Lung Cancer Resection at Hospitals With High vs Low Mortality Rates

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**IMPORTANCE** Wide variations in mortality rates exist across hospitals following lung cancer resection; however, the factors underlying these differences remain unclear.

**OBJECTIVE** To evaluate perioperative outcomes in patients who underwent lung cancer resection at hospitals with very high and very low mortality rates (high-mortality hospitals [HMHs] and low-mortality hospitals [LMHs]) to better understand the factors related to differences in mortality rates after lung cancer resection.

**DESIGN, SETTING, AND PARTICIPANTS** In this retrospective cohort study, 1279 hospitals that were accredited by the Commission on Cancer were ranked on a composite measure of risk-adjusted mortality following major cancer resections performed from January 1, 2005, through December 31, 2006. We collected data from January 1, 2006, through December 31, 2007, on 645 lung resections in 18 LMHs and 25 HMHs. After adjusting for patient characteristics, we used hierarchical logistic regression to examine differences in the incidence of complications and “failure-to-rescue” rates (defined as death following a complication).

**MAIN OUTCOMES AND MEASURES** Rates of adherence to processes of care, incidence of complications, and failure to rescue following complications.

**RESULTS** Among 645 patients who received lung resections (441 in LMHs and 204 in HMHs), the overall unadjusted mortality rates were 1.6% (n = 7) vs 10.8% (n = 22; \( P < .001 \)) for LMHs and HMHs, respectively. Following risk adjustment, the difference in mortality rates was attenuated (1.8% vs 8.1%; \( P < .001 \)) but remained significant. Overall, complication rates were higher in HMHs (23.3% vs 15.6%; adjusted odds ratio [aOR], 1.79; 95% CI, 0.99-3.21), but this difference was not significant. The likelihood of any surgical (aOR, 0.73; 95% CI, 0.26-2.00) or cardiopulmonary (aOR, 1.23; 95% CI, 0.70-2.16) complications was similar between LMHs and HMHs. However, failure-to-rescue rates were significantly higher in HMHs (25.9% vs 8.7%; aOR, 6.55; 95% CI, 1.44-29.88).

**CONCLUSIONS AND RELEVANCE** Failure-to-rescue rates are higher at HMHs, which may explain the large differences between hospitals in mortality rates following lung cancer resection. This finding emphasizes the need for better understanding of the factors related to complications and their subsequent management.
Major resections for thoracic malignant neoplasms are associated with considerable risk for morbidity and mortality. Despite improvements in overall mortality rates, significant differences in perioperative outcomes exist across hospitals that perform lung cancer resection. While the opportunity for quality improvement is clear, the optimal approach to achieve this goal is uncertain because the mechanisms underlying high morbidity and mortality rates have not been well defined. There is a significant knowledge gap regarding what aspects of health care are most likely to improve outcomes through quality improvement initiatives.

Multiple aspects of perioperative care have been proposed to explain the differences between hospitals with high and low mortality rates (high-mortality hospitals [HMHs] and low-mortality hospitals [LMHs]) that perform lung cancer resection. It is proposed that higher mortality rates may be associated with higher complication rates at poor-performing hospitals and that LMHs are more proficient at using practices that prevent complications. Hence, variations in complication rates may underlie differences in mortality rates. If this variation were the case, quality improvement efforts would be most effective in targeting compliance with evidence-based practices aimed at preventing complications, such as venous thromboembolism (VTE) prophylaxis or perioperative β-blockers. Furthermore, it may be that LMHs simply have fewer surgical complications. If this were the reason, efforts should be aimed at improving surgeons’ technical proficiency. Another hypothesis may be that LMHs are better at recognizing and managing complications effectively once they have occurred or decreasing “failure-to-rescue” rates. If this were the underlying reason for variation in hospital performance, quality improvement efforts should focus on systems aimed at early recognition and management of complications. Once the specific factors responsible for differences in performance are understood, quality improvement efforts can be designed to target these specific aspects of patient care.

A more in-depth understanding of these differences and their relationship to perioperative outcomes may provide insight into which aspects of care are the key drivers of variation in hospital performance and may have the most meaningful effect on improving surgical care for lung cancer. In this context, we examined perioperative care practices and outcomes in patients who underwent lung cancer resection at LMHs and HMHs.

Methods

Database and Study Participants

The National Cancer Data Base (NCDB) is a joint program of the American Cancer Society and the American College of Surgeons’ Commission on Cancer (CoC). The NCDB is a hospital-based registry that includes cases from CoC-accredited cancer programs nationwide. It currently includes approximately 1500 institutions and accounts for approximately 70% of all cancers diagnosed in the United States. The database collects information on all types of cancer; the information is then tracked prospectively, analyzed, and reported to the participating institutions as periodic feedback. Information such as patient demographics, cancer stage, tumor characteristics, treatment, and outcomes are included in the database.

We identified the hospitals with the lowest and highest mortality rates from the 1279 hospitals that participated in the NCDB from January 1, 2005, through December 31, 2006, using a composite measure that was derived from procedural volumes and mortality rates of major cancer resections according to previous methods. We used an empirical Bayesian approach to calculate hospital-specific predictive mortality rates, which provide the best estimate of a hospital’s mortality rate. The methods for construction of the composite measure have previously been described. We then ranked the hospitals based on this composite measure. Next, we enrolled hospitals as HMHs beginning with the institution with the highest predicted mortality rate and LMHs starting with the institution with the lowest predicted mortality rate until we reached the necessary sample size. Of the 41 hospitals with the lowest mortality rates, 22 declined to participate. One hospital did not perform any lung cancer resections. As a result, we included 18 LMHs in this study. Of the 77 hospitals identified as HMHs, we enrolled 30 and included 25 hospitals in this analysis (5 hospitals did not perform any lung cancer resections). After data abstraction, 18 LMHs and 25 HMHs were included in the analysis. The study was approved by the University of Michigan Institutional Review Board.

On-site medical record reviews of patients at participating institutions from January 1, 2006, through December 31, 2007, were conducted by trained data abstractors. Of the hospitals with 150 or fewer patients, all records were abstracted. In hospitals with more than 150 patients, a random sample of up to 150 records were selected for review. After excluding patients with incomplete medical records for data abstraction, 645 patients with lung cancer were included in the study, with 441 patients treated in LMHs and 204 treated in HMHs.

Investigators were masked to the performance status of all centers. We collected information on perioperative complications using a previously validated data collection tool. The occurrence of distinct complication events were captured and categorized according to surgical (eg, anastomotic leak or reoperation) and medical (eg, cardiac or pulmonary) complications. We were not able to capture the details of specific surgical complications on a more precise level than these categories. Patient-level data were collected on 11 clinical practices that were related to perioperative processes of care. Seven of the 11 practices focused on processes related to the prevention of complications, including 3 related to VTE, 3 related to surgical site infection, and 1 related to perioperative cardiac events. In addition, we collected 4 variables related to perioperative pain control (use of epidural catheter) and hemodynamic monitoring (arterial catheter, central venous catheter, and pulmonary artery catheter use).

Statistical Analysis

We compared complication rates, case fatality rates in patients who developed complications (failure-to-rescue...
rates), and perioperative practice patterns regarding processes of care between LMHs and HMHs. In determining complication rates, hierarchical logistic regression models were used to compare risk-adjusted complication rates between hospitals. The model included adjustment for age, sex, race, American Society of Anesthesiologists Physical Status classification, comorbid conditions, functional status, cancer stage, and emergency surgery. We used analogous methods to estimate failure-to-rescue rates between the 2 hospital groups.

To examine practice patterns, we estimated risk-adjusted adherence rates of processes of care by hospital performance status (HMHs vs LMHs) using standard logistic regression. Risk-adjusted odds ratios (aOR) of receiving specific processes of care were estimated by hospital performance (HMHs vs LMHs). To examine the effect of processes of care on complication rates, we calculated aORs with and without the inclusion of specific process-of-care variables. We used robust standard errors to adjust for the clustering of patients within hospitals.

Analyses were conducted using SAS, version 9.1 (SAS Institute Inc), and Stata, version 13 (StataCorp LP). \( P < .05 \) was considered statistically significant, and all tests were 2 sided.

### Results

Patients who underwent lung cancer resection at HMHs presented with greater illness severity compared with those who were treated at LMHs (Table 1). Both hospital groups had patients with a similar mean (SD) age (HMHs, 67.6 [10.7] years vs LMHs, 66.1 [10.6] years; \( P = .08 \)). However, a greater proportion of patients at HMHs had poorer functional status compared with patients at LMHs (16 [7.8%] vs 7 [1.6%]; \( P < .001 \)). Patients who were treated at HMHs were more likely to have 2 or more comorbid conditions (49 [24.0%] vs 70 [15.9%]; \( P = .01 \)). More specifically, there was a significantly higher proportion of patients with ischemic heart disease (46 [22.5%] vs 62 [14.1%]; \( P = .007 \)) and diabetes mellitus (38 [18.6%] vs 50 [11.3%]; \( P = .01 \)). In addition, HMHs performed a significantly higher percentage of emergency procedures (5 [2.5%] vs 1 [0.2%]; \( P = .006 \)). Patients who were treated at HMHs had a similar distribution of cancer stage compared with those who underwent resection at LMHs. Before risk adjustment, the overall mortality rates at LMHs and HMHs were 1.6% (n = 7) and 10.8% (n = 22; \( P < .001 \)), respectively. After risk adjustment, these differences were attenuated but mortality rates were still considerably different (1.8% at LMHs vs 8.1% at HMHs; \( P < .001 \)).
Across both hospital groups, we observed differences in operative approach (Table 2). After adjusting for patient factors and cancer stage, patients were slightly more likely to undergo an open thoracotomy approach at an HMH vs an LMH (aOR, 3.15; 95% CI, 1.00-9.93). However, patients were somewhat less likely to undergo a thoracoscopic lung resection at an HMH vs an LMH (aOR, 0.31; 95% CI, 0.10-0.99).

While HMHs were somewhat less likely to use epidural catheters for postoperative pain (64.6% vs 77.9%), this difference did not reach statistical significance (aOR, 0.48; 95% CI, 0.18-1.28) (Table 2). When evaluating the use of central venous catheters, pulmonary artery catheters, and arterial catheters, HMHs were less likely to use intraoperative monitoring (aOR, 0.16; 95% CI, 0.06-0.41) compared with LMHs. In terms of cardiovascular protective measures, both hospital groups were equally likely to use perioperative β-blockers (aOR, 0.77; 95% CI, 0.45-1.31).

No significant differences were found with respect to surgical site infection prophylaxis with administration of prophylactic antibiotics 1 hour before incision (aOR, 0.44; 95% CI, 0.12-1.64) (Table 2). Overall, the adjusted rate of prophylactic antibiotics given for more than 24 hours after surgery was high among both hospital groups (42.6% at LMHs vs 74.6% at HMHs). However, HMHs were significantly more

Table 2. Process of Health Care Adherence Rates and Complication Rates in LMHs and HMHs

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Percentage</th>
<th>LMHs*</th>
<th>HMHs*</th>
<th>OR (95% CI) of Complication, HMH vs LMH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neoadjuvant treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>12.2</td>
<td>13.3</td>
<td>9.6</td>
<td>0.63 (0.31-1.28)</td>
</tr>
<tr>
<td>Radiation</td>
<td>7.6</td>
<td>8.2</td>
<td>6.1</td>
<td>0.67 (0.26-1.73)</td>
</tr>
<tr>
<td>Any</td>
<td>12.5</td>
<td>13.5</td>
<td>10.1</td>
<td>0.66 (0.33-1.31)</td>
</tr>
<tr>
<td>Epidural catheter for pain management</td>
<td>73.7</td>
<td>77.9</td>
<td>64.6</td>
<td>0.48 (0.18-1.28)</td>
</tr>
<tr>
<td>Any intraoperative monitoring†</td>
<td>88.2</td>
<td>93.9</td>
<td>75.7</td>
<td>0.16 (0.06-0.41)</td>
</tr>
<tr>
<td>Prophylaxis against SSI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antibiotics 1 h before incision</td>
<td>92.8</td>
<td>94.4</td>
<td>89.3</td>
<td>0.44 (0.12-1.64)</td>
</tr>
<tr>
<td>Antibiotics &gt;24 h after surgery</td>
<td>53.1</td>
<td>42.6</td>
<td>74.6</td>
<td>4.69 (1.63-13.49)</td>
</tr>
<tr>
<td>Avoidance of perioperative hyperglycemia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recorded glucose level on postoperative day 1</td>
<td>81.2</td>
<td>78.1</td>
<td>90.7</td>
<td>2.53 (0.63-10.05)</td>
</tr>
<tr>
<td>Hyperglycemia management protocol</td>
<td>22.6</td>
<td>19.4</td>
<td>28.4</td>
<td>1.78 (0.82-3.85)</td>
</tr>
<tr>
<td>Perioperative β-blocker use</td>
<td>24.3</td>
<td>25.7</td>
<td>21.6</td>
<td>0.77 (0.45-1.31)</td>
</tr>
<tr>
<td>Venous thromboembolism prophylaxis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preoperative chemoprophylaxis or SCD use</td>
<td>80.9</td>
<td>91.1</td>
<td>57.5</td>
<td>0.10 (0.03-0.30)</td>
</tr>
<tr>
<td>Postoperative chemoprophylaxis or SCD use</td>
<td>87.9</td>
<td>96.1</td>
<td>69.6</td>
<td>0.06 (0.01-0.26)</td>
</tr>
<tr>
<td>Pulmonary function tests</td>
<td>88.9</td>
<td>88.3</td>
<td>79.9</td>
<td>0.62 (0.24-1.62)</td>
</tr>
<tr>
<td>Lung resection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td>82.0</td>
<td>77.0</td>
<td>90.7</td>
<td>3.15 (1.00-9.93)</td>
</tr>
<tr>
<td>Thoracoscopic</td>
<td>18.0</td>
<td>21.4</td>
<td>8.5</td>
<td>0.31 (0.10-0.99)</td>
</tr>
</tbody>
</table>

Abbreviations: HMHs, high-mortality hospitals; LMHs, low-mortality hospitals; OR, odds ratio; SCD, sequential-compression device; SSI, surgical site infection; VTE, venous thromboembolism.

* HMHs indicate hospitals with high mortality rates; LMHs, hospitals with low mortality rates.
† OR of complications related to specific perioperative processes of care.
‡ OR for pulmonary complication, adjusted for patient characteristics and epidural catheter.
§ Includes arterial catheter, central venous catheter, and pulmonary artery catheter.
¶ OR for cardiac complication, adjusted for patient characteristics and invasive monitoring.
†† OR for SSI, adjusted for patient characteristics and antibiotics within 1 hour of incision.
‡‡ OR for SSI, adjusted for patient characteristics and use of antibiotics more than 24 hours after surgery.
§§ OR for SSI, adjusted for patient characteristics and recorded glucose level on postoperative day 1.
¶¶ OR for SSI, adjusted for patient characteristics and hyperglycemia management.
††† OR for cardiac complication, adjusted for patient characteristics and perioperative β-blocker use.
‡‡‡ OR for VTE, adjusted for patient characteristics and chemoprophylaxis or use of SCDs.
likely to continue giving prophylactic antibiotics more than 24 hours after surgery (aOR, 4.69; 95% CI, 1.63-13.49). In terms of glycemic management, both hospital groups were similar in recording glucose levels on postoperative day 1 (aOR, 2.53; 95% CI, 0.63-10.05) and using a hyperglycemia management protocol (aOR, 1.78; 95% CI, 0.82-3.85). Rates of adherence to VTE prophylaxis varied significantly between hospital groups. High-mortality hospitals were significantly less likely to use preoperative chemoprophylaxis or sequential-compression devices (aOR, 0.10; 95% CI, 0.03-0.30). High-mortality hospitals were also less likely to use either chemoprophylaxis or sequential-compression devices in the postoperative setting (aOR, 0.06; 95% CI, 0.01-0.26).

The overall complication rate was not significantly different between HMHs and LMHs (23.3% vs 15.6%, respectively; aOR, 1.79; 95% CI, 0.99-3.21) (Table 3). There were no significant differences in the odds of experiencing surgical complications (aOR, 0.73; 95% CI, 0.26-2.00) when comparing HMHs and LMHs. High-mortality hospitals had a somewhat higher rate of medical complications (21.8% vs 13.7%); however, this difference was not statistically significant (aOR, 1.92; 95% CI, 1.00-3.66) when comparing the 2 hospital groups. More specifically, there were no significant differences in the chance of cardiopulmonary events (aOR, 1.23; 95% CI, 0.70-2.16) or thromboembolic events (aOR, 4.77; 95% CI, 0.28-79.10). High-mortality hospitals had a significantly higher likelihood of other complications (aOR, 2.60; 95% CI, 1.07-6.33).

Overall, there was a statistically significant rate of failure to rescue for any complications at HMHs (aOR, 6.55; 95% CI, 1.44-29.88). Furthermore, we observed that HMHs had a higher rate of failure to rescue following other medical complications (aOR, 15.39; 95% CI, 1.52-155.67).

### Discussion

This study evaluated the variation in perioperative mortality rates following lung cancer resection in a sample of hospitals with very high and very low mortality rates. We specifically examined variations in perioperative practices and subsequent outcomes. Our study revealed variations in adherence to evidence-based practices that are aimed at preventing complications, such as the use of VTE prophylaxis. However, these variations did not translate into significant differences in the rate of complications that are specifically associated with adherence to these practices. While our study found no significant differences in the rates of overall complications between HMHs and LMHs, we identified significant variations in failure-to-rescue rates following complications. Therefore, our findings suggest that variations in mortality rates between LMHs and HMHs may be driven by practices related to identification and effective management of complications rather than processes targeted at prevention of adverse events.

Previous studies have evaluated variations in mortality rates following lung cancer resection using a variety of data sources. However, findings from some studies that evaluated thoracic procedures using subspecialty society databases may not be generalizable to all hospitals that perform lung resection. Previous studies evaluating the generalizability of outcomes for lung cancer resection from the Society of Thoracic Surgeons General Thoracic Surgery Database have been conducted. LaPar et al compared General Thoracic Surgery Database results with the Nationwide Inpatient Sample, the largest all-payer inpatient care database in the United States, and found that the General Thoracic Surgery Database not only represented a small sample of all resections but also demonstrated significantly lower mortality rates and hospital lengths of stay. We focused on the NCDB, which captures procedures across a broader range of patients than Medicare-linked data (ie, patients who are younger than 65 years) and leveraged the ability to compare results at hospitals with very high and very low mortality rates.

Regarding perioperative care, we found that there were significant differences between HMHs and LMHs in terms of adherence to evidence-based practices that are aimed at preventing complications, such as intraoperative monitoring and VTE prophylaxis. Despite these differences, there were not any significant differences in the rate of complications that are specifically associated with adherence to these practices. However, our study found no significant differences in the rates of overall complications between HMHs and LMHs, we identified significant variations in failure-to-rescue rates following complications. Therefore, our findings suggest that variations in mortality rates between LMHs and HMHs may be driven by practices related to identification and effective management of complications rather than processes targeted at prevention of adverse events.
significant increases in complications associated with variation in adherence to these practices. Thus, our findings suggest that adherence to evidence-based processes of care do not necessarily influence differences in complication rates following lung cancer resection. Although we observed some differences in operative approaches between hospitals, the slight tendency toward thoracoscopic approaches at LMHs was not enough to explain the wide differences in mortality rates. As a result, variations in care that account for the differences in mortality rates are likely to be related to other aspects of care.

The findings from our study suggest that HMHs that perform lung cancer resection do not necessarily have higher overall complication rates but rather demonstrate higher rates of failure to rescue. These findings add to those from previous studies\(^5\),\(^6\),\(^7\) that have also demonstrated that failure to rescue is an important component of the underlying differences in mortality rates between hospitals that perform high-risk surgical procedures. While this factor identifies a potential explanation for disparities in mortality rates between hospitals, it does not provide a specific target for quality improvement efforts because the factors that underlie failure-to-rescue rates largely remain unclear aside from pointing out the importance of managing a complication once it has occurred. Previous work\(^8\) has identified several hospital characteristics that are associated with failure to rescue, such as nurse to patient ratios, but much of what makes some hospitals more proficient at rescuing patients following complications remains undetermined. The HMHs in our study had a larger burden of patients with higher clinical severity, and it could be that patients with more comorbidities develop complications more frequently and may be more difficult to rescue following a complication. A more in-depth understanding of the factors related to perioperative complications and their subsequent management will be essential in identifying targets for quality improvement initiatives to decrease mortality following these high-risk cancer operations.

This study has several important limitations. First, only hospitals with CoC accreditation status were included. Thus, this is not a random sample of hospitals that perform lung cancer resections in the United States. Hospitals with this accreditation may generally be more committed to participating in quality improvement initiatives than those without the CoC designation. Nonetheless, these hospitals demonstrate wide variations in mortality following lung cancer resection, representing opportunities for improvement. Second, our study only sampled CoC-accredited hospitals with the highest and lowest mortality rates. Thus, most CoC-accredited hospitals were excluded. As a result, the practice patterns and outcomes at hospitals with intermediate mortality rates are not examined by this study. However, the findings regarding outcomes and clinical practice patterns should be relevant across the spectrum of hospital performance. Third, health care practices, including surgical approaches, may have changed since our study. However, this study provides specific details on perioperative care that would otherwise not be obtainable from many other administrative data sets, which also lag behind the current data. Fourth, the complications detailed in this study are grouped in broad categories (eg, surgical, cardiopulmonary, or other) and do not necessarily focus on specific complications, which precludes us from identifying the specific adverse events that are driving differences in case fatality rates. Furthermore, we were not able to define case-level specific details of surgical complications or evaluate the technical aspects of the procedures. However, this study does identify general categories of complications (eg, other medical complications) that may identify areas that warrant further investigation to better understand the exact complications responsible for differences in case fatality rates.

**Conclusions**

Based on the results of this study, there are significant variations in mortality rates across this sample of hospitals following lung cancer resection. Because overall complication rates are similar between LMHs and HMHs, differences in morbidity do not explain the large differences in mortality rates between hospitals. Our results suggest that differences in mortality rates are not due to variations in perioperative practices but rather differences in case fatality rates or failure to rescue. Thus, a better understanding of the cause of failure to rescue may be crucial for improving mortality rates following lung cancer resection. This finding emphasizes the need for a better understanding of the factors related to complications following lung cancer operations and their subsequent management to identify areas that may have the most powerful effect on quality improvement.

**ARTICLE INFORMATION**

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**Author Contributions:** Drs Grenda and Wong had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

*Study concept and design:* Revels, Birkmeyer, Wong.

*Acquisition, analysis, or interpretation of data:* All authors.

*Drafting of the manuscript:* Grenda, Revels, Wong.

*Critical revision of the manuscript for important intellectual content:* All authors.

*Statistical analysis:* Grenda, Yin, Birkmeyer.

*Obtained funding:* Wong, Birkmeyer.

*Administrative, technical, or material support:* Revels, Wong.

*Study supervision:* Wong.

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Failure to Rescue Metric in Lung Surgery
A Needed Breath of Fresh Air

Thomas K. Varghese Jr, MD, MS

The performance of surgical procedures is inevitably associated with complications. The holy grail in assessing surgical quality is differentiating metrics that reflect the care a hospital and surgical team delivers (factors that can be improved) from those that are solely related to a patient’s medical comorbidities (factors often beyond our control). In the landmark article introducing the concept, Silber and colleagues demonstrated that although mortality and the occurrence of adverse events could be attributed to patient characteristics, the key finding was that the failure to rescue (FTR) patients from death once an adverse event had occurred was associated more with hospital characteristics and was less influenced by patient admission severity of illness. Since then, a body of literature has emerged assessing FTR in select surgical procedures as well as the variation in the quality of response to adverse events. In studying patients who have already developed a complication, the specifics of adjustment for comorbidities become less important in failure analyses because with the development of complications, patients are more uniformly ill.

In this issue of *JAMA Surgery*, Grenda and colleagues tackle the issue for lung cancer resections. The database selected for the study, the National Cancer Database, accounts for 70% of all cancers diagnosed in the United States. This is important because not all lung cancer operations are performed by specialists. The authors first stratified hospitals by risk-adjusted mortality and then explored differences in complications and FTR rates. What they found was similar to other FTR studies in that there was not a significant difference in the occurrence of complication rates between low-mortality and high-mortality rate hospitals but significant difference in the occurrence of complication rates to high-mortality rate hospitals, likely accounting for the difference in mortality. The authors further explored any differences in perioperative practices aimed at preventing complications, such as venous thromboembolism prophylaxis, these did not translate to significant differences in the rates of complications. Interestingly, a study published this year from our group using the Society of Thoracic Surgery National Database, which is reflective of data mainly from thoracic surgical specialists, had similar findings. Failure to rescue rates had considerably more variation among professionals than the occurrence of postoperative complications.

What are the take-home messages from this study and other FTR studies? Although it is important to use evidence-based measures to prevent complications, the difference in mortality for surgical procedures in the present day is often related to what hospitals systems do after complication occurs. Actions matter, not a special hospital designation or...