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ABSTRACT: J. Maxwell Chamberlain Memorial Paper for General Thoracic Surgery: Thoracic Surgery Regionalization Within an Integrated Health Care System Improves Outcomes From Major Pulmonary Resections for Lung Cancer

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Purpose: The current literature on volume-outcome relationship in lobectomy for lung cancer is mixed and inconclusive. Furthermore, many of the studies are based on data following centralization within national, single-payer systems. We examined the impact of thoracic surgery regionalization on outcomes from major pulmonary resection in an American integrated healthcare system.

Methods: We retrospectively reviewed patients undergoing major pulmonary resection (lobectomy, bi-lobectomy or pneumonectomy) within our managed care network in the three years before (2011-2013, n=782) and after (2015-2017, n=845) regionalization of thoracic surgery care to five designated Centers of Excellence (CoE). We compared perioperative outcomes from pre- to post-regionalization (PreR, PostR) using bivariate analysis (Student's t-, chi-squared, Kruskal-Wallis tests). We used hierarchical linear (for length of stay (LOS)) and logistic (for morbidity) mixed multivariate models to examine these outcomes changes while controlling for patient-, surgeon-, and hospital-level effects, as well as for clustering within surgeon and facility levels.

Results: Regionalization successfully shifted cases from 16 PreR sites to 5 CoE, where 100% were performed by 2015-2016. Average facility volume increased from 16 to 56 cases/year at CoE. Regionalization also resulted in increased use of video-assisted thoracoscopic surgery (VATS) approach, 86% from 57% (729/845 and 449/782 cases, p<0.001), as well as decreased ICU utilization (-1.7 days, p<0.001) and hospital LOS (-3.3 days, p<0.001). Patients in the PostR era also had fewer total (26.2% from 38.6%, p<0.001) and major complications (9.6% from 13.6%, p=0.01) than those in the PreR era; this change was driven exclusively by decreased morbidity among the VATS cases, which comprised the vast majority (86%) of all PostR resections. Mortality decreased modestly (30-day: 0.7% from 1.3%; 90-day: 1.4% from 2.3%) but was low in both eras. In our multivariate analyses, regionalization was significantly associated with decreased LOS and complication rates, independent of surgical approach or patient factors.

Conclusions: Thoracic surgery regionalization, previously only described at large scale in foreign models, was feasible within an American integrated healthcare system and dramatically increased major pulmonary resection facility volume. Regionalization was independently associated with significant improvements in VATS utilization, LOS, and morbidity, suggesting an effect beyond that of volume alone.

Figure 1. Adjusted multivariable associations with any complication (hierarchical logistic model)

