

The Timing of Tracheostomy and Outcomes After Aneurysmal Subarachnoid Hemorrhage: A Nationwide Inpatient Sample Analysis

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Introduction

Few studies have specifically evaluated the timing of tracheostomy in the subarachnoid hemorrhage population, where cerebral edema, delayed cerebral ischemia, and the tempo of neurologic recovery provide unique considerations. The goal of this study was to utilize a national population to investigate the association of tracheostomy timing with complications.

Table 1. Multivariable linear regression evaluating predictors of later tracheostomy

Variable	Regression Coefficient	95% Confidence Interval	P Value
Race or Ethnicity			
Caucasian	Ref.	-	-
African-American	0.00	-1.25 – 1.24	0.99
Hispanic	2.33	-0.04 – 4.69	0.05
Asian	-0.76	-2.69 – 1.17	0.44
Unknown	-2.77	-4.24 – -1.31	<0.001*
Socioeconomic Status			
Lower Quartile	Ref.	-	-
Second Quartile	1.14	0.08 – 2.20	0.04*
Third Quartile	0.90	-0.13 – 1.94	0.09
Upper Quartile	1.59	0.02 – 3.16	0.047*
Missing	0.33	-2.49 – 3.15	0.82
Time to Aneurysm Repair			
Day of Admission	Ref.	-	-
Post-Admission Day 1	-0.12	-0.98 – 0.73	0.78
Post-Admission Day ≥2	1.72	0.26 – 3.18	0.02*
Large Hospital Bed Size	1.12	-0.23 – 2.48	0.10

Methods

Poor grade patients requiring mechanical ventilation with aneurysmal subarachnoid hemorrhage were extracted from the Nationwide Inpatient Sample (NIS, 2002-2011).

Multivariable linear regression analyzed predictors for tracheostomy timing and multivariable logistic regression evaluated the association of timing of intervention with mortality, complications, and discharge to institutional care.

Covariates included patient demographics (including age, sex, race/ethnicity, insurance status, and socioeconomic status), comorbidities, severity of subarachnoid hemorrhage (measured with the NIS-SAH severity scale), and hospital characteristics.

Table 2. Evaluation of outcomes stratified by tracheostomy timing

Outcome	Odds Ratio	95% Confidence Interval	P Value	C Statistic
Greater than Four Days Post Admission				
Renal Complications	1.33	0.53 – 3.31	0.54	0.73
Infectious Complications	2.30	1.39 – 3.79	0.001	0.62
Pneumonia	1.80	1.07 – 3.03	0.03	0.61
Venous Thromboembolism	1.20	0.64 – 2.25	0.57	0.65
Gastrointestinal Complications	1.52	0.76 – 3.03	0.24	0.65
Greater than Seven Days Post Admission				
Renal Complications	1.50	0.89-2.51	0.13	0.73
Infectious Complications	1.88	1.31-2.70	0.001*	0.63
Pneumonia	1.49	1.07-2.07	0.02*	0.61
Venous Thromboembolism	1.88	1.21-2.92	0.005*	0.66
Gastrointestinal Complications	0.98	0.65-1.47	0.90	0.65
Greater than Fourteen Days Post Admission				
Renal Complications	1.62	1.18-2.23	0.003*	0.74
Infectious Complications	1.53	1.13-2.08	0.007*	0.63
Pneumonia	1.55	1.22-1.97	<0.001*	0.62
Venous Thromboembolism	1.52	1.10-2.10	0.01*	0.66
Gastrointestinal Complications	1.47	1.10-1.98	0.01*	0.65

Results

- 1,428 admissions were included and the median time to tracheostomy was 13 (interquartile range: 9-17) days.
- Higher socioeconomic status and delayed aneurysm repair were associated with later tracheostomy placement (Table 1).
- Mortality, discharge to institutional care, neurologic, pulmonary, and cardiac complications, stroke, and decubitus ulcers did not differ significantly by tracheostomy time.
- Later tracheostomy was associated with greater odds of gastrointestinal (odds ratio (OR): 1.031, 95% confidence interval (CI): 1.014-1.048, $p < 0.001$), venous thromboembolic (OR: 1.022, 95% CI: 1.000-1.044, $p = 0.047$), and infectious complications (OR: 1.037, 95% CI: 1.007-1.065, $p = 0.001$) (Table 2, Figure 1).

Conclusions

In this national analysis, the timing of tracheostomy was not associated with mortality, neurologic complications, or discharge disposition. However, late tracheostomy was associated with increased odds of some medical complications.

Figure 1: Rates of Complications by Timing of Tracheostomy

