Indications and Outcomes of Tracheostomy: A Descriptive Study Using the Outcome-Based Evaluation Forms of Otorhinolaryngology - Head and Neck Surgery Department in a Tertiary Hospital (2016-2020)

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ABSTRACT

Introduction Tracheostomy is a surgical procedure that creates a neck opening directly into the trachea, typically performed to establish an alternative airway for individuals who experience difficulty breathing as a result of certain medical conditions. Tracheostomy can be temporary or permanent, and it plays a crucial role in the management of both acute and chronic respiratory issues and can significantly improve the quality of life for those who require it.

Objective This study aims to investigate the incidence, common indications and outcomes of tracheostomy in the Otorhinolaryngology-Head and Neck Surgery (ORL-HNS) department of a tertiary hospital in Manila, Philippines.

Methodology This is a retrospective descriptive study including all admissions and in-patient referrals to the clinical division of the Department of Otorhinolaryngology-Head and Neck Surgery who underwent tracheostomy from January 2016 to December 2020. Data were retrieved by review of medical records and Outcome Based Evaluation (OBE) form of all patients who underwent tracheostomy during the study period.

Results Our study involved 74 patients with a male-to-female ratio of 22:15. The patients' ages ranged from 5 to 89 years. Prolonged intubation was the main reason for tracheostomy, followed by upper airway obstruction due to supraglottic mass for males and vocal cord paralysis for females. Only three patients who had tracheostomy experienced complications and were managed accordingly.

Conclusion Tracheostomy is one of the most valuable and reliable surgical procedures for managing airway obstructions. Proper patient and caregiver education as well as constant follow-up are crucial to prevent complications.

Keywords Airway, Tracheostomy, ORL-HNS

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INTRODUCTION

Tracheostomy is the surgical creation of an opening into the trachea to establish an airway in critically ill

patients with upper airway obstruction or in patients with other indications. Tracheostomy is one of the oldest surgical procedures on record, dating back as far as 3600 B.C.E. in Egypt.[1,3] Tracheostomy today is one of the standard surgical procedures performed by the otolaryngologist to help improve the lives of patients with upper airway obstruction. Indications for tracheostomy have evolved from mainly short-term procedures secondary to infectious causes to long-term procedures for chronic disease and disability.[2]

Complications in tracheostomy, although minimal, still exist. A 2006 review revealed the overall complication rate for tracheostomy to be 3.2%, with procedure-related mortality approximating 0.6%. Complication rates were higher in patients with upper airway infections, obesity, paralysis and congestive heart failure. Not surprisingly, post-procedure mortality was also higher in patients with cardiac conditions (>25%) compared to patients with trauma (6% vs. 11.5%) or pulmonary infection (5.7%).[2,3]

This research study aims to evaluate and determine the common indications and outcomes of tracheostomy performed by Otolaryngology-Head and Neck surgeons. With the knowledge that will be obtained in this study and information regarding the probable complications and their causative factors, the surgeon can efficiently plan the procedure and refine his techniques during tracheostomy.

METHODOLOGY

This is a retrospective, descriptive study, including all patients who underwent tracheostomy under the Department of Otorhinolaryngology-Head and Neck Surgery of the University Hospital clinical division from January 2016 to December 2020. The research includes all admissions and inpatient referrals to the department at the clinical division. Data retrieved from medical records and the Department's Outcome Based Evaluation form (OBE), which includes demographic profile, main service, primary diagnosis, indication for tracheostomy, surgery outcome/complications, operation time, cutting to insertion of the tube and care outcome of management. This paper only includes patients with a complete OBE form (Figure 1) from the department. The OBE form is only used for the clinical division patient who underwent the procedure.

Mean, range and standard deviation summarized the data in quantitative forms, such as age, gender, indications for the surgery and outcome while counts and percentage summarized the data in categorical form.

RESULTS

From 2016 to 2020, the University Hospital clinical division had 115 patients who underwent tracheostomy under the Department of Otorhinolaryngology-Head and Neck Surgery. The study included a total of 74 patients, while 41 patients were excluded due to the presence of missing or incomplete OBE forms or due to being lost to follow-up.

The age of patients ranged from 5 to 89 years. There are 44 males and 30 females with M:F ratio of 22:15. Majority of the patients were in the sixth decade of life.

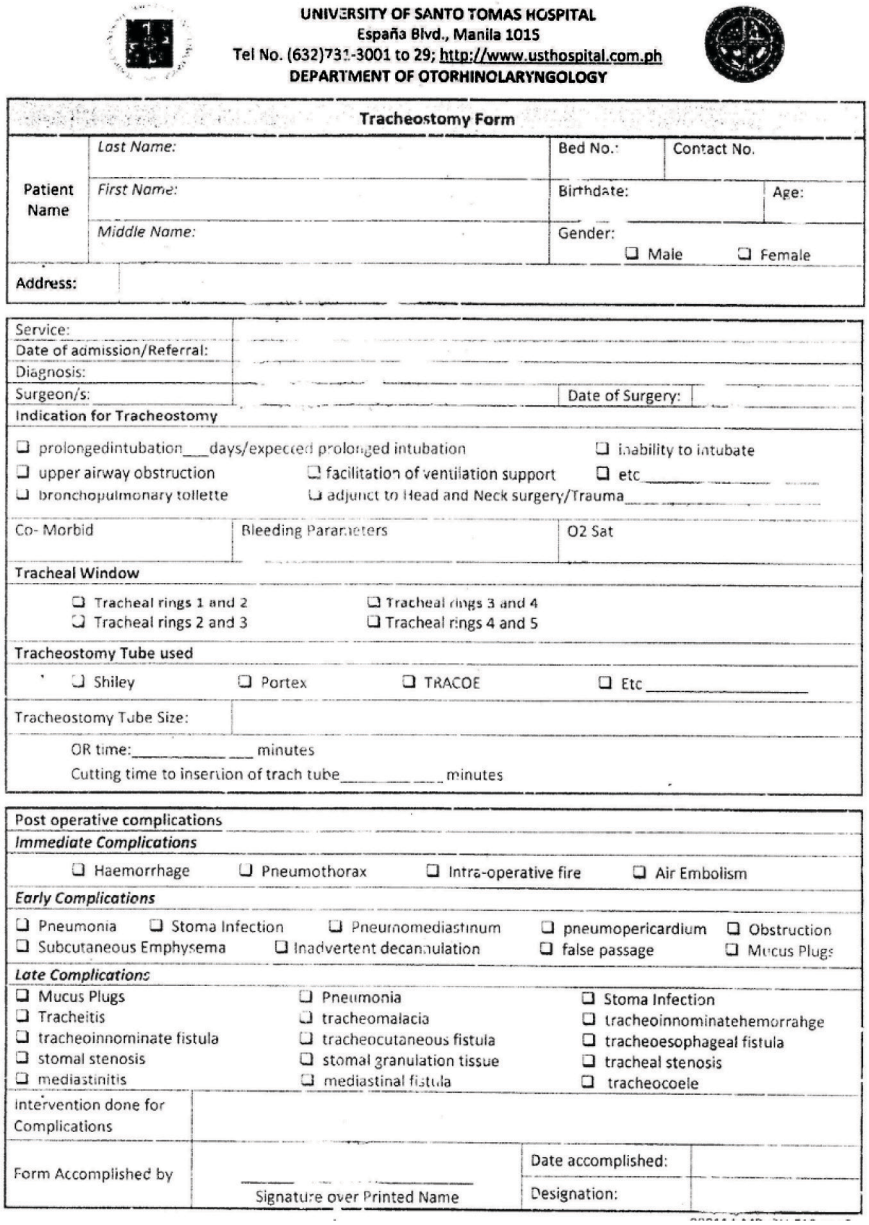
The most common indication for tracheostomy was prolonged intubation at 32 (43.24%), followed by upper airway obstruction at 29 (39.19%), and adjunct to head and neck surgery at 10 (13.51%). In patients who had tracheostomy secondary to prolonged ventilation, the duration of intubation before tracheostomy was performed ranged from 10 to 147 days with a mean duration of 22 days. Most patients were in the sixth and eighth decade of life for females and the third and sixth decade for males (Table 1).

Among the patients who had tracheostomy secondary to upper airway obstruction, they were predominantly due to supraglottic mass (23.80%) for males and vocal cord paralysis (37.5%) for females (Table 2).

At the same time, those who underwent tracheostomy secondary to malignancy were in their fourth to eighth decade of life and were primarily due to supraglottic mass (30%) followed by transglottic mass (20%) (Table 3).

In addition, this study noted that the average operating time was 56.88 minutes, with the average time from cutting to insertion of the tube at 34.91 minutes (Table 4).

Complications related to tracheostomy were documented only in three patient cases. One early complication of subcutaneous emphysema was noted, while two late complications of pneumonia and mucus plug were noted. Intervention done was



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Tracheostomy Form

Patient Name	*Last Name:*	Bed No.:	Contact No.
	First Name:	Birthdate:	Age:
	Middle Name:	Gender: ❑ Male ❑ Female	
Address:			

Service:		
Date of admission/Referral:		
Diagnosis:		
Surgeon/s:		Date of Surgery:

Indication for Tracheostomy

❑ prolongedintubation___days/expected prolonged intubation ❑ inability to intubate
❑ upper airway obstruction ❑ facilitation of ventilation support ❑ etc_____
❑ bronchopulmonary toilette ❑ adjunct to Head and Neck surgery/Trauma_____

Co- Morbid	Bleeding Parameters	O2 Sat

Tracheal Window

❑ Tracheal rings 1 and 2 ❑ Tracheal rings 3 and 4
❑ Tracheal rings 2 and 3 ❑ Tracheal rings 4 and 5

Tracheostomy Tube used

❑ Shiley ❑ Portex ❑ TRACOE ❑ Etc_____

Tracheostomy Tube Size:

OR time:_____ minutes
Cutting time to insertion of trach tube_____minutes

Post operative complications

Immediate Complications

❑ Haemorrhage ❑ Pneumothorax ❑ Intra-operative fire ❑ Air Embolism

Early Complications

❑ Pneumonia ❑ Stoma Infection ❑ Pneumomediastinum ❑ pneumopericardium ❑ Obstruction
❑ Subcutaneous Emphysema ❑ Inadvertent decannulation ❑ false passage ❑ Mucus Plugs

Late Complications

❑ Mucus Plugs	❑ Pneumonia	❑ Stoma Infection
❑ Tracheitis	❑ tracheomalacia	❑ tracheoinnominatehemorrahge
❑ tracheoinnominate fistula	❑ tracheocutaneous fistula	❑ tracheoesophageal fistula
❑ stomal stenosis	❑ stomal granulation tissue	❑ tracheal stenosis
❑ mediastinitis	❑ mediastinal fistula	❑ tracheocoele

Intervention done for Complications			
Form Accomplished by	_____ Signature over Printed Name	Date accomplished:	
		Designation:	

Figure 1 Blank Department's Outcome-Based Evaluation (OBE) Form

Table 1 Age and gender distribution of patients who had tracheostomy due to prolonged intubation

Age	Female (n=16) (%=freq)	Male (n=16) (%=freq)	Total for both gender (n=32) (%=freq)
0-9	-	1 (6.25%)	1 (3.13%)
10-19	2 (12.50%)	1 (6.25%)	3 (9.38%)
20-29	1 (6.25%)	-	1 (3.13%)
30-39	1 (6.25%)	4 (25.00%)	5 (15.63%)
40-49	1 (6.25%)	2 (12.50%)	3 (9.38%)
50-59	2 (12.50%)	3 (18.75%)	5 (15.63%)
60-69	4 (25.00%)	4 (25.00%)	8 (25.00%)
70-79	2 (12.50%)	-	2 (6.25%)
80-90	3 (18.75%)	1 (6.25%)	4 (12.50%)

Table 2 Gender and main diagnosis of patients who underwent tracheostomy secondary to upper airway obstruction

Diagnosis	Female (n= 8) (%=freq)	Male (n= 21) (%=freq)	Total for both gender (n= 29) (%=freq)
Enlarged Tongue	1 (12.5%)	-	1 (3.45%)
Base of the Tongue	-	1 (4.76%)	1 (3.45%)
Tongue and Floor of the Mouth Squamous Cell Carcinoma Stage IVA(T4aN0M0)	1 (12.5%)	-	1 (3.45%)
Laryngeal Mass	-	2 (9.52%)	2 (6.90%)
Laryngeal Edema	-	1 (4.76%)	1 (3.45%)
True Vocal Cord Mass	-	1 (4.76%)	1 (3.45%)
Supraglottic Mass	-	5 (23.80%)	5 (17.24%)
Glottic Mass	1 (12.5%)	4 (19.05%)	5 (17.24%)
Hypopharyngeal Mass	1 (12.5%)	2 (9.52%)	3 (10.34%)
Transglottic Mass	-	3 (14.29%)	3 (10.34%)
Papillary Thyroid Carcinoma	1 (12.5%)	-	1 (3.45%)
Vocal Cord Paralysis	3 (37.5%)	2 (9.52%)	5 (17.24%)

Table 3 Age, gender, and main diagnosis of patients who underwent tracheostomy in adjunct to head and neck malignancy

Age and Diagnosis	Female (n=5) (%=freq)	Male (n=5) (%=freq)	Total for both gender (n=10) (%=freq)
40-49			
Laryngeal Mass	0	1 (20%)	1 (10%)
50-59			
Laryngeal Mass	1 (20%)	0	1 (10%)
True Vocal Cord Paralysis Secondary to Iatrogenic Cause	1 (20%)	0	1 (10%)
60-69			
Supraglottic Mass	1 (20%)	2 (40%)	3 (30%)
Transglottic Mass	0	2 (40%)	2 (20%)
Tongue Mass	1 (20%)	0	1 (10%)
80-90			
Glottic Mass	1 (20%)	0	1 (10%)

cuff inflation for early complications and antibiotic therapy and proper tracheostomy care for late complications, respectively (Table 4).

DISCUSSION

Since it was originally described in the first century B.C., tracheostomy is currently one of the most commonly performed operations in critically ill patients.[4] Out of 74 patients included in the study, 44 were males and 30 females, with a male:female ratio of 22:15. Male predominance seen in this study may be due to their increased risk of malignancy as a result of their habits of smoking and alcohol consumption. In most of the studies worldwide, the same findings show a male predominance among tracheostomized patients.[4-9] The patients in this study ranged from 5 to 89 years, with the predominant age group being 61 and above, similar to the study of Menon, et al.[5] The most common indication in the study was prolonged intubation, followed by upper airway obstruction due to supraglottic

Table 4 Outcome-Based Evaluation (OBE) Form

DATA COLLECTION FORM

Characteristics	Year					Total (n=74)	Proportion (%freq)
	2016	2017	2018	2019	2020		
Age							
0-10	0	1	0	1	0	**2**	**2.7%**
11-20	1	2	1	1	0	**5**	**6.76%**
21-30	1	0	0	0	0	**1**	**1.35%**
31-40	3	1	0	2	0	**6**	**8.11%**
41-50	2	0	1	1	1	**5**	**6.76%**
51-60	5	6	1	6	1	**19**	**25.68%**
61 and above	8	15	1	10	2	**36**	**48.65%**
Gender							
Male	13	14	2	11	4	**44**	**59.46%**
Female	7	11	2	10	0	**30**	**40.54%**
Indications							
Adjunct to Head and Neck Surgery/Trauma	3	3	1	2	1	**10**	**13.52%**
Bronchopulmonary toilette	0	1	0	0	0	**1**	**1.35%**
Facilitation of ventilation support	0	0	0	1	0	**1**	**1.35%**
Inability to intubate	1	0	0	0	0	**1**	**1.35%**
Prolonged intubation	6	9	3	14	0	**32**	**43.24%**
Upper airway obstruction	10	12	0	4	3	**29**	**39.19%**
Outcome							
Hemorrhage	0	0	0	0	0	**0**	**0**
Pneumothorax	0	0	0	0	0	**0**	**0**
Intra-operative fire	0	0	0	0	0	**0**	**0**
Air embolism	0	0	0	0	0	**0**	**0**
Early complications							
Pneumonia	0	0	0	0	0	**0**	**0**
Stoma infection	0	0	0	0	0	**0**	**0**
Pneumomediastinum	0	0	0	0	0	**0**	**0**
Pneumopericardium	0	0	0	0	0	**0**	**0**
Obstruction	0	0	0	0	0	**0**	**0**
Subcutaneous emphysema	0	0	0	1	0	**1**	**1.35%**
Inadvertent decannulation	0	0	0	0	0	**0**	**0**
False passage	0	0	0	0	0	**0**	**0**
Mucus plug	0	0	0	0	0	**0**	**0**
Late complications							
Mucus plug	0	1	0	0	0	**1**	**1.35%**
Tracheitis	0	0	0	0	0	**0**	**0**
Tracheoinnominate fistula	0	0	0	0	0	**0**	**0**
Stomal stenosis	0	0	0	0	0	**0**	**0**
Mediastinitis	0	0	0	0	0	**0**	**0**
Pneumonia	0	1	0	0	0	**1**	**1.35%**

(Continued)

Table 4 Outcome-Based Evaluation (OBE) Form (Continued)

DATA COLLECTION FORM

Characteristics	Year					Total (n=74)	Proportion (%freq)
	2016	2017	2018	2019	2020		
Tracheomalacia	0	0	0	0	0	**0**	**0**
Tracheocutaneous fistula	0	0	0	0	0	**0**	**0**
Stromal granulation tissue	0	0	0	0	0	**0**	**0**
Mediastinal fistula	0	0	0	0	0	**0**	**0**
Stoma infection	0	0	0	0	0	**0**	**0**
Tracheoinnominate hemorrhage	0	0	0	0	0	**0**	**0**
Tracheoesophageal fistula	0	0	0	0	0	**0**	**0**
Tracheal stenosis	0	0	0	0	0	**0**	**0**
Tracheocoele	0	0	0	0	0	**0**	**0**
Intervention done for complications	N/A		N/A		N/A		
Antibiotic Therapy Only	N/A	1	N/A	0	N/A		
Proper Tracheostomy Care Only	N/A	0	N/A	0	N/A		**N/A**
Antibiotic Therapy and Proper Tracheostomy Care	N/A	1	N/A	0	N/A		
Cuff inflation	N/A	0	N/A	1	N/A		
Average OR time per year (minutes)	43.75	50.84	70.75	73.95	56.75	**59.21**	**N/A**
Average overall OR time (minutes)				56.88			
Cutting to Insertion of tube (Average time per year)	23.2	30.16	46.25	51.05	27	**35.53**	**N/A**
Cutting to Insertion of tube (Overall Average time)				34.91			

mass (23.80%) for males and vocal cord paralysis (37.5%) for females. Complications were only noted in the three patients who underwent tracheostomy and were managed accordingly.

To the researchers' knowledge, this would be the first study in the country to report patient demographics, indications and outcomes of tracheostomy in the ORL-HNS department of a tertiary hospital. The result gathered in this research can provide local data on the common complications of our Filipino patients and may help us establish preventive strategies and intra-/post-operative guidelines on the possible outcome, which may be used for further refinement of surgical techniques in order to give quality service to our patients.

Even though tracheostomy is simple and a commonly performed procedure by other surgeons, ORL-HNS surgeons often deal with head and neck malignancies and frequently manage upper airway emergencies; hence most of the challenging cases are referred to an otolaryngologist. Furthermore, the use of the department's OBE form also highlighted the competency of the ORL-HNS surgeon, emphasizing that training during residency is crucial to confirm the competence of the otolaryngologist during challenging tracheostomies.

It is important to acknowledge that this study has certain limitations, mainly due to its retrospective nature. As mentioned previously, 74 patients were included in the study, while 41 were excluded due to various reasons, which is a significant aspect to consider as it affects the statistical significance and generalizability of results. Therefore, it is crucial to ensure that all forms are accurately filled out and adequate measures taken to prevent loss of follow-up in order to maintain the integrity of the study's findings.

In order to improve future studies, it is recommended to create a standardized digital format that includes additional patient data such as the type of anesthesia used, whether the tracheostomy was emergency or elective, as well as relevant anatomical factors such

as weight, previous head and neck surgery, and any limitations in neck mobility. It is also important to establish criteria for follow-up time with the patient to monitor their current status and address any potential complications that may arise after hospital discharge. This should include management strategies and the possibility of decannulation if necessary.

CONCLUSION

Tracheostomy will likely remain one of the most valuable and reliable surgical procedures that will be used in the care of patients with actual or potential airway compromise. It remains a quick, safe and simple procedure when performed by an experienced surgeon under controlled circumstances and should be considered an option for the care of the critically ill. Common indications during the time investigated include prolonged intubation (43.24%), upper airway obstruction secondary to laryngeal masses (39.19%) and as an adjunct to head and neck surgery (13.51%). In relation to this, patient and caregiver education before performing elective tracheostomy and during discharge will help to improve patient outcomes and decrease complications related to the tracheostomy. A majority of the outcomes were noted to be unremarkable except for the 4% (3 cases) who had complications that could be avoided by proper caregiver education preoperatively, the expertise of the surgeon, adequate tracheostomy care and regular follow-up.

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Conflict of interest None declared

Ethical approval The study was approved by the University of Santo Tomas Hospital - Research Ethics Committee (USTH-REC)

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