011
  ▫ These were added to the multilevel regression model in order to examine trends that could be attributed to stage of disease
Results

- 8070 patients that underwent surgical resection for NSCLC, of whom 4070 (50.4%) were male

- 124 unique physicians and 45 institutions

- Distribution of resection types:
  - Pneumonectomy: 842 (10.4%)
    - Fell from 14.8% to 7.6% from 2004 to 2011
  - Lobectomy: 6212 (77.0%)
  - Wedge resection 1002 (12.4%)
    - 12.1% to 10.7% from 2004 to 2011
Results

- Average 90-day mortality:
  - Pneumonectomy = 12.6%
  - Lobectomy = 3.9%
    - 2.6% in 2011
  - Wedge resection = 5.7%
    - 2.8% in 2011
Physician volume, age, year of procedure, gender, and Charlson Comorbidity Index were all predictive of selecting pneumonectomy as choice of surgery.

After adjusting for all other variables, the results indicated that for each additional 10 unit increase in physician volume, the risk of performing a pneumonectomy decreases by 9.1%

- (95% CI=8.2 to 10.0, p=0.04)
Conclusion

- While patient and temporal factors influence the type of resection a patient receives for NSCLC, surgeon volume is also a strong predictor.

- This study may be limited by minimal stage data, but the suggestion that a surgeon’s total procedural volume for NSCLC significantly influences procedure selection has implications on how we deliver care to this patient population.