NTSP Podcast series

National Tracheostomy Safety Project

This month's top papers: October 2021

Welcome to the latest blog in the literature podcast from the NTSP. We try to bring you a quick roundup of what is hot in the world of tracheostomy and laryngectomy publications by scouring internationally recognised journals and media and bringing you the highlights.

The papers we will discuss this month are detailed below, along with an automated transcript of the podcast. Please note that the transcript is generated by AI and so may not be totally accurate.

You can find the links to the podcast on www.tracheostomy.org.uk and by searching for NTSP on your favourite podcast platform. Some of the podcasts are also uploaded to YouTube if you prefer to get your news that way. Check out the NTSP YouTube channel at https://www.youtube.com/c/NationalTracheostomySafetyProject. Please follow us and/or subscribe to keep up to date! https://x.com/NTSP_UK

Please note that the comments below and on the podcasts represent the individual authors' opinions and do not reflect the opinions of any of the organisations that the authors work for. Please leave any comments in the chat function or via X.

This month's top papers

- The Epidemiology of Adult Tracheostomy in the United States 2002-2017: A Serial Cross-Sectional Study
- Upper Airway Assessment for One-Way Valve Use in a Patient With a Tracheostomy.
- Multidisciplinary team management of tracheostomy procedures in neurocritical care patients: our experience over 17 years in a quaternary centre.
- Navigation system for percutaneous tracheotomy

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The Epidemiology of Adult Tracheostomy in the United States 2002-2017: A Serial Cross-Sectional Study

Lay Summary:

This study looked at how often tracheostomy procedures were performed on adults in U.S. hospitals between 2002 and 2017 and how this trend changed over time. A tracheostomy is a surgical procedure to create an opening in the neck to insert a tube that helps a patient breathe, especially when they need a breathing machine for a long time.

The study found that the number of tracheostomies peaked around 2008 and has been steadily decreasing since then. Specifically for patients on a breathing machine due to respiratory failure, the rate of tracheostomy dropped from a peak of 10.9% in 2004 to a low of 7.4% in 2017.

The study also found some other interesting trends:

- Patients who received a tracheostomy were getting younger. The proportion of patients aged 70 and older decreased, while the proportion of those aged 50-69 increased.
- The average hospital stay for these patients became shorter, and the death rate in the hospital decreased by half.
- More patients were being sent to intermediate care facilities, which are places for long-term care outside of a traditional hospital.

The authors believe these changes suggest that doctors are becoming more selective about who receives a tracheostomy. This might be due to better overall care for critically ill patients or possibly a shift in where patients are dying, such as in long-term care facilities rather than in the hospital itself.

Summary for Healthcare Professionals:

This serial cross-sectional study analyzed the national epidemiology of adult tracheostomies in U.S. acute care hospitals from 2002-2017 using the Healthcare Utilization Project's National Inpatient Sample datasets. The study aimed to describe the annual case volume and occurrence rate of tracheostomies, particularly for the subgroup of patients with respiratory failure (RF) requiring invasive mechanical ventilation (IMV).

The study identified a peak of 89,545 tracheostomies in 2008, with a subsequent decline to 58,840 in 2017. The annual occurrence rate per 100,000 U.S. adults mirrored this trend, peaking at 39.7 in 2003 and reaching a nadir of 28.4 in 2017. Among the subgroup of discharges with RF-IMV, the annual rate of tracheostomy decreased from a peak of 10.9% in 2004 to a nadir of 7.4% in 2017.

Key demographic and outcome shifts were observed in the RF-IMV with tracheostomy subgroup:

- **Patient Selection**: The proportion of patients aged 70 and older decreased, while those aged 50-69 increased. The prevalence of comorbidities like obesity, diabetes with complications, and renal failure increased, while diagnoses of solid tumors without metastases and diabetes without complications decreased.
- **Hospital Outcomes**: Mean hospital length of stay and in-hospital mortality both decreased, while discharges to intermediate care facilities, including long-term acute care (LTAC) and hospice, increased significantly. The proportion of patients with an "extreme likelihood of dying" increased, while those with a "minor," "moderate," and "major" likelihood decreased.

The authors conclude that these trends suggest evolving patterns of patient selection for tracheostomy, with a decreasing proportion of advanced-age patients receiving the procedure. They speculate that the decrease in in-hospital mortality may be linked to an increase in patients being discharged to intermediate care facilities, where they may subsequently die outside of the acute care hospital setting.

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Upper Airway Assessment for One-Way Valve Use in a Patient With a Tracheostomy.

Lay Summary:

This is a letter written by a team of medical experts in response to another study about how to check if a patient with a tracheostomy tube can safely use a special one-way valve to help them speak. A tracheostomy is a tube in the neck that helps a person breathe. A one-way valve allows air to be exhaled through the mouth and nose, which is necessary for speech, but only works if the airway above the tube is open.

The authors of this letter point out some issues with the original study's methods. They argue that a test called the Mallampati classification, which is used to predict difficult intubation, is not a good way to determine if a patient's airway is open enough for a speaking valve. They also explain that simply checking for a little bit of air flow is not enough; the airway must be clear enough for a full exhalation.

The letter's authors suggest a different, more reliable method: measuring how much air leaks around the tube when the cuff is deflated. They have found that a 40% reduction in exhaled air volume indicates enough space for the patient to breathe comfortably and safely with a speaking valve. This method is documented in some guidelines and has been successful in their own practice for over a decade. They emphasize that it is crucial to assess the airway's openness before trying to use a valve to avoid patient distress and wasted resources.

Summary for Healthcare Professionals:

This letter to the editor addresses a study by Li et al. (2021) concerning upper airway patency assessment for one-way valve use in patients with a tracheostomy. The authors of this letter, Sutt et al., raise methodological concerns and propose a more robust approach to assessment.

They argue that the Mallampati classification, a tool for predicting difficult intubation, is an inappropriate and misleading metric for this context as it does not provide information about the area around the glottis that may be damaged from endotracheal intubation. A low Mallampati score could therefore lead to a false-positive assessment of patency.

The authors advocate for a quantifiable assessment method, specifically measuring the reduction in exhaled tidal volume (TV) after cuff deflation. They state that a clinical consensus suggests a reduction in exhaled TV of at least 40% is needed to indicate sufficient space for a patient to comfortably redirect all exhaled gas through their upper airway. This method has been 100% successful in their facilities for over a decade. They also propose that transtracheal pressure (TTP) is a valuable tool, particularly for spontaneously breathing patients with a prolonged disorder of consciousness.

A critical point emphasized is the need to distinguish between anatomical integrity of the upper airway and the space around a deflated tracheostomy cuff. The authors recommend that airway patency be established

prior to the use of a one-way valve, as attempting it concurrently can be distressing for the patient if exhalation is limited or not possible. They suggest that flexible nasal endoscopy, which is part of a speech-language pathologist's toolkit, is the best way to assess the nature of a patency issue.

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Multidisciplinary team management of tracheostomy procedures in neurocritical care patients: our experience over 17 years in a quaternary centre.

Lay Summary:

This study looked at how a team of specialists can improve the care and outcomes for patients with brain-related conditions who need a tracheostomy (a breathing tube in their neck). The team included an intensive care doctor, a speech and language therapist, a physiotherapist, and an ear, nose, and throat (ENT) consultant.

The study, which followed patients for 17 years, found that this team approach led to very good results. More than half of the patients (51%) were able to have their breathing tube removed before leaving the hospital. For the 42% of patients who were transferred to another care facility with the tube still in place, more than a third were already well on their way to having it removed. The overall number of complications was very low, at 4.8%, and there were no deaths directly caused by the tracheostomy. The study concludes that using a consistent, team-based approach to care can lead to better outcomes for these patients.

Summary for Healthcare Professionals:

This prospective longitudinal study evaluated the impact of a multidisciplinary tracheostomy team on outcomes for patients in a neurocritical care setting. The team consisted of an intensive care consultant, a speech and language therapist, a physiotherapist, and an ENT consultant.

The study, spanning 17 years, demonstrated that this multidisciplinary approach can lead to favorable outcomes. A total of **51%** of patients were successfully decannulated in the hospital. The average time to decannulation was 48 days for neuromedical patients and 57.6 days for neurosurgical patients. Of the **42%** of patients discharged to another facility with a tracheostomy tube in situ, **37.5%** were at an advanced stage of the weaning process. The complication rate was low at **4.8%**, with no tracheostomy-associated mortalities reported.

The study concludes that a consistent, multidisciplinary approach to tracheostomy care is effective in achieving good outcomes in the neurocritical care population. It emphasizes that maintaining this consistency as patients transition from critical care to ward-level care is a crucial factor for improving outcomes.

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Navigation system for percutaneous tracheotomy

Lay Summary:

This paper describes a new tool called "SafeTrach," a three-dimensional navigation system designed to make a common surgical procedure called percutaneous dilatational tracheotomy (PDT) safer, especially for patients with a difficult neck anatomy.

PDT is a procedure where a breathing tube is inserted into the windpipe. Typically, doctors identify the correct spot by feeling the outside of the neck, but this can be challenging in some patients. The SafeTrach tool is a forceps-like instrument that helps doctors find the right spot by using internal landmarks instead of external ones. It works by using an inner part to stabilize the existing breathing tube and a computer-guided outer part to direct the needle to the correct location.

In a study of 48 patients, the researchers used this tool to measure the distance from the vocal cords to the puncture site, finding that it was about 50 mm for men and 40 mm for women. This new technique may help minimize the risk of injuring the back wall of the windpipe during the procedure. The study concludes that this navigation system offers a safer and more precise way to perform PDT.

Summary for Healthcare Professionals:

This paper introduces a novel three-dimensional navigation system, "SafeTrach," designed to facilitate percutaneous dilatational tracheotomy (PDT) in patients with difficult neck anatomy. The device is a forceps-like instrument with an inner shank that serves as a ventilation lumen and stabilizes the orotracheal tube in the tracheal midline. The outer shank functions as a three-dimensional guide for the puncturing needle.

The study aimed to present an alternative technique using internal anatomical landmarks to guide the puncture level. In a cohort of 48 patients, intraoperative measurements were used to determine the puncture level in 20 patients, with the distance from the vocal cords averaging approximately 50 mm for men and 40 mm for women. In a subgroup of 13 patients who had undergone CT scans, the median distance between the vocal cords and the optimal puncture site was found to be 45 mm for men and 42 mm for women.

The authors conclude that the SafeTrach navigation system allows for the use of either external or internal landmarks to guide the puncture level during PDT. They suggest that this device may minimize the risk of injuring the posterior tracheal wall, thereby offering a safer approach to the procedure, particularly in cases where external landmarks are unreliable.

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Scientific abstracts and references

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Crit Care Explor. 2021 Sep 10;3(9):e0523. doi: 10.1097/CCE.0000000000000523. eCollection 2021 Sep.

The Epidemiology of Adult Tracheostomy in the United States 2002-2017: A Serial Cross-Sectional Study.

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Describe the longitudinal national epidemiology of tracheostomies performed in acute care hospitals and describe the annual rate of tracheostomy performed for patients with respiratory failure with invasive mechanical ventilation. DESIGN: Serial cross-sectional study. SETTING: The 2002-2014 and 2016-2017 Healthcare Utilization Project's National Inpatient Sample datasets. PATIENTS: Discharges greater than or equal to 18 years old, excluding those with head and neck cancer or transferred from another hospital. We used diagnostic and procedure codes from the International Classification of Diseases, 9th and 10th revisions to define cases of respiratory failure, invasive mechanical ventilation, and tracheostomy. INTERVENTIONS: None. MEASUREMENTS AND MAIN RESULTS: There were an estimated 80,612 tracheostomies performed in 2002, a peak of 89,545 tracheostomies in 2008, and a nadir of 58,840 tracheostomies in 2017. The annual occurrence rate was 37.5 (95% CI, 34.7-40.4) tracheostomies per 100,000 U.S. adults in 2002, with a peak of 39.7 (95% CI, 36.5-42.9) in 2003, and with a nadir of 28.4 (95% CI, 27.2-29.6) in 2017. Specifically, among the subgroup of hospital discharges with respiratory failure with invasive mechanical ventilation, an annual average of 9.6% received tracheostomy in the hospital. This changed over the study period from 10.4% in 2002, with a peak of 10.9% in 2004, and with a nadir of 7.4% in 2017. Among respiratory failure with invasive mechanical ventilation discharges with tracheostomy, the annual proportion of patients 50-59 and 60-69 years old increased, whereas patients from 70 to 79 and greater than or equal to 80 years old decreased. The mean hospital length of stay decreased, and in-hospital mortality decreased, whereas discharge to intermediate care facilities increased. CONCLUSIONS: Over the study period, there were decreases in the annual total case volume and adult occurrence rate of tracheostomy as well as decreases in the rate of tracheostomy among the subgroup with respiratory failure with invasive mechanical ventilation. There is some evidence of changing patterns of patient selection for in-hospital tracheostomy among those with respiratory failure with invasive mechanical ventilation with decreasing proportions of patients with advanced age.

DOI: 10.1097/CCE.0000000000000523 PMCID: PMC8437212 PMID: 34589711

6. Am J Speech Lang Pathol. 2021 Sep 28:1-2. doi: 10.1044/2021_AJSLP-21-00174. Online ahead of print.

Upper Airway Assessment for One-Way Valve Use in a Patient With a Tracheostomy.

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[Figure: see text].

DOI: 10.1044/2021_AJSLP-21-00174 PMID: 34582260

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J Laryngol Otol. 2021 Sep 28:1-21. doi: 10.1017/S002221512100253X. Online ahead of print.

Multidisciplinary team management of tracheostomy procedures in neurocritical care patients: our experience over 17 years in a quaternary centre.

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Abstract

Objective: Tracheostomy in the neurocritical care population is associated with poorer outcomes. This study hypothesised that a multidisciplinary approach to tracheostomy care can improve outcomes.

Methods: This study was a prospective longitudinal study of all tracheostomised patients in the neurocritical care units of a quaternary centre over 17 years. All patients were managed by a tracheostomy team with a constant core membership of an intensive care consultant, speech and language therapist, and physiotherapist with consultant ENT input.

Results: A total of 51 per cent of patients were decannulated in hospital at an average of 48 (neuromedical) and 57.6 (neurosurgical) days. Of the 42 per cent of patients transferred to another facility with a tracheostomy tube in situ, 37.5 per cent were at an advanced stage of tracheostomy weaning. Complication rates were low at 4.8 per cent with no tracheostomy associated mortalities.

Conclusion: A multidisciplinary approach can enable good outcomes in the neurocritical care population. Consistency of care spanning the step-down from critical to ward-level care is crucial to improving outcomes.

DOI: 10.1017/S002221512100253X PMID: 34579802

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Acta Otolaryngol. 2021 Sep 27:1-7. doi: 10.1080/00016489.2021.1982147. Online ahead of print.

Navigation system for percutaneous tracheotomy.

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BACKGROUND: Percutaneous dilatational tracheotomy (PDT) is a well-established method. The prerequisite is to identify anatomical landmarks of the neck. We introduce a three-dimensional navigation system - SafeTrach. AIMS/OBJECTIVES: We present an alternative technique using internal landmarks that can be used in patients with difficult anatomy. MATERIAL AND METHODS: The device is a forceps-like instrument with an outer and an inner shank. The later serves as a ventilation lumen and stabilizes the orotracheal tube in the midline of trachea. The outer shank acts as a three-dimensional guide for the puncturing needle. RESULTS: Out of 48 patients we have determined the level of puncture in 20 patients by using intraoperative measurements. The distance from the vocal cords to the puncture site was about 50 mm for men and 40 mm for women. In 13 of the patients who had had CT scans, we studied the distance between the vocal cords and the optimal puncture site and found the median distance for men 45 mm and for women 42 mm. CONCLUSIONS AND SIGNIFICANCE: With the studied navigation system one may use external or internal landmarks to indicate the puncture level in PDT. The device may minimize the risk of injuring the posterior tracheal wall.