

# Comparison of temporal outcomes in patients undergoing tracheostomy between otolaryngology and general surgery

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## ABSTRACT

### Background

Nationally, there has been a relative decline in tracheostomies performed by otolaryngologists compared to general surgery. It has been postulated that this could be related to the maturing of acute care services that offer tracheostomy on an expedited basis, as well as the increasing popularity of percutaneous tracheostomy. Tracheostomy management varies widely between surgical disciplines and institutions. Such variation may impact patient safety, financial outcomes, and timely delivery of care. The primary objective of this study was to compare safety and quality outcomes for critical care patients undergoing tracheostomy by either otolaryngology or general surgery, with attention directed towards timely provision of tracheostomy placement.

### Methods

A retrospective case series with chart review using CPT codes to identify patients undergoing tracheostomy by otolaryngology or general surgery over a 5-year period was performed. Adults over 18 years of age undergoing tracheostomy in this interval were included. Patients below 18 years of age, or that underwent tracheostomy by a service other than otolaryngology or general surgery, were excluded. Primary outcomes included length-of-stay and number of days of mechanical ventilation prior to consultation and tracheostomy placement. Co-morbidities, post-operative complications, tracheostomy changes, tracheostomy-related readmissions and demographic variables were compared between surgical services.

### Results

There were 46 tracheostomies performed by otolaryngology and 17 tracheostomies performed by general surgery. Two patients had tracheostomies performed by cardiothoracic surgery, and were thus excluded. There were no additional exclusions. Median time to tracheostomy placement following consultation was 2.5 days and 3.0 days for general surgery and otolaryngology, respectively ( $p = 0.515$ ). Consultation following intubation took 10.5 days for otolaryngology and 8.0 days for general surgery ( $p = 0.375$ ). Median time to tracheostomy placement following intubation was 13 days and 16 days for general surgery and otolaryngology, respectively ( $p = 0.463$ ). No difference was identified between general surgery and otolaryngology regarding length-of-stay following tracheostomy ( $p=0.209$ ).

### Conclusions

Prolonged intubation and delay in tracheostomy placement are associated with multiple adverse outcomes. Despite increasing use of acute care services for the provision of tracheostomy placement on a national level, our institution demonstrates that otolaryngology services can indeed deliver timely tracheostomy care comparable to general surgery. In the future, we hope to develop a standardized protocol to further expedite tracheostomy care in an effort to reduce length-of-stay and minimize complications associated with prolonged intubation.

## INTRODUCTION

- A third of patients requiring long term mechanical ventilation will undergo tracheostomy
- Prolonged intubation associated with ventilator-associated pneumonia (VAP)
- Tracheostomy associated with decreases in VAP, sedative medication usage, and improved patient comfort and decreased healthcare costs and length of stay
- Shifting national trends in referral patterns for tracheostomy towards general surgery, with declining referral for otolaryngology
- The objective of this study is to evaluate the temporal relationship between intubation, consultation, and tracheostomy between both otolaryngology and general surgery at a community hospital

## METHODS

- Retrospective case series with chart review
- Utilized CPT codes to identify patients over 18 years old that underwent tracheostomy with either otolaryngology or general surgery
- Only included adult patients that underwent tracheostomy with otolaryngology or general surgery
- Excluded patients below 18 years of age, patients with inadequate medical record documentation to enable assessment of primary outcomes, or patients that underwent tracheostomy with a service other than otolaryngology or general surgery
- Primary outcomes included length of stay, total ventilation days until consultation, and total ventilation days until tracheostomy
- Secondarily interested in tracheostomy-related complications and tracheostomy-specific readmissions
- Also tracked demographic characteristics of patients that underwent tracheostomy with either otolaryngology and general surgery
- Complications and readmissions were intended to be assessed, but were found to be poorly reported
- Fisher's exact and Wilcoxon tests were used to compare categorical or continuous outcomes by type of service or patient subgroups. Patient characteristics were included in a multiple regression model for adjustments when estimating differences in outcomes between services. Log transformation was used on continuous outcomes when raw data revealed to be not normal.

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## RESULTS

**Table 1. Demographic characteristics of tracheostomy patients that underwent tracheostomy with either otolaryngology or general surgery**

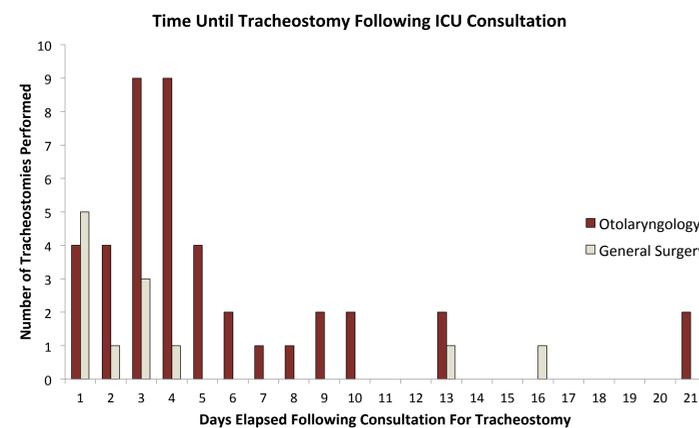
	Otolaryngology (N = 46)	General Surgery (N = 17)
Age	65.5 (56.0-74.0)	64.0 (54.0-76.0)
Male	27 (59%)	10 (59%)
Race		
Caucasian Non-Hispanic	32 (70%)	9 (53%)
Black	6 (13%)	3 (18%)
Other	8 (17%)	5 (29%)
Obesity	17 (37%)	6 (35%)
Medical History		
COPD	13 (28%)	4 (23%)
Pneumonia	7 (15%)	0 (0%)
Hypertension	15 (33%)	3 (18%)
Atrial Fibrillation	12 (26%)	2 (12%)
Coronary Artery Disease	9 (19%)	5 (29%)
Obstructive Sleep Apnea	1 (2%)	0 (0%)
Anticoagulated	22 (48%)	6 (35%)

**Table 1.** Demographic characteristics of patients undergoing tracheostomy with either general surgery or otolaryngology. Only age greater than 65 ( $p = 0.003$ ) and obesity ( $p = 0.002$ ) were found to be significant predictors of prolonged intubation; however, both otolaryngology and general surgery performed tracheostomy in a similar cohort with respect to age and obesity. Reported units in days. Table entry: Median (Interquartile range (IQR)) or count (%).

**Table 2. Comparison of temporal lengths between intubation, consultation and tracheostomy between otolaryngology and general surgery**

	Otolaryngology (N = 46)	General Surgery (N = 17)	p value
Total length of stay, d	27.5 (22.0-38.0)	24.0 (15.0-32.0)	0.209
Intubation to consultation, d	10.5 (8.0-16.5)	8.0 (6.0-12.0)	0.375
Intubation to tracheostomy, d	16.0 (10.0-19.0)	13.0 (10.5-18.5)	0.463
Consultation to tracheostomy, d	3.0 (2.0-5.0)	2.5 (1.0-3.5)	0.515
Tracheostomy to discharge, d	11.0 (6.0-16.0)	6.0 (3.0-15.0)	0.175

**Table 2.** Comparison of temporal lengths of intubation, consultation, and tracheostomy between otolaryngology and general surgery. No significant differences were found between otolaryngology and general surgery in terms of length of time elapsed until consultation or time elapsed between consultation and placement of tracheostomy. Reported units in days. Table entry: Median (Interquartile range (IQR)).



**Figure 1.** Graph comparing the relative distribution of tracheostomy following consultation between general surgery and otolaryngology. There is a general trend for earlier tracheostomy amongst general surgery, however, no significant difference was found in terms of timeliness to tracheostomy following consultation between otolaryngology and general surgery.

## DISCUSSION

- Similar demographic characteristics between otolaryngology and general surgery patient cohorts, although otolaryngology cohort had a much higher proportion of patients on anticoagulation and whites.
- Intubation to tracheostomy consultation time represented one of the longest delays within the episode of care, with consultation generally not occurring until day 8 to 11 for either service.
- Both age >65 and obesity were significantly associated with longer intubation times; however, age profiles and rates of obesity were similar between the otolaryngology and general surgery cohorts
- Trend towards significant suggesting general surgery patients may be discharged sooner after tracheostomy ( $p = 0.175$ ), however, additional study power is needed.
- No statistically significant differences between otolaryngology and general surgery cohorts in terms of time until consultation or time until tracheostomy following intubation, even after having adjusted for potential confounders, i.e., age and obesity
- More efforts are needed to initiate early consultation for tracheostomy in patients at risk for prolonged ventilation requirements, as this could in turn reduce the length of time between consultation and tracheostomy placement

## CONCLUSIONS

- At a single institution, otolaryngology was able to provide tracheostomy in as timely of a fashion as general surgery
- There is still a significant delay in tracheostomy placement in patients with prolonged intubation
- Protocol for early, targeted tracheostomy in patients suspected to require prolonged ventilation will need to be developed in the future
- Future studies needed to compare efficacy of such a protocol in improving LOS and healthcare costs

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