

Impact of Geographic and Sociodemographic Factors on the Utilization of Robotic Lung Resection versus Videoscopic Lung Resection

Aaron R. Dezube MD 1,2, Natasha K Valas DO 1,2, Michael Dezube M.Eng 3, Virginia R. Litle MD 1,2

1. St. Elizabeth's Medical Center, Brighton, MA; 2. Boston University Chobanian and Avedisian School of Medicine, Boston, MA; 3. Department of Radiology, Massachusetts General Hospital, Boston MA

Background

• Robotic-assisted thoracoscopic surgery (RATS) is now a widely accepted approach for lung resection.

• Less is know about patterns of usage within the United States.

Objective

• Investigate whether geographic and sociodemographic factors impact trends in utilization of RATS versus video-assisted thoracoscopic surgery (VATS) for lung resection in the United States.

Materials and Methods

• A data use agreement was signed.

• All patients with complete demographic variables undergoing RATS and VATS within the National Inpatient Sample between 2016-2020 for benign or malignant neoplasms and nodules were included.

• Degree of resection and technique were compared with respect to pretreatment variables: sociodemographic, hospital-level, and geographic factors.

Results

• 81,360 patients underwent lobectomy (35.7% vs. 64.3% for RATS and VATS respectively).

• 88,620 underwent sub-lobar resection (24.2% vs 75.8% for RATS and VATS respectively).

• Rates of RATS lung resection increased annually

- Rate varied by geographic hospital division (Figure 1 + 2)

• Differences in sociodemographic, hospital-level, and geographic variables were present between the RATS and VATS cohorts (all $p < 0.05$).

• Odds of RATS utilization for lobectomy varied by geographic hospital division (Table 1) as well as patient and hospital factors.

• Odds of RATS utilization for sublobar resection varied by geographic hospital division.

- Odds of RATS utilization for sublobar resection was not significant for insurance status

Results (cont.)

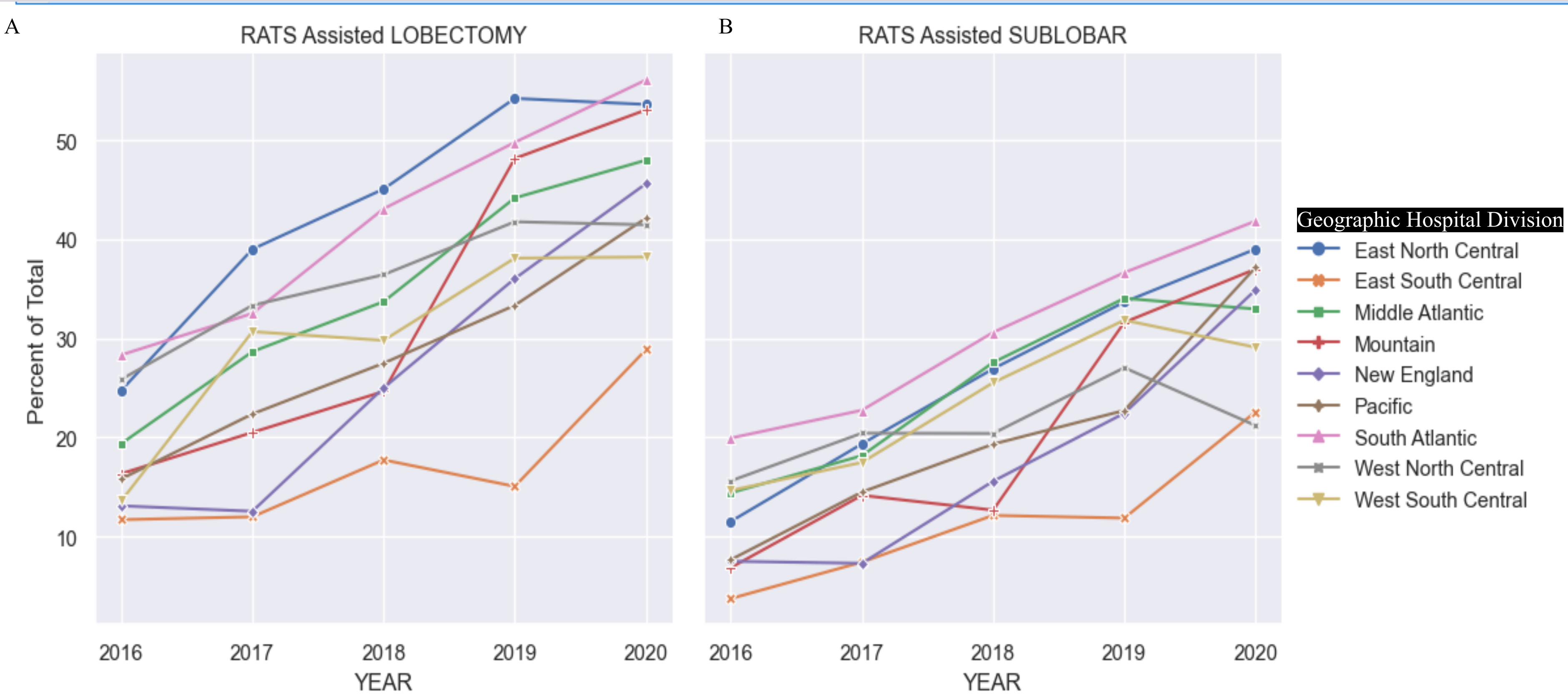


Figure 1: Trends in robotic-assisted lung resection by hospital division within the national inpatient sample from 2016-2020 for lobectomy (A) and sublobar lung resection (B); RATS= Robotic-assisted thoracoscopic Surgery

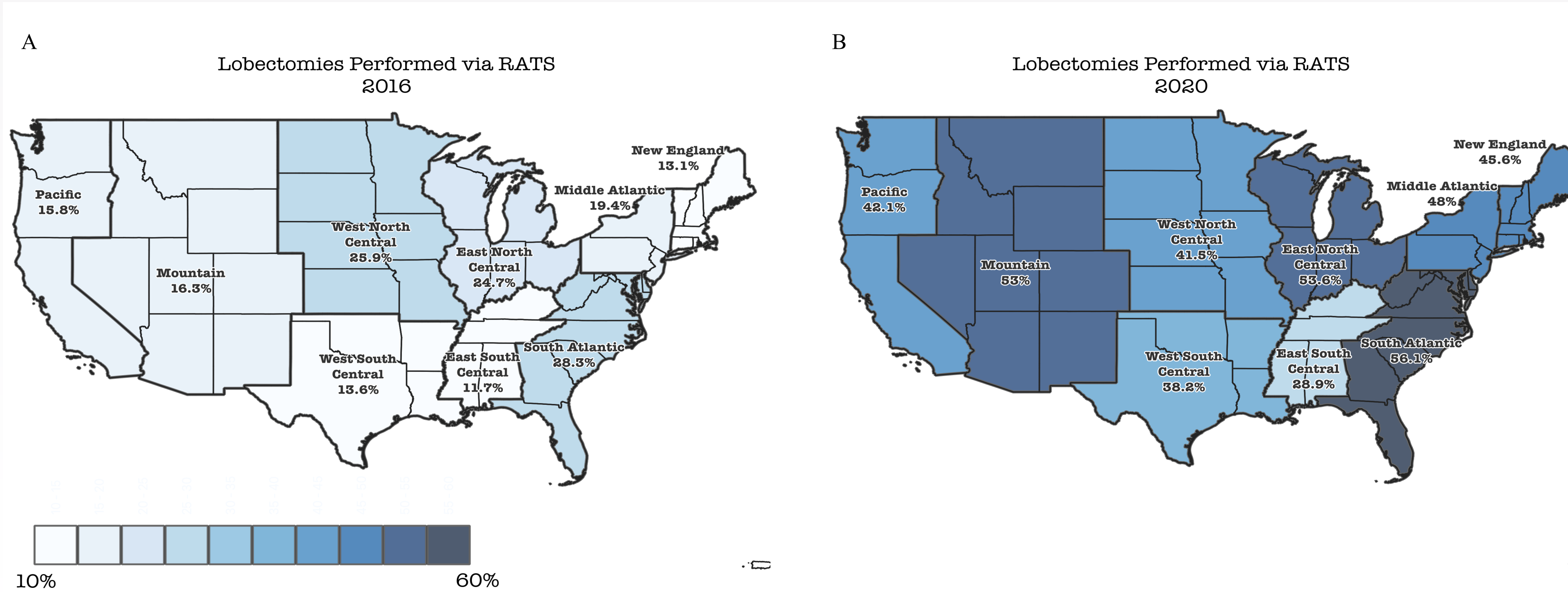


Figure 2: Rates of robotic-assisted lung resection within each hospital geographic division in the United States in 2016 (A) and 2020 (B)

VARIABLE	Odds Ratio (95% CI)	P-value
RURALNESS (Ref. "Central" counties of metro areas of ≥ 1 million population)		
"Fringe" counties of metro areas of ≥ 1 million population	0.85 (0.77 to 0.93)	<0.001
Counties in metro areas of 250,000-999,999 population	0.83 (0.75 to 0.92)	<0.001
Counties in metro areas of 50,000-249,999 population	0.67 (0.55 to 0.77)	<0.001
Metropolitan counties	0.75 (0.64 to 0.86)	<0.001
Not metropolitan or micropolitan counties	0.58 (0.49 to 0.69)	<0.001
POVERTY QUARTILE (Ref. 0-25th percentile)		
26-50th percentile	1.00 (0.91 to 1.11)	0.93
51-75th percentile	1.03 (0.93 to 1.14)	0.58
76-100th percentile	0.98 (0.87 to 1.09)	0.68
YEAR		
2016	1.38 (1.35 to 1.42)	<0.001
HOSPITAL GEOGRAPHIC DIVISION (Ref. East South Central)		
East North Central	3.88 (3.23 to 4.67)	<0.001
Middle Atlantic	2.44 (2.04 to 2.94)	<0.001
Mountain	2.31 (1.83 to 2.91)	<0.001
New England	1.77 (1.43 to 2.20)	<0.001
Pacific	1.64 (1.35 to 2.00)	<0.001
South Atlantic	3.53 (2.96 to 4.22)	<0.001
West North Central	2.87 (2.28 to 3.61)	<0.001
West South Central	2.02 (1.63 to 2.50)	<0.001
FEMALE (Ref. Male)		
Yes	0.98 (0.92 to 1.05)	0.59
RACE (Ref. White)		
Asian or Pacific Islander	1.27 (1.07 to 1.50)	0.006
Black	0.88 (0.77 to 1.00)	0.044
Hispanic	1.52 (1.29 to 1.78)	<0.001
Native American	0.38 (0.14 to 0.88)	0.036
Other	0.83 (0.65 to 1.06)	0.15
AGE		
18-44	1.01 (1.00 to 1.01)	0.03
PAYER TYPE (Ref. Private Insurance)		
Medicaid	1.13 (0.97 to 1.32)	0.11
Medicare	0.99 (0.91 to 1.09)	0.89
No charge	1.25 (0.43 to 3.48)	0.68
OTHER	1.49 (1.16 to 1.92)	0.002
Self-pay	0.69 (0.46 to 1.02)	0.071
EMERGENCY ADMISSION (Ref. No)		
Yes	0.69 (0.50 to 0.92)	0.015
HOSPITAL LOCATION & TEACHING STATUS (Ref. Rural)		
Urban nonteaching	1.38 (1.05 to 1.83)	0.022
Urban teaching	1.27 (0.99 to 1.66)	0.065
HOSPITAL BED SIZE (Ref. Small)		
Large	0.90 (0.80 to 1.01)	0.07
Medium	1.09 (0.96 to 1.23)	0.19

Table 1: Odds ratios of robotic-assisted thoracoscopic surgery utilization for lobectomy among studied variables.

Conclusions

- There were significant geographic differences in RATS utilization over VATS for lung resection.
- Demographic and hospital level factors also impacted odds of RATS utilization.
 - Ruralness impacted odds, but poverty and payer type largely did not for either lobectomy or sublobar resection
- Overall rates of RATS utilization between different geographic ranged from 16.9% to 44.7% for lobectomy and 11.5% to 30.6% for sublobar lung resection.

Contact

Aaron Dezube MD St. Elizabeths Medical Center;
Aaron.Dezube@Steward.org