

## Original Research Article

# Changing trends in tracheostomy indications: a single-center observational study

Sridhar Reddy Dandala, Vinod Kumar Gonuru\*, Swetha Kolla

Department of Otorhinolaryngology, Apollo Institute of Medical Sciences and Research, Hyderabad, Telangana, India

**Received:** 11 March 2026

**Revised:** 17 April 2026

**Accepted:** 30 April 2026

### \*Correspondence:

Dr. Vinod Kumar Gonuru,

E-mail: [drvinodkumar\\_g@apolloimsr.edu.in](mailto:drvinodkumar_g@apolloimsr.edu.in)

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

**Background:** The indications for tracheostomy have evolved, shifting from emergency airway obstruction to prolonged mechanical ventilation in intensive care settings. Objectives were to analyze the changing trends in tracheostomy indications and evaluate patient outcomes in a tertiary care center.

**Methods:** A retrospective observational study of 40 patients who underwent tracheostomy. Data included demographics, indication, diagnosis, intubation-to-tracheostomy interval, complications, discharge condition, and follow-up outcomes.

**Results:** The mean age was 53.5±18.1 years. Prolonged intubation/ventilation remained the predominant indication (55%; n=22). The mean interval between intubation and tracheostomy was 7.8±4.2 days. No intraoperative complications occurred. Ward complications were seen in 15% (n=6). At discharge, 55% (n=22) were discharged with a tracheostomy tube. During follow-up, 20% (n=8) were decannulated, 10% (n=4) died, and outcomes were unknown in 40% (n=16).

**Conclusions:** Prolonged ventilation continues to be the leading indication for tracheostomy. The procedure demonstrates a strong safety profile. However, follow-up documentation remains inadequate and needs structured improvement.

**Keywords:** Tracheostomy, Indications, Mechanical ventilation, Critical care, Outcome

### INTRODUCTION

Tracheostomy is a surgical intervention in airway management, involving the creation of a direct opening into the trachea to secure ventilation, facilitate pulmonary toileting, and provide a stable airway for prolonged respiratory support. Traditionally, the procedure was performed as an emergency measure for acute upper airway obstruction resulting from infections, trauma, or neoplastic conditions.<sup>1</sup> However, with the evolution of modern critical care medicine and the widespread use of endotracheal intubation, the indications for tracheostomy have undergone a significant transformation.<sup>2,3</sup>

In contemporary clinical practice, prolonged mechanical ventilation has emerged as the predominant indication for tracheostomy in intensive care units worldwide.<sup>1</sup> This shift reflects advancements in ventilatory support, improved

survival of critically ill patients, and an increasing burden of diseases requiring extended respiratory assistance, including severe infections, neurological impairment, and multiorgan dysfunction.<sup>4,5</sup> As a result, tracheostomy is now more frequently performed as an elective procedure in controlled ICU settings rather than as an emergency intervention.<sup>3</sup>

The incorporation of tracheostomy into ICU management has been associated with several physiological and clinical advantages. Compared with prolonged endotracheal intubation, it reduces airway resistance, improves patient comfort, and facilitates effective clearance of tracheobronchial secretions.<sup>1,5</sup> Additionally, it enables better oral hygiene, reduces sedation requirements, and supports earlier mobilization and rehabilitation.<sup>1,3</sup> These benefits have contributed to its increasing acceptance as a supportive modality in critically ill patients.

Despite these advantages, the optimal timing of tracheostomy remains a subject of ongoing debate. Early tracheostomy, typically performed within the first week of intubation, has been associated with reduced duration of mechanical ventilation and shorter ICU stay, whereas delayed tracheostomy may be appropriate in selected patients based on clinical judgment.<sup>2,4</sup>

Although tracheostomy is considered a relatively safe procedure when performed under standardized conditions, it is not without potential complications. These include hemorrhage, infection, tube displacement, and airway injury, particularly in patients with significant comorbidities.<sup>7,8</sup> Careful surgical technique and meticulous postoperative care are essential to minimize morbidity and optimize outcomes.<sup>7</sup>

In resource-limited settings, tracheostomy practices may be influenced by infrastructure constraints, availability of skilled personnel, and variability in follow-up systems.<sup>9</sup>

The present study aims to evaluate the changing trends in tracheostomy indications, timing, complications, and outcomes in a tertiary care setting.

## METHODS

### Study design and setting

This was a retrospective observational study conducted at the Department of ENT, Apollo Institute of Medical Sciences and Research, Hyderabad, India.

### Study period

This study was conducted from December 2024 to December 2025.

### Study population

A total of 40 patients who underwent tracheostomy during the study period were included, consistent with similar observational cohort sizes in previous studies.

### Inclusion criteria

Adult patients (>18 years) who underwent tracheostomy during the study period, patients who required tracheostomy for prolonged mechanical ventilation or airway obstruction and patients with complete and accessible medical records were included in the study.

### Exclusion criteria

Pediatric patients (<18 years) due to differences in indications and management and patients who underwent tracheostomy under emergency conditions without complete documentation were excluded from the current study.

## Procedure

Tracheostomy was performed under aseptic precautions with the patient in a supine position and neck extended to optimize exposure of the trachea.<sup>2,12,14</sup> A horizontal skin incision was made 2 finger breadths below suprasternal notch, and the subcutaneous tissue and platysma were dissected. The strap muscles were separated in the midline, and the thyroid isthmus was either retracted or divided to expose the trachea.<sup>2,12</sup> The trachea was identified and opened at the level of the second to fourth tracheal rings, which is considered the safest and most commonly recommended site to avoid injury to adjacent structures.<sup>12,14</sup> A tracheostomy tube of appropriate size was inserted and secured with ties, and correct placement was confirmed clinically by adequate air entry and chest expansion.<sup>2</sup>

Postoperative care included regular suctioning, humidification, monitoring for complications such as bleeding, infection, tube blockage, and displacement, and ensuring proper tube maintenance.<sup>7,8,14</sup> Standard tracheostomy care protocols were followed to minimize complications and improve patient outcomes.<sup>7,14</sup>

### Data collection

Data were collected from hospital records including demographic details, indication, diagnosis, interval between intubation and tracheostomy, complications, discharge status, and follow-up outcomes.

### Ethical approval

As this was a retrospective study based on existing records, the need for full ethical approval was reviewed and waived by the institutional ethics committee.

### Statistical analysis

Data were analyzed using SPSS (Statistical package for the social sciences), version 25 with continuous variables expressed as mean±SD and categorical variables as frequency and percentages.

## RESULTS

The study included a total of 40 patients who underwent tracheostomy during the study period. The mean age of the study population was 53.5±18.1 years, and the average interval between endotracheal intubation and tracheostomy was 7.8±4.2 days, as summarized in Table 1.

**Table 1: Demographic characteristics of study population.**

| Parameters          | Value        |
|---------------------|--------------|
| Number of patients  | 40           |
| Mean age (in years) | 53.5±18.1    |
| Mean interval       | 7.8±4.2 days |

### Intubation-to-tracheostomy interval

Mean interval was  $7.8 \pm 4.2$  days.

Prolonged mechanical ventilation was identified as the most common indication for tracheostomy, accounting for the majority of cases, while other indications such as airway obstruction and miscellaneous causes constituted the remaining proportion. Detailed distribution of indications is presented in Table 2.

**Table 2: Distribution of indications.**

| Parameters   | Value             |
|--|-------------------|
| <b>Prolonged intubation/ventilation</b>                  | 22 patients (55%) |
| <b>Other causes (airway obstruction + miscellaneous)</b> | 18 patients (45%) |

The procedure demonstrated a favorable intraoperative safety profile, with no complications reported during surgery. Postoperative complications were observed in a subset of patients.

Intraoperative were none.

Ward complications were 6 patients (15%) Bloodstream infection-MRSA colonization, local wound complications.

At the time of discharge, more than half of the patients required continuation of tracheostomy tube support, whereas only a small proportion were decannulated prior to discharge. These findings are detailed in Table 3.

**Table 3: Discharge status.**

| Discharge status                         | N        |
|--|----------|
| <b>Discharged with tracheostomy tube</b> | 22 (55%) |
| <b>Discharged without tube</b>           | 2 (5%)   |

Follow-up outcomes revealed that a proportion of patients were successfully decannulated, while some patients succumbed during the follow-up period. However, a significant number of cases had incomplete follow-up data, limiting comprehensive outcome assessment. The distribution of follow-up outcomes is presented in Table 4.

**Table 4: Follow-up endpoints.**

| Outcome             | N        |
|---------------------|----------|
| <b>Decannulated</b> | 8 (20%)  |
| <b>Death</b>        | 4 (10%)  |
| <b>Unknown</b>      | 16 (40%) |
| <b>Other</b>        | 2 (5%)   |

## DISCUSSION

This study demonstrates that prolonged mechanical ventilation has emerged as the predominant indication for

tracheostomy, accounting for 55% of cases in our cohort. This finding is consistent with contemporary global trends, where advances in intensive care, improved ventilatory strategies, and increased survival of critically ill patients have shifted the role of tracheostomy from an emergency airway procedure to an elective intervention in ICU settings.<sup>1,3,13</sup> Historically, tracheostomy was commonly performed for upper airway obstruction due to infections, trauma, or malignancy; however, such indications now represent a smaller proportion of cases.<sup>3</sup>

The mean interval between endotracheal intubation and tracheostomy in this study was  $7.8 \pm 4.2$  days, which falls within the early tracheostomy window described in the literature.<sup>4,9</sup> Early tracheostomy has been associated with several potential benefits, including improved patient comfort, reduced need for sedation, enhanced pulmonary hygiene, and facilitation of weaning from mechanical ventilation.<sup>1,5</sup> Although the optimal timing of tracheostomy remains a subject of debate, our findings support the growing preference for earlier intervention in selected patients.<sup>2,4</sup>

The procedure demonstrated a favorable safety profile, with no intraoperative complications reported. This highlights the importance of surgical expertise, adherence to standard techniques, and appropriate patient selection.<sup>2,7</sup> Postoperative complications were observed in 15% of patients, including bloodstream infections, MRSA colonization, and local wound complications. These findings are comparable to previously reported complication rates and indicate that tracheostomy, when performed under controlled conditions, is a relatively safe procedure.<sup>7,8</sup>

The decannulation rate observed in this study was 20%, which is lower than that reported in larger studies.<sup>6,10</sup> This may be attributed to the high proportion of critically ill patients with prolonged ICU stays and significant comorbidities. Additionally, a major limitation influencing outcome interpretation is the high percentage (40%) of patients with unknown follow-up status. This reflects gaps in post-discharge tracking and emphasizes the need for structured follow-up systems and standardized decannulation protocols.<sup>9,10</sup>

The mortality rate of 10% in this study is likely related to the severity of underlying illness rather than the tracheostomy procedure itself. Tracheostomy should therefore be viewed as a supportive intervention that facilitates long-term airway management rather than a determinant of survival.

### Limitations

The retrospective design introduces inherent biases related to incomplete or inconsistent documentation, which may affect the accuracy of collected data. A major limitation is the high proportion of patients with unknown follow-up outcomes (approximately 40%), which significantly

impacts the reliability of long-term outcome assessment, particularly decannulation rates and late complications. Additionally, some patients were not traceable after discharge, further limiting follow-up evaluation.

The study did not analyze important clinical variables such as comorbidities, duration of ICU stay, ventilator dependence, sedation requirements, and severity indices like APACHE II or SOFA scores, which could have provided deeper insight into factors influencing outcomes.

The relatively small sample size and single-center setting also limit the generalizability of the findings.

Variability in documentation practices across departments and referring specialties may have introduced inconsistencies in follow-up data. Furthermore, the absence of a standardized tracheostomy follow-up protocol or registry may have contributed to incomplete outcome tracking.

Future prospective multicenter studies with standardized data collection, structured follow-up systems, and inclusion of comprehensive clinical parameters are necessary to validate these findings and improve outcome assessment.

## CONCLUSION

This study highlights the evolving trends in tracheostomy practice, with prolonged mechanical ventilation emerging as the predominant indication in a tertiary care setting. The findings reflect a broader global shift from traditional emergency indications such as upper airway obstruction toward elective procedures performed in critically ill patients requiring sustained ventilatory support. The mean timing of tracheostomy in our cohort falls within the early intervention window, suggesting a tendency toward earlier airway conversion, which may contribute to improved patient comfort and optimized ICU management.

The procedure demonstrated a favorable safety profile, with no intraoperative complications and an acceptable rate of postoperative complications comparable to existing literature. The observed mortality was largely attributable to underlying systemic illness rather than the procedure itself, reinforcing the role of tracheostomy as a supportive intervention in critically ill patients.

However, suboptimal follow-up and relatively low decannulation rates emphasize the need for structured post-discharge care and standardized decannulation protocols. Establishing dedicated tracheostomy care pathways and prospective registries may improve long-term outcomes and data quality. Overall, tracheostomy remains a safe and essential procedure in modern critical care, and strengthening follow-up systems will be key to enhancing patient outcomes and guiding future clinical practice.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. Freeman BD, Borecki IB, Coopersmith CM, Buchman TG. Relationship between tracheostomy timing and duration of mechanical ventilation in critically ill patients. *Crit Care Med.* 2005;33(11):2513-20.
2. Griffiths J, Barber VS, Morgan L, Young JD. Systematic review and meta-analysis of studies of the timing of tracheostomy in adult patients undergoing artificial ventilation. *BMJ.* 2005;330(7502):1243.
3. Durbin CG Jr. Tracheostomy: why, when, and how? *Respir Care.* 2010;55(8):1056-68.
4. Terragni PP, Antonelli M, Fumagalli R, Chiara F, Maurizio B, Franco BP, et al. Early vs late tracheostomy for prevention of pneumonia in mechanically ventilated adult ICU patients: a randomized controlled trial. *JAMA.* 2010;303(15):1483-9.
5. Heffner JE. The role of tracheostomy in weaning. *Chest.* 2001;120(6):477S-81S.
6. McGrath BA, Wallace S, Goswamy J. Laryngeal complications after tracheal intubation and tracheostomy. *BJA Educ.* 2019;19(10):289-95.
7. Yadav SP, Gulia JS, Hooda A, Khaowas AK. Complications of tracheostomy: a retrospective analysis in an Indian tertiary care centre. *Indian J Otolaryngol Head Neck Surg.* 2008;60(4):305-8.
8. Mahajan RK, Mahajan R, Sharma A. Evaluation of early versus late tracheostomy in intensive care unit patients. *Indian J Crit Care Med.* 2013;17(6):347-52.
9. Kumar S, Gupta AK, Sinha S. Changing indications of tracheostomy in a tertiary care hospital in India. *Indian J Otolaryngol Head Neck Surg.* 2015;67(3):299-303.
10. Sharma K, Goyal S, Sharma S. A prospective study of indications and complications of tracheostomy in a teaching hospital. *Int J Otorhinolaryngol Head Neck Surg.* 2017;3(2):365-9.
11. Goldenberg D, Golz A, Netzer A, Joachims HZ. Tracheostomy: Changing Indications and a Review of 1130 Cases. *J Otolaryngol.* 2002;31(4):211-5.
12. Durbin Jr CG. Indications for and timing of tracheostomy. *Respiratory Care.* 2005;50(4):483-7.
13. Cheung NH, Napolitano LM. Tracheostomy: epidemiology, indications, timing, technique, and outcomes. *Respiratory Care.* 2014;59(6):895-919.
14. Avery B, Jankowski S. Management of and indications for tracheostomy in care of the critically ill patient. *Surgery (Oxford).* 2021;39(1):37-47.
15. Rumbak MJ, Newton M, Truncale T. A prospective randomized study comparing early vs late tracheostomy. *Crit Care Med.* 2004;32(8):1689-94.

**Cite this article as:** Dandala SR, Gonuru VK, Swetha K. Changing trends in tracheostomy indications: a single-center observational study. *Int J Res Med Sci* 2026;14:2428-31.