



Factors during training which predict future use of minimally invasive thoracic surgery



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ABSTRACT

Background: While minimally invasive thoracic surgery (MIS) has increased nationwide over the years, most patients undergoing lung and esophageal resections still undergo an open approach. We performed a national survey to analyze factors associated with a propensity to perform MIS after completing a cardiothoracic training program.

Materials and methods: Cardiothoracic surgery trainees in 2 or 3-year programs from 2010 to 2016 were sent an online survey regarding the numbers and types of cases performed during training and current practice patterns as attending surgeons. Comfort level with MIS was also assessed. Responses were recorded and analyzed using SPSS.

Results: One hundred thirty-six trainees responded, with a mean of 121 lobectomies (30–250) and 40 esophagectomies (8–110) performed during training. Mean minimally invasive lobectomy and esophagectomy rates during training were 53% and 30% respectively. A greater ratio of MIS procedures performed during training correlated with a higher rate performed as an attending (lobectomies, $p = 0.04$; esophagectomies, $p = 0.01$) and a greater comfort level with performing these procedures (lobectomies, $p = 0.01$ and esophagectomies, $p < 0.01$).

Conclusions: Based on these results, performing a greater ratio of minimally invasive lobectomies and esophagectomies during fellowship training increases the likelihood of performing them as an attending.

1. Introduction

There has been a lag in adoption and full implementation of minimally invasive surgery in cardiothoracic surgery. While minimally invasive thoracic surgery has been associated with faster recovery, lower morbidity and mortality, decreased length of stay (LOS), and costs, the national utilization rate of minimally invasive approaches in thoracic surgery has remained at approximately 40% [1].

One reason that the implementation of minimally invasive techniques in thoracic surgery has been slow is the lack of confidence in these approaches by residents and fellows at the end of their training. A previous study reported the confidence level of recent thoracic surgery graduates to be 56% and 46% for performing minimally invasive pulmonary and esophageal operations respectively [2]. Understanding the causes of low confidence levels for some recent graduates would help to identify possible training insufficiencies and allow programs to adapt as

needed. The goal of this study was to determine the factors in cardiothoracic education which were associated with increased use of minimally invasive approaches after training.

2. Materials and Methods

2.1. Subjects

All standard 2 or 3-year cardiothoracic surgery training programs in the United States were included. After obtaining institutional review board approval, contact information was obtained for every trainee ($n = 608$) who had finished from 2010 to 2016. Contact information was obtained from the Thoracic Surgery Directors Association (TSDA) and the Cardiothoracic Surgery Network (CTSNet). Participation was voluntary.

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Survey questions

1. Do you perform more than 50% of your cases in general thoracic surgery?
2. How many years has it been since you finished your cardiothoracic training?
3. What was the number of open lobectomies that you did during your cardiothoracic training?
4. What was the number of VATS lobectomies that you did during your cardiothoracic training?
5. What was the number of open esophagectomies that you did during your cardiothoracic training?
6. What was the number of minimally invasive esophagectomies that you did during your cardiothoracic training?
7. What percentage of lobectomies performed in your current practice are performed minimally invasively?
8. What percentage of esophagectomies performed in your current practice are performed minimally invasively?
9. In what percentage of lobectomies that you begin minimally invasively do you convert to open?
10. In what percentage of esophagectomies that you begin minimally invasively do you convert to open?
11. On a scale of 1-10, with 10 being extremely comfortable, what is your comfort level with VATS lobectomy?
12. On a scale of 1-10, with 10 being extremely comfortable, what is your comfort level with minimally invasive esophagectomy?

Fig. 1. Survey questions.

2.2. Survey

A 12-question survey was constructed by the authors (Fig. 1). The survey asked trainees to recall the number of lobectomies and esophagectomies performed, and the percentage of each which were performed minimally invasively. The survey also asked trainees to provide their current practice patterns as attendings and their comfort level with minimally invasive lobectomy and minimally invasive esophagectomy (MIE). The comfort level scale ranged from 1 (very uncomfortable) to 10 (completely comfortable).

To create the survey, each of the cardiothoracic surgeons at our institution was queried about factors which they felt contributed to a propensity to perform minimally invasive surgery as an attending. Multiple general surgeons at our institution were also queried, to decrease any potential bias of cardiothoracic surgery alone and because our general surgery team has a high overall rate of usage of minimally invasive techniques. The overall aggregate of responses were used to create the topics for the 12 questions.

To design each question, previous literature on survey design in education research was used to craft each question [3]. Specifically, the manner used to create the questions was based on a previously validated process for developing questionnaires in medical education research [4].

2.3. Survey administration

A survey was emailed to each trainee. Each email outlined the project, details of anonymity and the opportunity to be awarded. An incentive \$50 online cash card was given randomly to 10 respondents.

2.4. Statistical analysis

Survey information was analyzed using SPSS (Version 24). One-way analysis of variance and independent samples t-testing were used to determine statistically significant associations of different variables. To analyze the association of number/percentage of surgeries versus the percentage of minimally invasive usage as attending surgeons, the

number of lobectomies/esophagectomies was used as a continuous value without creating a cutoff value.

3. Results

There was a response rate of 22.4% (136/608). Graduates had performed an average of 121 lobectomies and 40 esophagectomies during their training (Table 1). Fifty-two percent of lobectomies and 30% of esophagectomies during training were performed minimally invasively.

As attendings, the overall group currently performed 68% of their lobectomies minimally invasively. The mean comfort level was 7.4. Their mean conversion rate was 12%. Trainees were more likely to perform lobectomies minimally invasively if they had performed a higher number of minimally invasive lobectomies ($p < 0.01$) and a higher ratio of minimally invasive lobectomies versus all lobectomies ($p < 0.01$) during training (Table 2). Furthermore, the comfort level of minimally invasive lobectomy as an attending was associated with a higher number of minimally invasive lobectomies ($p < 0.01$) and a higher ratio of minimally invasive lobectomies versus all lobectomies ($p < 0.01$) during training. The likelihood of performing minimally

Table 1
Survey responses of recent cardiothoracic surgery graduates (2010-2016).

	Mean
Lobectomy	
Open lobectomies performed during training	58 (4–250)
Minimally invasive lobectomies performed during training	63 (0–250)
Conversion rate of minimally invasive lobectomies as attending	12% (5–100)
Mean comfort level with minimally invasive lobectomy as attending	7.4 (1–10)
Esophagectomy	
Open esophagectomies performed during training	28 (1–150)
MIEs performed during training	12 (0–110)
Conversion rate of MIEs as attending	16% (5–100)
Mean comfort level with MIEs as attending	5.1 (1–10)

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