A National Survey of Surgeons Evaluating the Accuracy of Mediastinal Lymph Node Identification

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Introduction

▸ Quality of invasive mediastinal staging nationally may be suboptimal

　　▸ Alex Little reported alarming findings at 2005 STS meeting[1]

▸ National analysis led by Odell et al. demonstrated that approximately 73% of non-small cell lung cancer cases in the U.S. had inadequate regional lymph node sampling[2]

▸ Understanding of mediastinal lymph node anatomy is a first step to performing adequate lymphadenectomy

1.　Little AG et al. *Ann Thorac Surg* 2005; 80:2051-2056.
2.　Odell DD, et al. *JTCVS* 2019;157:1219-1235

Objectives

▶ To assess whether surgeons who treat lung cancer in different clinical settings correctly identify mediastinal lymph node stations using a national survey

▶ To identify characteristics of surgeons that are associated with improved accuracy of mediastinal lymph node identification

Results: Study Cohort
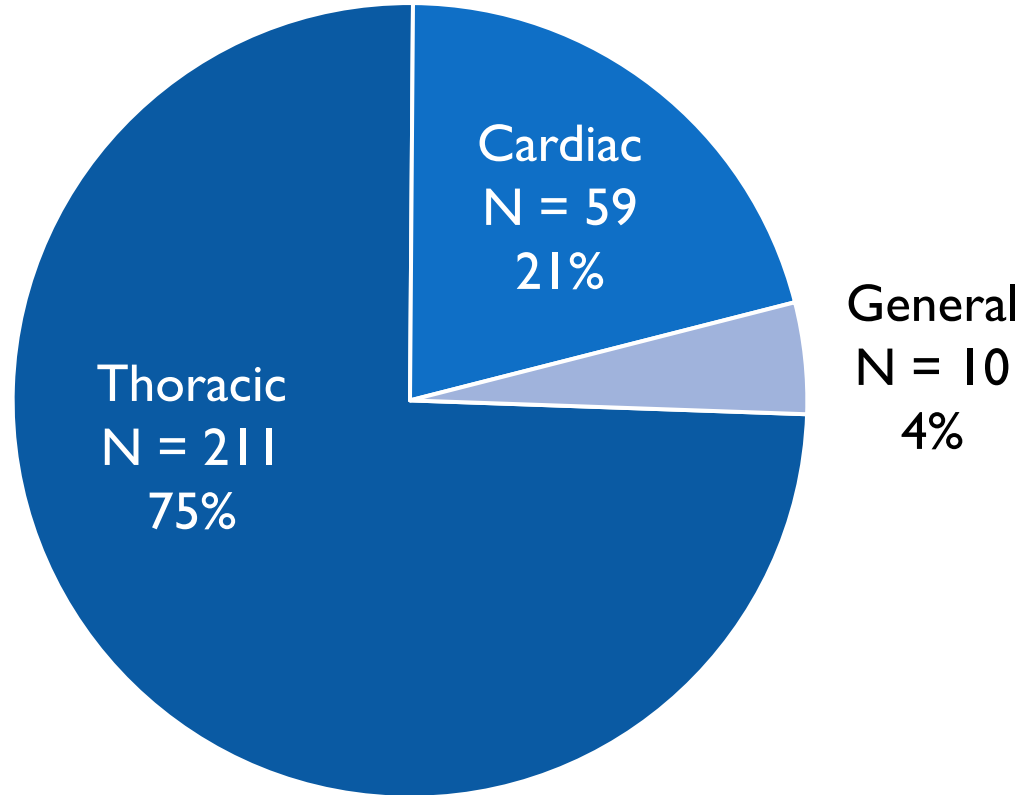
Survey Responses and Results

Question #1: Which nodal stations are exposed with this view of the right inferior pulmonary ligament?
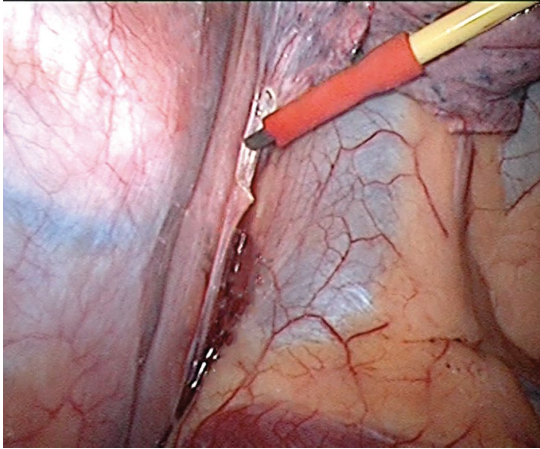
A. Levels 9R and 11R

B. Levels 9L and 11L

C. Levels 7 and 9R

D. Levels 6 and 8R

E. Levels 8R and 9R

Variable	Thoracic (N=211)	Cardiac (N=59)	General (N=10)	P Value
Q1 (correct responses)	94.8%	94.9%	90.0%	0.59

Survey Responses and Results
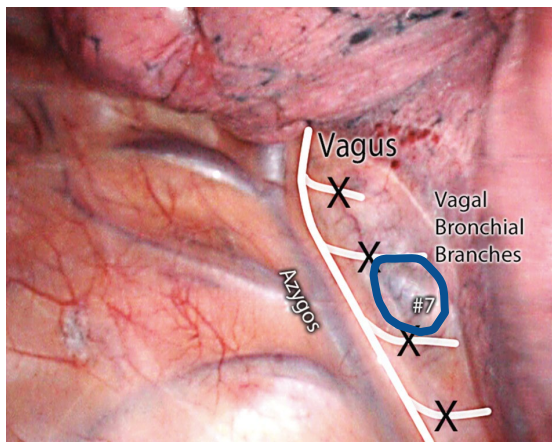
Question #2: Which nodal station is exposed in this photo?

A. Level 3A
B. Level 3P
C. Level 4R
D. Level 7
E. Level 8

Variable	Thoracic (N=211)	Cardiac (N=59)	General (N=10)	P Value
Q2 (correct responses)	72.0%	50.8%	50.0%	0.003

Survey Responses and Results

Question #3: Which nodal station (highlighted in blue) is exposed in this photo?

A. Level 7
B. Level 4R
C. Level 8R
D. Level 10R
E. Level 11R

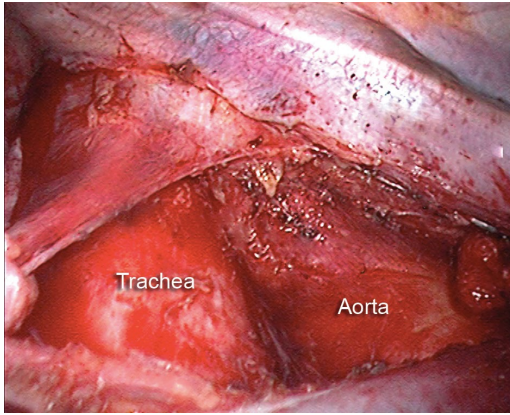| Variable	Thoracic (N=211)	Cardiac (N=59)	General (N=10)	P Value
Q3 (correct responses)	76.3%	50.8%	60.0%	<0.001

Survey Responses and Results

Question #4: Exposure of subcarinal nodes from the left chest is best accomplished by:

A. Dissect from the anterior aspect of the hilum

B. <mark>Dissect from the posterior aspect of the hilum</mark>

C. Dissect only after dividing the inferior pulmonary vein

D. Dissect via the fissure

E. Dissect off the descending aorta

Variable	Thoracic (N=211)	Cardiac (N=59)	General (N=10)	P Value
Q4 (correct responses)	92.4%	72.9%	70.0%	<0.001

Survey Responses and Results

Question #5: This picture shows the nodal dissection bed after removal of which two stations?
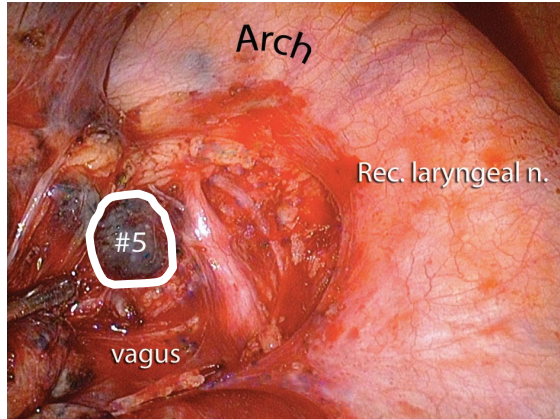

A. 5 and 6
B. 2R and 4R
C. 2R and 3A
D. 3P and 4R
E. 4R and 7

Variable	Thoracic (N=211)	Cardiac (N=59)	General (N=10)	P Value
Q5 (correct responses)	76.3%	67.8%	50.0%	0.04

Survey Responses and Results

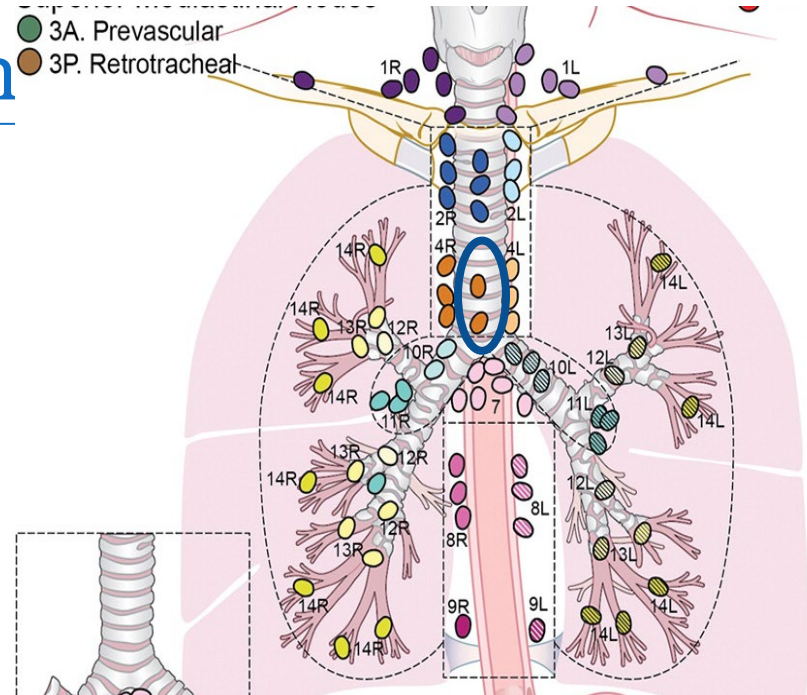Question #6: Which nodal station is shown in this picture?

A. 10L
B. 11L
C. 6
D. 5
E. 7

Variable	Thoracic (N=211)	Cardiac (N=59)	General (N=10)	P Value
Q6 (correct responses)	75.8%	81.4%	80.0%	0.62

Survey Responses an

Question #7: A midline pretracheal node, just superior to the carina, is labeled:

A. 3A
B. 7
C. 4R
D. 4L
E. 2R

Variable	Thoracic (N=211)	Cardiac (N=59)	General (N=10)	P Value
Q7 (correct responses)	58.8%	40.7%	20.0%	<0.001

Distribution of Scores on the Lymph Node Assessment by Surgical Specialty
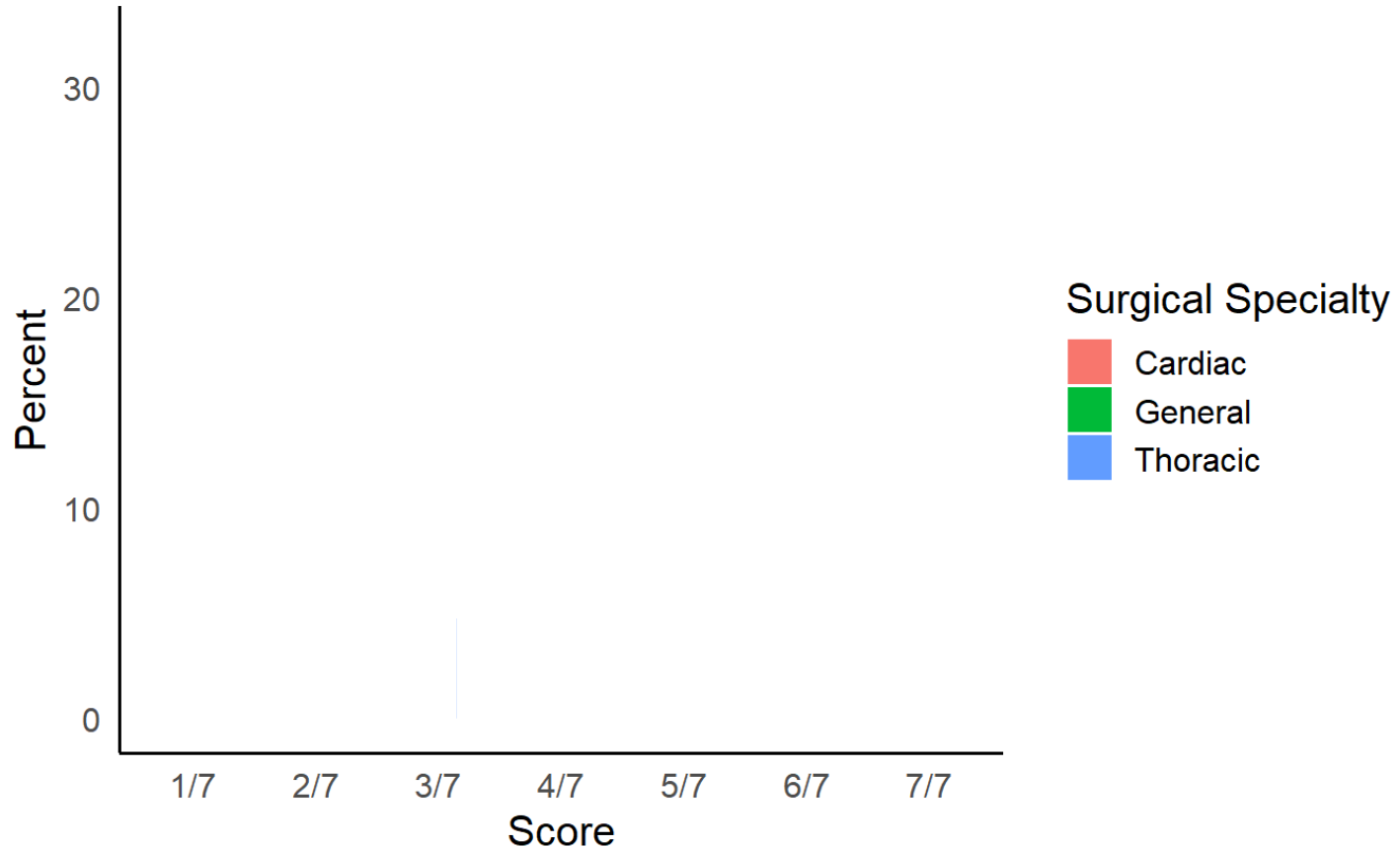
Mean Multivariable-adjusted Score between Cardiac and Thoracic Surgeons Stratified by Resection Frequency
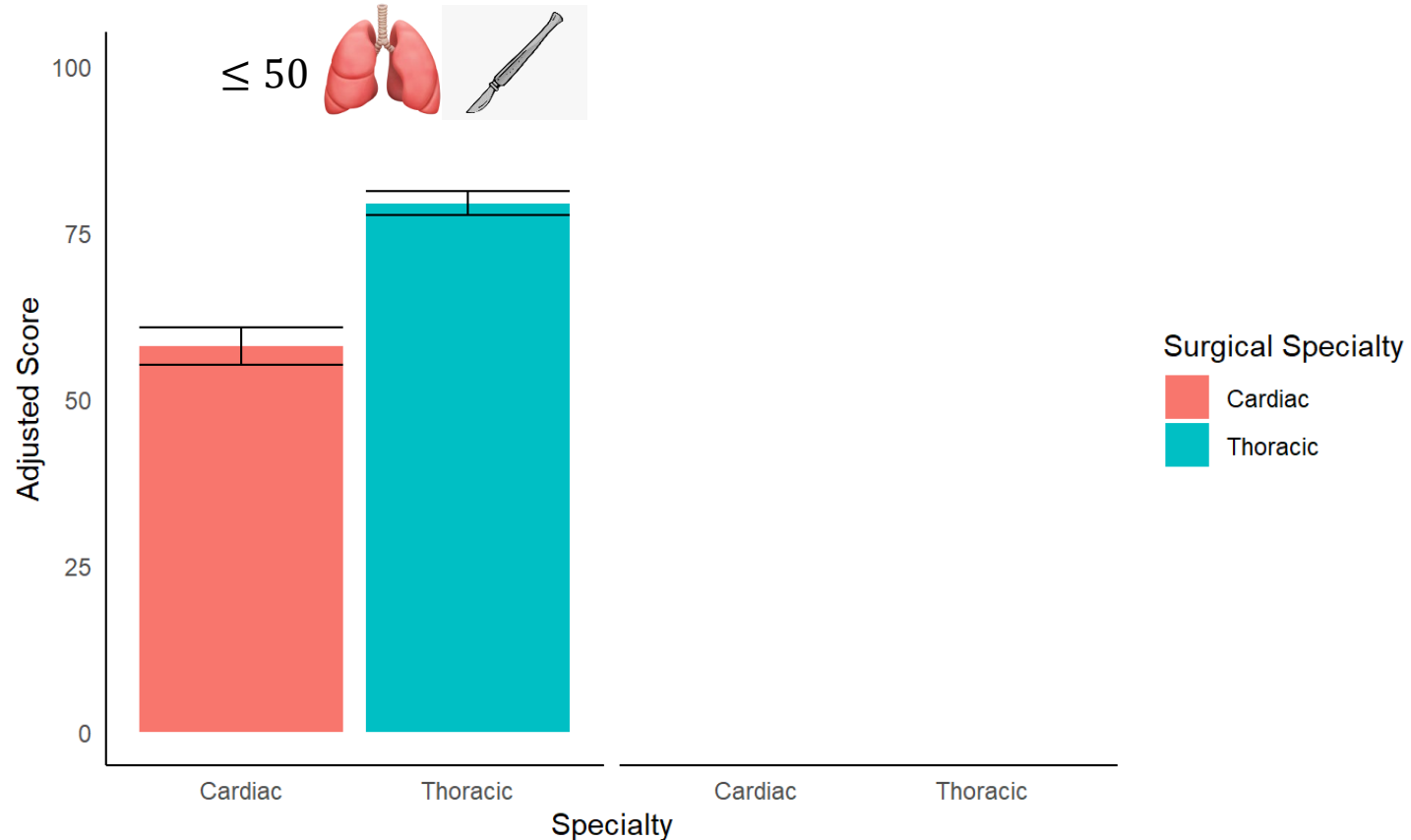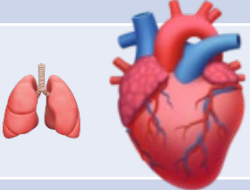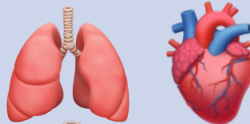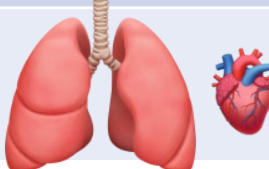
Factors Associated with Improved Score:
Thoracic Surgeons

Variable	Coefficient	95% CI	P Value
Practice Environment (Ref: Academic Hospital)			
Non-academic Hospital	-0.08	-0.15, -0.02	**0.02**
Private Practice	-0.01	-0.13, 0.11	0.87
Military	-0.09	-0.3, 0.12	0.42
Other	0.0002	-0.15, 0.15	1.00
Years of Work Experience (Ref: 0-5)			
6-10	0.13	0.03, 0.24	**0.01**
11-20	0.10	-0.06, 0.26	0.22
21-30	0.09	0, 0.18	**0.04**
>30	0.11	-0.11, 0.32	0.33

Factors Associated with Improved Score:
Cardiac Surgeons

Variable	Coefficient	95% CI	P Value
% General Thoracic Surgery (Ref: 0-25%)			
26-50%	0.12	-0.01, 0.26	0.08
51-75%	0.24	0.04, 0.44	**0.02**
>75%	0.41	0.17, 0.65	**0.001**

Next Steps

▸ Focused education on node anatomy

▸ Qualitative interviews to understand the barriers to performing adequate lymphadenectomy

▸ Evaluation of strategies in real world settings to improve adherence to guidelines

▸ Accountability

  ▸ Op note templates

  ▸ Lymph node collection kits – Osarogiagbon et al. JTO 2012

  ▸ CoC Measures, impact on accreditation

Conclusion

- Surgeons whose practice involved a greater percentage of thoracic surgery patients and surgeons who performed a greater number of lobectomies demonstrated the greatest knowledge of mediastinal lymph node anatomy

- An increased percentage of a surgeon's practice consisting of general thoracic surgery was associated with significantly improved performance on the lymph node assessment

Conclusion

▸ Knowledge of mediastinal node anatomy among surgeons who perform thoracic surgery generally high but does vary across clinical settings

▸ Further efforts to better educate lung cancer surgeons on nodal anatomy may be necessary

▸ Knowledge is just a small part of adherence to guidelines
  ▸ Cancer Surgery is not a part-time occupation
  ▸ We owe it to our patients to know the subject matter, and be up-to-date on how to deliver quality care

Historical Context: 41ˢᵗ Annual STS Meeting in 2005

▸ Dr. Alex Little presented the Commission on Cancer Patient Care Evaluation data for 729 hospitals caring for over 40,000 lung cancer patients who underwent surgery

▸ Commentary by the late Dr. Carolyn Reed:

"…*this survey renders some astounding findings.* **In two-thirds of…patients undergoing mediastinoscopy no lymph node tissue was submitted; 42% of the patients had no mediastinal staging at the time of operation…** *Dr Little, you are to be commended for outlining the dismal care of lung cancer patients.* **It will be up to the STS community to address the findings of this survey and institute corrective action.**"

Multivariable Logistic Regression Model Covariates

Variable	Coefficient
Thoracic Surgeons	Sex, Age, Board Certification, Report Data to STS Database, Practice Environment, Percent of Practice Involving General Thoracic Surgery, Practice Location, Practice Region, Residency Track, Number of Thoracic Surgeons at Institution, Number of Lobectomies Performed Per Year, Years of Work Experience
Cardiac Surgeons	Sex, Age, Percent of Practice Involving General Thoracic Surgery, Number of Lobectomies Performed Per Year, Years of Work Experience
Less than or Equal to 50 Lung Cancer Resections	Sex, Age, Practice Environment, Practice Location, Residency Track, Years of Work Experience, Surgical Specialty (Thoracic *vs.* Cardiac)
More than 50 Lung Cancer Resections	Sex, Age, Practice Environment, Practice Location, Residency Track, Years of Work Experience, Surgical Specialty (Thoracic *vs.* Cardiac)

Survey Question Difficulty and Discrimination Analysis

Survey Question	Item Difficulty Index (% answered correctly)	Item Discrimination Index
Question 1	94.6%	0.14
Question 2	66.8%	0.13
Question 3	70.4%	0.16
Question 4	87.5%	0.21
Question 5	73.6%	0.16
Question 6	77.1%	0.15
Question 7	53.6%	0.23

Factors Associated with Improved Score; Entire Cohort

Variable	Coefficient	95% CI	P Value
Female (Ref: Male)	-0.05	-0.12, 0.01	0.11
Age	-0.001	-0.007, 0.004	0.60
Board Certified (Ref: Yes)			
No	0.02	-0.06, 0.09	0.67
Report Data to STS Database (Ref: Yes)			
No	-0.02	-0.07, 0.04	0.58
Practice Environment (Ref: Academic Hospital)			
Non-academic Hospital	-0.05	-0.11, 0.01	0.12
Private Practice	0.03	-0.06, 0.13	0.47
Military	-0.16	-0.33, 0.009	0.06
Other	0.05	-0.08, 0.17	0.48

Factors Associated with Improved Score; Entire Cohort

Variable	Coefficient	95% CI	P Value
% General Thoracic Surgery (Ref: 0-25%)			
26-50%	0.15	0.05, 0.25	0.005
51-75%	0.11	-0.02, 0.24	0.09
>75%	0.16	0.05, 0.28	0.004
Practice Location (Ref: Urban)			
Suburban	-0.009	-0.06, 0.04	0.72
Rural	-0.05	-0.15, 0.05	0.31
Region (Ref: South)			
Midwest	0.004	-0.05, 0.06	0.89
Northeast	-0.02	-0.08, 0.04	0.45
West	-0.04	-0.11, 0.03	0.23

Factors Associated with Improved Score; Entire Cohort

Variable	Coefficient	95% CI	P Value
Residency Track (Ref: Thoracic Track)			
None	-0.10	-0.30, 0.11	0.35
Yes; No Specific Track	0.02	-0.06, 0.06	0.94
Yes; Cardiac Track	0.04	-0.08, 0.16	0.56
Thoracic Surgeons in Practice (Ref: 1)			
2-3	-0.01	-0.08, 0.05	0.67
4-5	0.003	-0.07, 0.08	0.94
6-8	-0.009	-0.11, 0.10	0.86
<8	-0.08	-0.18, 0.03	0.15

Factors Associated with Improved Score; Entire Cohort

Variable	Coefficient	95% CI	P Value
Surgical Specialty (Ref: Thoracic)			
Cardiac	-0.05	-0.14, 0.04	0.25
General	-0.01	-0.21, 0.19	0.90
Lobectomies per Year (Ref: 0-30)			
31-80	0.06	0.003, 0.11	0.04
81-120	0.02	-0.06, 0.10	0.63
121-180	0.06	-0.06, 0.19	0.31
>180	-0.04	-0.30, 0.22	0.77

Factors Associated with Improved Score; Entire Cohort

Variable	Coefficient	95% CI	P Value
Years of Work Experience (Ref: 0-5)			
6-10	0.08	-0.02, 0.17	0.12
11-20	0.05	-0.09, 0.19	0.47
21-30	0.07	-0.02, 0.15	0.11
>30	0.05	-0.14, 0.23	0.63

Factors Associated with Improved Score; Thoracic Surgeons

Variable	Coefficient	95% CI	P Value
% General Thoracic Surgery (Ref: 0-25%)			
26-50%	0.25	-0.008, 0.51	0.06
51-75%	0.12	-0.11, 0.35	0.32
>75%	0.15	-0.05, 0.34	0.15
Practice Location (Ref: Urban)			
Suburban	0.007	-0.05, 0.06	0.81
Rural	-0.06	-0.18, 0.06	0.30
Region (Ref: South)			
Midwest	0.003	-0.06, -0.07	0.93
Northeast	-0.01	-0.08, 0.05	0.64
West	-0.02	-0.10, 0.06	0.58

Factors Associated with Improved Score; Thoracic Surgeons

Variable	Coefficient	95% CI	P Value
Residency Track (Ref: Thoracic Track)			
None	N/A	N/A	N/A
Yes; No Specific Track	0.02	-0.04, 0.08	0.58
Yes; Cardiac Track	-0.07	-0.34, 0.19	0.59
Thoracic Surgeons in Practice (Ref: 1)			
2-3	0.009	-0.06, 0.08	0.80
4-5	0.01	-0.07, 0.10	0.76
6-8	-0.004	-0.12, 0.11	0.95
<8	-0.05	-0.17, 0.06	0.34

Factors Associated with Improved Score; Cardiac Surgeons

Variable	Coefficient	95% CI	P Value
Lobectomies per Year (Ref: 0-30)			
31-80	0.02	-0.12, 0.17	0.72
81-120	-0.19	-0.48, 0.10	0.19
121-180	0.09	-0.35, 0.53	0.69
>180	N/A	N/A	N/A
Years of Work Experience (Ref: 0-5)			
6-10	-0.28	-0.58, 0.01	0.06
11-20	-0.25	-0.63, 0.12	0.18
21-30	-0.21	-0.47, 0.05	0.12
>30	-0.22	-0.72, 0.28	0.38