High Tide Raises All Boats: Esophagectomy Outcomes for Low Volume Surgeons in High Volume Centers

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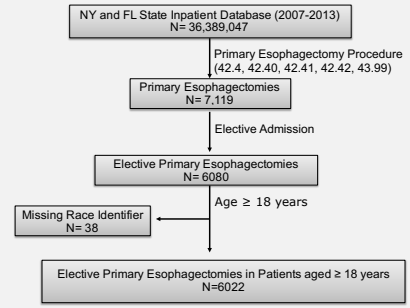
INTRODUCTION

- Esophageal cancer is the 8th most common incident cancer worldwide and the 5th leading cause of cancer among patients aged 40-59 years in the United States.[1]
- Esophagectomy, a surgical procedure that entails removing the majority of the esophagus and reconstructing most commonly with a gastric conduit, is the standard of care treatment for early to locally advanced esophageal cancer and end-stage benign esophageal disease.
- Over the past decade, higher hospital procedure volume has served as a marker of healthcare quality for esophagectomy.[2] Although surgeon volume effects are unclear.

We sought to answer the question do surgeons with low esophagectomy case volumes (LVS; <7 esophagectomies/year) operating at high volume hospitals (HVH; ≥13/year) exhibit patient outcomes comparable to high volume surgeons (HVS; ≥7/year)?

Hypothesis: Hospital esophagectomy volume has a greater effect on incidence of mortality and postoperative complications than surgeon esophagectomy volume.

METHODS



42.4	Excision of the esophagus
42.40	Esophagectomy, otherwise specified
42.41	Partial esophagectomy
42.42	Total esophagectomy
43.99	Other total gastrectomy

FIGURE 1. Inclusion criteria flowchart

High Vol Hosp (≥ 13 eso/yr) vs Low Vol Hosp (< 13 eso/yr)[2]

High Vol Surg (≥ 7 eso/yr) vs Low Vol Surg (< 7 eso/yr)[3]

We used *generalized linear mixed modeling* and adjusted for patient characteristics (sex, race, sum of Elixhauser comorbidities[4], age), year, and hospital State. Bonferroni correction was performed to account for multiple testing. NY and FL data were used as those states had both surgeon and hospital data.

RESULTS

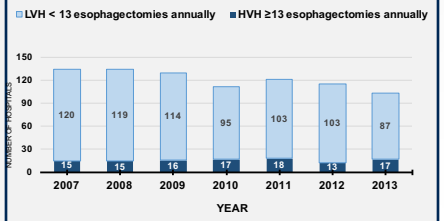


FIGURE 2. Number of high volume hospitals (HVH) and low volume hospitals (LVH) performing esophagectomies. **A greater proportion (84% - 89%) of hospitals in New York and Florida (2007 – 2013) performed <13 esophagectomies/year.**

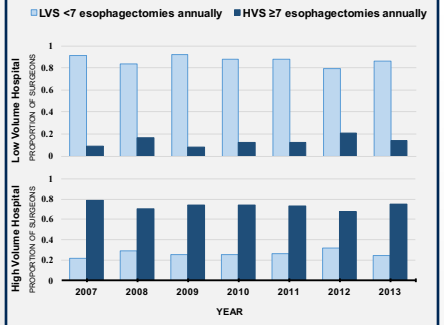


FIGURE 3. Distribution of low esophagectomy volume surgeons (LVS) and high esophagectomy volume surgeons (HVS) at low volume hospitals (LVH) and high volume hospitals (HVH) performing esophagectomies. At LVH, 80% - 92% of surgeons were LVS. **At HVH, 21% - 31% of surgeons performing esophagectomies were LVS.**

RESULTS

	Low Volume Hospital N=2126			High Volume Hospital N=3896		
	LVS (86.7%)	HVS (13.3%)	p	LVS (26.3%)	HVS (73.7%)	p
Age (years)*	64.2±11.3	61.7±11.4	<0.001	62.6±12.1	63.2±11.3	0.215
Male Sex	72.1%	71.4%	0.813	71.5%	76.5%	0.001
Race			0.310			<0.001
White	67.8%	67.8%		72.1%	84.8%	
Black	10%	7.4%		5.6%	2.7%	
Other	22.3%	24.7%		22.3%	12.5%	
Comorbidity+	3 (2-4)	2 (1-4)	0.015	2 (1-3)	2 (1-3)	0.106
1° CA Diagnosis	91%	91.5%	0.773	90.8%	93.8%	0.001

* values represent mean ± SD
\+ values represent median [interquartile range]

TABLE 1. Clinical characteristics of patients undergoing esophagectomy at low and high volume hospitals. Patients were predominantly male and white with a primary cancer diagnosis. **Although patients at low volume hospitals were primarily treated by low volume surgeons (LVS) and patients at high volume hospitals were primarily treated by high volume surgeons (HVS), there was an approximate equal proportion of patients treated by LVS and HVS (48%, 52% respectively).**

	HVH vs LVH OR	HVH vs LVH p	HVS vs LVS OR	HVS vs LVS p
Death	0.48	0.004	1.00	1.000
PLOS	0.76	0.021	0.81	0.250
Pulmonary Complications	1.00	1.000	0.77	0.070
Cardiac Complications	0.92	1.000	1.23	0.382
Gastrointestinal Complications	0.97	1.000	0.65	0.035
Hematologic Complications	0.66	0.002	0.81	0.690
Infectious Complications	0.91	1.000	0.83	1.000
Neurologic and Other Complications	0.90	1.000	0.96	1.000

PLOS = prolonged length of stay (≥14 days)

TABLE 2. Postoperative outcomes in patients undergoing esophagectomy. High volume hospitals (HVH) were associated with greater than 50% decrease in the odds of mortality and 15% reduced odds of incident prolonged length of stay > 14 days (PLOS) compared to low volume hospitals (LVH) **Other than gastrointestinal complications, surgeon volume had no effect on the odds for mortality, incidence of PLOS and postoperative complications irrespective of whether the surgery was performed at a HVH or LVH .**

CONCLUSIONS

Surgeons with low esophagectomy case volumes operating at high volume hospitals exhibit patient outcomes comparable to high volume surgeons.

Hospital volume is a modifiable risk factor associated with reduced mortality in patients undergoing elective esophagectomies.

Surgeon volume did not affect mortality, incidence of PLOS, or complications

These results suggest that surgical hospital environment, rather than individual surgeon experience, has the most impact on patient outcomes.

These results should be considered in the continued debate on allocation of healthcare resources, quality assessment and centralization of surgeries to improve outcomes after esophagectomy.

Esophagectomy is a less-commonly performed, high risk surgery and direct measurement of mortality and morbidity is not statistically reliable for policy decisions.

Hospital volume is a useful substitute for measurement of surgical quality and allows for selective referral of patients to high-performing hospitals.

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