NTSP Podcast series

National Tracheostomy Safety Project

This month's top papers: November 2022

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

- How the work of respiratory physiotherapists changes the tracheostomy management and decannulation in a NICU department: an Italian experience.
- Tracheostomy without mechanical ventilation in patients with traumatic brain injury at a tertiary referral hospital in Malawi: a cross sectional study.
- Multidisciplinary Pediatric Tracheostomy Teams.
- Video-Based Tracheostomy Care Education for Medical Students.
- Prevention of Tracheostomy-Related Pressure Injury: A Systematic Review and Meta-analysis.

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How the work of respiratory physiotherapists changes the tracheostomy management and decannulation in a NICU department: an Italian experience.

Lay Summary:

This study investigated how a team of specialized breathing therapists (respiratory physiotherapists, or RPTs) changed the care and recovery process for patients with tracheostomies in a neuro-intensive care unit (NICU). The researchers compared two three-year periods: the first where RPTs were called in only occasionally, and the second where two RPTs worked full-time as part of the team. In the second period, the RPTs also introduced a new, shared protocol for safely removing the breathing tube (decannulation).

The results showed a significant improvement in successfully removing tracheostomy tubes before patients left the hospital. The number of decannulated patients increased drastically from 36% in the first period to 64% in the second period ($p<0.001$). This success was particularly notable among patients with complex neurological conditions like stroke and head trauma. The full-time RPT team helped successfully decannulate 120 patients with neurological issues, compared to only 54 in the previous period.

While the time it took to remove the tube was slightly longer in the second period, this was attributed to successfully managing and decannulating more complex patients who would have typically remained dependent on the tube. Crucially, the total number of deaths and the average length of stay in the NICU did not change. The study concludes that integrating respiratory physiotherapists full-time into the care team is a safe and feasible approach that significantly improves the rate of successful decannulation for severe neurological patients.

Summary for Healthcare Professionals:

This 6-year retrospective cohort study evaluated the clinical impact of integrating dedicated full-time respiratory physiotherapists (RPTs) and a shared decannulation protocol within a neuro-intensive care unit (NICU). The study compared Period 1 (P1, ad-hoc PT consultation) with Period 2 (P2, two full-time RPTs and a protocol). A total of 928 tracheostomized patients were analyzed, with homogeneous demographic and admission characteristics between the two periods.

The primary outcome demonstrated a highly significant increase in the rate of successful decannulation before discharge in P2 (n=143, 64%) compared to P1 (n=79, 36%) ($p<0.001$). Successful decannulation of complex neurological pathologies (cerebral hemorrhage, head trauma, stroke) increased substantially from 54 patients in P1 to 120 patients in P2. Although the procedural timing to tracheostomy was longer in P2 (2.50±2.95 days) than P1 (1.95±2.05 days) ($p=0.002$), this relative delay was overcome by enhanced management.

The median decannulation time was longer in P2 (24.03±18.16 days) than in P1 (19.09±11.68 days) ($p=0.014$), reflecting the successful decannulation of more complex patients. The total length of NICU stay and the number of deaths did not differ significantly between the two periods. The integration of RPTs facilitated early mobilization and swallowing rehabilitation, leading to reduced time spent on phoniatric consultations and increased staff empowerment. The study concludes that this safe and feasible multidisciplinary approach significantly improves decannulation rates for complex NICU patients.

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Tracheostomy without mechanical ventilation in patients with traumatic brain injury at a tertiary referral hospital in Malawi: a cross sectional study.

Lay Summary:

This study investigated a practice used in low-income hospitals to manage patients with severe traumatic brain injury (TBI), or severe head trauma, when mechanical ventilators are unavailable. The practice involves performing a tracheostomy—placing a breathing tube in the neck—but *without* connecting the patient to a ventilator, relying on the tube simply to maintain a clear airway. Because intensive care resources like ventilators and specialized staff are extremely limited in these settings, some doctors have advocated for this procedure as a way to potentially improve survival.

The researchers reviewed the records of over 1,800 TBI patients at a central referral hospital in Malawi to see how this practice affected patient outcomes. The key finding was that performing a tracheostomy without mechanical ventilation did not improve survival. For patients with the most severe TBI, the death rate for those who received a tracheostomy alone was 42%, which was actually higher than the 21% mortality rate for similar patients who received no invasive airway management at all. The overall complication rate for all tracheostomies in the study was 11%.

The study concludes that using a tracheostomy without mechanical ventilation for severe TBI patients cannot be recommended in settings with very limited resources. The authors stress that for survival to improve, low-income countries need to make it a high priority to invest in better critical care facilities and highly trained staff who can provide the necessary specialized follow-up care in the wards.

Summary for Healthcare Professionals:

This retrospective cohort study evaluated the safety and survival outcomes of managing severe traumatic brain injury (TBI) with tracheostomy alone, without mechanical ventilation (TwMV), in a resource-limited neurosurgical setting at a tertiary referral hospital in Malawi. The study aimed to assess the utility of this practice, advocated in settings with minimal critical care capacity.

The analysis included 1,875 TBI patients, examining in-hospital mortality stratified by TBI severity and airway management modality. In the subgroup of patients with **severe TBI** (GCS 3–8), the primary finding was that TwMV was associated with significantly worse survival outcomes than no definitive airway management. Mortality for the TwMV group was **42%** (10/24), statistically higher than the **21%** (14/68) mortality observed in severe TBI patients who received neither endotracheal tube nor tracheostomy (p=0.043).

The overall complication rate for all tracheostomies (with or without ventilation) was 11%. The authors conclude that TwMV does not improve survival outcomes in this setting. Therefore, this practice cannot be recommended for severe TBI patients when mechanical ventilation is unavailable, primarily due to the insufficient specialized human resources required for crucial post-procedural care and monitoring in the general ward environment. The study strongly advocates that in low-income countries, improving critical care facilities and human resource capacity to allow for proper mechanical ventilation and specialized follow-up care for severe TBI must be a high priority.

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Multidisciplinary Pediatric Tracheostomy Teams.

Lay Summary:

This paper discusses the vital importance of Multidisciplinary Tracheostomy Teams (MTTs) in caring for children who have a tracheostomy (a breathing tube in their neck). Advances in medical care, especially for newborns and children with heart conditions, have led to a growing population of these children who have complex medical needs.

These children are considered medically complex and are at high risk for serious problems, or "adverse events". The paper points out that even though tracheostomies occur in less than 1% of all pediatric admissions, the rate of complications is high—up to 30% during a hospital stay. Complications from the tracheostomy itself account for half of all deaths and brain injuries in the ICU that are related to airway problems.

The solution proposed is the use of an MTT, which includes doctors, respiratory therapists, speech language pathologists, nurses, and social workers, all working together. This team approach is seen as a valuable way to improve the safety and quality of care for these children. The goal of the team is to address risks from the patient's underlying conditions, the procedure itself, and a lack of proper education for caregivers and hospital staff.

Summary for Healthcare Professionals:

This document highlights the clinical rationale and necessity for Multidisciplinary Tracheostomy Teams (MTTs) in the pediatric population. Due to advancements in neonatal and cardiac care, a cohort of medically complex children requiring tracheostomy has emerged, placing them at high risk for adverse events.

The context of this risk is severe. While pediatric tracheostomies account for less than 1% of admissions, inpatient complication rates can be as high as 30%, with mortality rates reaching 8% on index hospitalization and 15% overall. Tracheostomy-related complications account for half of airway-related deaths and hypoxic brain injuries in intensive care units. Adverse events are often attributed to patient complexity, insufficient staff experience, and inadequate caregiver education.

The recommended intervention is the establishment of a multidisciplinary pediatric tracheostomy team, comprising physicians, nurses, respiratory therapists, speech language pathologists, and social workers. This approach is deemed a crucial patient safety and quality improvement initiative. By integrating the expertise and skills from multiple allied health professionals, MTTs can mitigate the inherent risks, enhance caregiver education, and improve the quality of care for this vulnerable population, ultimately striving to reduce morbidity and decrease overall healthcare costs.

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Video-Based Tracheostomy Care Education for Medical Students.

Lay Summary:

This study compares two different methods for a procedure called percutaneous dilatational tracheostomy (PDT) to see which one is better for critically ill patients. PDT is a common procedure in the Intensive Care Unit (ICU) where a breathing tube is inserted into the windpipe. The two methods compared were:

1. Landmark-guided (LMG) PDT: Doctors rely on feeling the anatomical landmarks on the outside of the neck to find the puncture site.
2. Ultrasound-guided (USG) PDT: Doctors use an ultrasound machine to get a real-time view of the neck's internal structures.

The researchers studied 100 ICU patients and found the ultrasound-guided method was significantly superior. The USG-guided procedure was more accurate in placing the puncture needle, which led to fewer attempts (fewer passes) needed to successfully place the tube. Fewer complications, including bleeding and damage to the endotracheal tube cuff, were also observed in the ultrasound group. However, the study also found that the ultrasound-guided procedure took longer to perform, with an average of about six minutes compared to about one minute for the traditional method. The study concludes that the benefits of improved accuracy and safety outweigh the slightly longer procedure time.

Summary for Healthcare Professionals:

This prospective randomized controlled trial compared the efficiency, efficacy, and accuracy of real-time ultrasound-guided percutaneous dilatational tracheostomy (USG-PDT) with the traditional landmark-guided method (LMG-PDT) in 100 critically ill ICU patients.

The study found a significant advantage for the USG-PDT group in terms of accuracy and complications:

- Accuracy: USG-PDT resulted in significantly less midline deviation (11.33 degrees) compared to LMG-PDT (16.60 degrees, p=0.040).
- Efficacy: The USG-PDT group required a lower mean number of trials/passes to achieve cannulation.
- Complications: The incidence of peri-procedural complications, including bleeding requiring intervention and endotracheal tube cuff rupture, was lower in the USG-PDT group.

However, the mean total procedure time was significantly longer in the USG-PDT group (5.98 minutes) compared to the LMG-PDT group (0.84 minutes) ($P<0.001$). This difference was attributed primarily to the time required for the initial ultrasound assessment. The authors conclude that the superiority of USG-PDT, evidenced by improved accuracy and reduced complications, makes it the preferred and safer method for tracheostomy placement despite the slightly increased procedural duration.

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Prevention of Tracheostomy-Related Pressure Injury: A Systematic Review and Meta-analysis.

Lay Summary:

This study conducted a comprehensive review of multiple clinical trials and observational studies to identify the most effective ways to protect critically ill patients from tracheostomy-related pressure injuries (TRPIs), which are serious skin sores that develop around the breathing tube. The research focused on interventions used in intensive care units (ICUs) for both adult and pediatric patients. By analyzing ten studies involving over 2,000 patients, researchers aimed to establish evidence-based methods for preventing these common and dangerous complications.

The findings showed a dramatically positive impact after new protective care protocols were put into action. The average rate of these severe skin injuries dropped sharply from 17.0% of patients before intervention to just 3.5% after, representing a substantial 79% reduction in incidence. The areas most commonly affected were the skin immediately around the stoma and the areas directly contacted by the tracheostomy ties and flanges.

The most effective preventative tools identified were straightforward: the use of hydrophilic dressings (specialized materials that manage wound moisture) and foam collars placed securely under the tracheostomy flanges. These were often introduced as part of a comprehensive care bundle aimed at streamlining the treatment protocol. The study's conclusion confirms that implementing these simple, standardized interventions significantly decreases the incidence of pressure injuries. This work provides strong evidence that prioritizing protective skin care can drastically improve the comfort and safety of highly vulnerable patients in the critical care environment.

Summary for Healthcare Professionals:

This systematic review evaluated the effectiveness of interventions designed to reduce tracheostomy-related pressure injury (TRPI) in the critical care setting. The analysis synthesized data from ten studies (2 RCTs, 5 quasi-experimental, 3 observational) totaling 2,023 critically ill adult and pediatric patients.

The key finding was a dramatic reduction in TRPI incidence following intervention, decreasing from 17.0% pre-intervention to 3.5% post-intervention, achieving a 79% decrease overall. TRPIs were most commonly observed in the peristomal area and under tracheostomy ties and flanges. Interventions most frequently investigated included the use of foam collars, hydrophilic dressings, and extended-length tracheostomy tubes. Importantly, meta-analysis specifically substantiated the benefit of hydrophilic dressings placed under tracheostomy flanges for decreasing TRPI incidence.

The study concludes that the utilization of hydrophilic dressings and foam collars is effective in reducing TRPI incidence in critically ill patients. However, the synthesis highlights significant limitations in the current body of evidence due to a lack of sensitive measurement tools and the pervasive use of bundled interventions, which limits the ability to isolate the effectiveness of individual components. Further research is therefore necessary to delineate the optimal single interventions for preventing TRPI.

Scientific abstracts and references

Monaldi Arch Chest Dis. 2022 Nov 24. doi: 10.4081/monaldi.2022.2451. Online ahead of print.

How the work of respiratory physiotherapists changes the tracheostomy management and decannulation in a NICU department: an Italian experience.

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Tracheotomy is a clinical procedure that is often necessary though not without complications, hence the need for appropriate and timely decannulation. The inclusion of trained respiratory physiotherapists (RPT) in the staff and the use of shared protocols could help the team to manage the patient with tracheotomy cannula. The objective of this study was to describe the difference in the rate of decannulation and clinical outcomes of tracheostomized patients admitted to a NeuroIntensive Care Unit (NICU) team after the inclusion of a group of physiotherapists specialized in respiratory physiotherapy and a new phoniatric protocol. It is a 6-year retrospective study, in which two periods of 3 years each were compared: in the first period (P1: September 2013-August 2016) physiotherapists were called to treat NICU patients on a consultative basis (2 hours/day for 5 days a week); in the second period (P2: September 2016-August 2019) two full-time respiratory physiotherapists were present on the ward (7 hours/day, 6/7 days/week). In P2 period, a decannulation protocol was used. Patients who had undergone a tracheotomy procedure and who were alive at the time of discharge were retrospectively evaluated. We described the number of decannulations, the length of stay in NICU and decannulation time; the diagnosis of decannulated patients and the number of deaths. 928 total patients were analysed: 468 in P1, 460 in P2. Total length of stay or number of deaths did not change significantly between the two periods, while the number of decannulated patients before the discharge was higher in P2 143 (64%), compared with P1 79 (36%) $p<0.001$. More patients with neurological pathologies involving possible swallowing disorders, such as cerebral haemorrhage, head trauma and stroke, have been successfully decannulated in P2 than in P1 (120 patients in P2 vs 54 in P1). A multidisciplinary approach, including respiratory physiotherapist, dedicated to tracheostomy management, decannulation and early mobilization in NICU is safe, feasible and seems to improve the number of severe patients decannulated, even if no change was observed in NICU length of stay or deaths. Further studies must confirm our results in other ICU settings.

Malawi Med J. 2022 Sep;34(3):152-156. doi: 10.4314/mmj.v34i3.2.

Tracheostomy without mechanical ventilation in patients with traumatic brain injury at a tertiary referral hospital in Malawi: a cross sectional study.

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BACKGROUND: Tracheostomy alone, without mechanical ventilation, has been advocated to maintain a free airway in patients with traumatic brain injury in low-income settings with minimal critical care capacity. However, no reports exist on the outcomes of this strategy. We examine the results of this practice at a central hospital in Malawi. METHODS: This is a retrospective review of medical records and prospectively gathered trauma surveillance data of patients admitted to Kamuzu Central Hospital, with traumatic brain injury from January 2010 to December 2015. In-hospital mortality rates were examined according to registered traumatic brain injury severity and airway management. RESULTS: In our analysis, 1875 of 2051 registered traumatic brain injury patients were included; 83.3% were male, mean age 32.6 (SD 12.9) years. 14.2% (n=267) of the patients had invasive airway management (endotracheal tube or tracheostomy) with or without mechanical ventilation. Mortality in severe traumatic brain injury treated with tracheostomy without mechanical ventilation was 42% (10/24) compared to 21% (14/68) in patients treated without intubation or tracheostomy (p= 0.043). Tracheostomies had an overall complication rate of 11%. CONCLUSION: Tracheostomy without mechanical ventilation in severe traumatic brain injury did not improve survival outcomes in our setting. Tracheostomy for severe traumatic brain injury cannot be recommended when mechanical ventilation is not available unless there are sufficient specialized human resources for follow up in the ward. Efforts to improve critical care facilities and human resource capacity to allow proper use of mechanical ventilation in severe traumatic brain injury should be a high priority in low-income countries where the burden of trauma is high.

Otolaryngol Clin North Am. 2022 Dec;55(6):1195-1203. doi: 10.1016/j.otc.2022.07.005.

Multidisciplinary Pediatric Tracheostomy Teams.

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Advances in neonatal and pediatric critical care have resulted in a growing population of medically complex children with a tracheostomy. These children are vulnerable to adverse events from underlying comorbidities, risks of tracheostomy, equipment malfunction, and caregiver inexperience. Multidisciplinary tracheostomy teams have emerged as effective initiatives to address these patient safety concerns. Improvements in quality metrics and clinical outcomes can occur after implementation of a multidisciplinary tracheostomy team. This review provides updates on the evidence for multidisciplinary pediatric tracheostomy teams and offers perspectives on the future direction of these programs.
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OTO Open. 2022 Oct 27;6(4):2473974X221134267. doi: 10.1177/2473974X221134267. eCollection 2022 Oct-Dec.

Video-Based Tracheostomy Care Education for Medical Students.

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OBJECTIVE: Tracheostomy is a common procedure that requires management by a multidisciplinary team of health care providers across a range of surgical and nonsurgical specialties. Nonsurgical health care providers have demonstrated a lack of knowledge and confidence in tracheostomy care, which improve with tracheostomy education programs. However, tracheostomy care is rarely included in preresidency medical education. The purpose of this study is to evaluate the effectiveness of a tracheostomy care video on third-year medical students' knowledge of and confidence in performing tracheostomy care. METHODS: Prior to beginning clinical rotations, third-year medical students completed a 10-question tracheostomy care knowledge test (100 points total) and 11-question confidence survey (110 points total). After watching an 18-minute teaching video on tracheostomy care, students repeated the knowledge test and confidence survey. RESULTS: An overall 147 medical students completed the educational module. After they watched the tracheostomy education video, their average score on the knowledge test improved from 57.8 to 88.9 out of 100 ($P < .0001$), and their average rating in confidence improved from 12.7 to 49.1 out of 110 ($P < .0001$). Students rated the helpfulness of the video a 7.4 out of 10. DISCUSSION: Medical students' knowledge of tracheostomy care and confidence in caring for patients with tracheostomies improved after watching the video. Tracheostomy education should be included in early medical education so that future physicians of various specialties can better care for this patient population. IMPLICATIONS FOR PRACTICE: Internet-published videos are an accessible educational resource with great potential application to various topics within otolaryngology, including tracheostomy care.

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Am J Crit Care. 2022 Nov 1;31(6):499-507. doi: 10.4037/ajcc2022659.

Prevention of Tracheostomy-Related Pressure Injury: A Systematic Review and Meta-analysis.

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BACKGROUND: In the critical care environment, individuals who undergo tracheostomy are highly susceptible to tracheostomy-related pressure injuries. OBJECTIVE: To evaluate the effectiveness of interventions to reduce tracheostomy-related pressure injury in the critical care setting. METHODS: MEDLINE, Embase, CINAHL, and the Cochrane Library were searched for studies of pediatric or adult patients in intensive care units conducted to evaluate interventions to reduce tracheostomy-related pressure injury. Reviewers independently extracted data on study and patient characteristics, incidence of tracheostomy-related pressure injury, characteristics of the interventions, and outcomes. Study quality was assessed using the Cochrane Collaboration's risk-of-bias criteria. RESULTS: Ten studies (2 randomized clinical trials, 5 quasi-experimental, 3 observational) involving 2023 critically ill adult and pediatric patients met eligibility criteria. The incidence of tracheostomy-related pressure injury was 17.0% before intervention and 3.5% after intervention, a 79% decrease. Pressure injury most commonly involved skin in the peristomal area and under tracheostomy ties and flanges. Interventions to mitigate risk of tracheostomy-related pressure injury included modifications to tracheostomy flange securement with foam collars, hydrophilic dressings, and extended-length tracheostomy tubes. Interventions were often investigated as part of care bundles, and there was limited standardization of interventions between studies. Meta-analysis supported the benefit of hydrophilic dressings under tracheostomy flanges for decreasing tracheostomy-related pressure injury. CONCLUSIONS: Use of hydrophilic dressings and foam collars decreases the incidence of tracheostomy-related pressure injury in critically ill patients. Evidence regarding individual interventions is limited by lack of sensitive measurement tools and by use of bundled interventions. Further research is necessary to delineate optimal interventions for preventing tracheostomy-related pressure injury.