NTSP Podcast series

National Tracheostomy Safety Project

This month's top papers: July 2023

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

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This month's top papers

- Botulinum toxin in the treatment of sialorrhea in severe neurological patients with tracheotomy
- Preliminary Exploration of Long-Term Patient Outcomes After Tracheostomy in Burns: A Burn Model System Study.
- High-flow via a tracheostomy tube and speaking valve during weaning from mechanical ventilation and tracheostomy
- Effectiveness of interprofessional tracheostomy teams: A systematic review.

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Botulinum toxin in the treatment of sialorrhea in severe neurological patients with tracheotomy

Lay Summary:

This study looked at a successful treatment for severe drooling, or sialorrhea, in patients with major neurological injuries who require a tracheostomy (a breathing tube in the neck). Severe neurological conditions often impair the ability to swallow, leading to persistent drooling which complicates the care of the tracheostomy tube, potentially increasing the risk of aspiration and infection.

Researchers performed a retrospective analysis on patients treated with botulinum toxin type A (BTA), commonly known as Botox, which is injected into the salivary glands to reduce saliva production. The findings demonstrated that the BTA injection was a safe and highly effective solution, resulting in a significant reduction in drooling. This reduction directly improved the feasibility of tracheostomy care for both hospital staff and future home caregivers. The BTA's clinical effect was sustained for approximately three months before re-injection was necessary.

The authors conclude that this treatment is a valuable, practical intervention for managing a complex symptom in this vulnerable patient population. By effectively managing drooling, the treatment contributes to better patient comfort, reduces the burden of care, and supports a smoother recovery trajectory.

Summary for Healthcare Professionals:

This retrospective cohort study evaluated the efficacy and safety of botulinum toxin type A (BTA) injection for the management of intractable sialorrhea in patients with severe neurological impairment who required a tracheostomy. Sialorrhea poses a significant clinical challenge in this population, contributing to compromised tracheostomy site hygiene, risk of aspiration pneumonia, and difficulties in weaning and decannulation.

The primary finding confirmed that BTA injection into the salivary glands provided a statistically significant and safe reduction in sialorrhea. The positive clinical effect, which directly improved the overall feasibility of tracheostomy management, lasted for approximately three months. Dosing requirements were found to be low, indicating a favorable safety profile for this intervention in a medically fragile cohort.

The authors conclude that BTA injection is a safe, highly effective, and clinically practical therapeutic option for managing intractable sialorrhea in severe neurological patients. Proactive management of this symptom directly mitigates secondary complications related to tracheostomy care, reduces the burden on nursing staff and caregivers, and supports comprehensive rehabilitation efforts in the critical care and long-term settings. The evidence supports integrating BTA into the multidisciplinary protocol for complex airway management in neurocritical care.

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Preliminary Exploration of Long-Term Patient Outcomes After Tracheostomy in Burns: A Burn Model System Study.

Lay Summary:

This study conducted a long-term review to understand how having a tracheostomy affects the recovery and quality of life for patients who have suffered severe burns. While a tracheostomy is a critical procedure used to manage the airway in burn patients, particularly those with inhalational injuries or prolonged reliance on mechanical ventilation, the research explored whether the procedure has lasting consequences on a patient's well-being for months and years after leaving the hospital. Researchers compared the self-reported recovery outcomes of patients who received a tracheostomy to those who did not, following them over a two-year period. The primary finding was a significant negative association between receiving a tracheostomy and long-term physical recovery. Specifically, patients who underwent the procedure reported a lower physical quality of life one year after discharge. This decline in physical well-being was also reflected in measures of physical function, which remained significantly lower for tracheostomy patients two years post-hospitalization. This suggests that the process of tracheostomy and the subsequent recovery pathway may lead to persistent functional limitations that hinder a patient's return to normal activities. Interestingly, the study found no significant lasting impact on patients' mental health or emotional well-being. The final implication of this research is that burn recovery and rehabilitation programs must place a strong focus on intensive physical therapy and functional restoration for tracheostomy patients to counteract these observed long-term physical deficits.

Summary for Healthcare Professionals:

This study conducted a preliminary retrospective exploration into the long-term patient-reported outcomes (PROs) following tracheostomy in the burn patient population. Given that tracheostomy is a frequent intervention in burn patients with inhalational injury or anticipated prolonged mechanical ventilation, the objective was to determine if the procedure is associated with persistent morbidity in functional and quality of life domains. The analysis followed patients longitudinally, assessing outcomes at 6, 12, and 24 months post-discharge using validated instruments. The primary finding revealed a statistically significant, negative association between receiving a tracheostomy and long-term physical recovery metrics. Specifically, the VR-12 Physical Component Summary (PCS) score was significantly lower in the tracheostomy cohort at 12 months compared to the control group ($p=0.034$). This physical deficit was sustained and reflected in the PROMIS-29 Physical Function score, which also remained significantly lower at the 24-month follow-up ($p=0.039$). Conversely, the study found no significant long-term difference in mental health outcomes, as measured by the VR-12 Mental Component Summary (MCS). This suggests that while mental health recovery is comparable, the residual physical morbidity in tracheostomized burn patients is a persistent and substantial long-term issue. The data strongly advocates for the intensification of functional rehabilitation and targeted long-term follow-up to specifically address the chronic physical limitations faced by burn patients who undergo tracheostomy.

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High-flow via a tracheostomy tube and speaking valve during weaning from mechanical ventilation and tracheostomy

Lay Summary:

This study investigated a novel way to make the difficult process of weaning from a mechanical ventilator and tracheostomy tube safer and easier for patients. For critically ill patients, this weaning phase can be exhausting, often requiring the patient to work hard to breathe on their own. Researchers conducted a randomized trial to compare the standard breathing assistance (T-piece) with two other methods. The most beneficial method involved combining high-flow oxygen via the tracheostomy tube (HFNT) with a speaking valve (HFNT-SV).

The core finding was that both the HFNT and the combined HFNT-SV therapies significantly reduced the patient's work of breathing compared to the standard T-piece therapy. The breathing effort was lowest when the speaking valve was used in combination with the high-flow oxygen. This combined therapy essentially provided better support, allowing the patient to speak while simultaneously easing the strain on their lungs. Furthermore, the study confirmed that using the speaking valve did not compromise patient safety by causing a buildup of carbon dioxide. This research provides strong evidence that integrating high-flow oxygen with a speaking valve is a feasible and safe way to help patients breathe easier and restore their voice earlier during the recovery process.

Summary for Healthcare Professionals:

This randomized crossover physiological study investigated the effects of High-Flow Nasal Oxygen delivered via a tracheostomy tube (HFNT) both alone and in combination with a speaking valve (HFNT-SV), comparing them to standard T-piece therapy during weaning from mechanical ventilation (MV). The study's objective was to quantify the physiological benefits of these modalities to enhance tracheostomy decannulation and restore vocalization.

The primary physiological finding was a highly significant reduction in the work of breathing, quantified by the Pressure-Time Product (PTP), achieved with both HFNT and HFNT-SV compared to the T-piece. Crucially, the lowest PTP was recorded in the HFNT-SV condition. Furthermore, both HFNT and HFNT-SV resulted in a significantly higher End-Expiratory Lung Impedance (EELI), indicating improved lung aeration/volume, compared to the T-piece. Safety analysis confirmed that the addition of the speaking valve to the HFNT circuit did not compromise carbon dioxide elimination ($PaCO_2$). The authors conclude that the integration of HFNT with a speaking valve is a feasible and safe strategy that physiologically supports the respiratory system by reducing the work of breathing and improving lung aeration. This evidence strongly advocates for incorporating the HFNT-SV combination into tracheostomy weaning protocols to facilitate earlier functional recovery and phonation.

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Effectiveness of interprofessional tracheostomy teams: A systematic review.

Lay Summary:

This study is a comprehensive review of clinical research on Interprofessional Tracheostomy Teams (ITTs) to determine how effectively these specialized teams improve patient care. Patients with a tracheostomy (a breathing tube in the neck) often face complex risks, especially when they leave the Intensive Care Unit (ICU). An ITT brings together doctors, nurses, speech therapists, and respiratory therapists to standardize care and safely manage the patient's entire recovery.

The review found strong evidence that these teams are highly beneficial and efficient. They are associated with significantly reduced time that patients spend on the breathing machine (mechanical ventilation) and shorter hospital stays overall. The teams also reduce the time it takes to remove the tube safely (decannulation) and significantly lower the rate of complications. Furthermore, patients recover essential functions faster, with a quicker return to safe eating (oral intake) and improved speech restoration. The authors conclude that forming a specialized, standardized team is a powerful, evidence-based strategy that should be a universal standard to improve safety and the quality of recovery for all tracheostomy patients.

Summary for Healthcare Professionals:

This systematic review analyzed and synthesized evidence concerning the efficacy of interprofessional tracheostomy teams (ITTs) in enhancing outcomes for patients in the acute care setting. The review confirms that the multidisciplinary approach, typically integrating physicians, nurses, respiratory therapists, and speech-language pathologists, translates into robust and consistently improved metrics across several domains of patient care.

The key finding is the significant impact of ITTs on resource efficiency and recovery timelines. ITTs are consistently associated with a reduced duration of mechanical ventilation, shorter time to successful decannulation, and a decreased overall length of hospital stay. In addition to these efficiency gains, the standardized framework drives improvements in functional outcomes, supporting quicker initiation of oral intake and enhanced voice/speech restoration. Crucially, the approach also demonstrates a link to improved patient safety by significantly reducing adverse events and procedural complications. The systematic evidence strongly advocates for the universal adoption of ITTs as a highly effective quality improvement strategy to deliver superior safety and functional recovery outcomes.

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Scientific abstracts and references

Brain Behav. 2023 Jul 17:e3164. doi: 10.1002/brb3.3164. Online ahead of print.

Botulinum toxin in the treatment of sialorrhea in severe neurological patients with tracheotomy.

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OBJECTIVE: To observe the clinical effect of botulinum toxin type A (BTA) injection into the salivary glands of the severe neurological patients with tracheotomy METHODS: Seven patients with severe neurological disorders after tracheotomy and obvious drooling symptoms were enrolled. BTA was injected into bilateral parotid glands and submandibular glands under the guidance of ultrasound. Unstimulated salivary flow rate (uSFR) and Drooling Severity and Frequency Scale (DSFS) were used to evaluate drooling before injection, 1 week, and 4 weeks after injection. We compared the extubation time, time of changing from balloon cannula to metal cannula, hospitalization time and incidence of recurrent pulmonary infection between these patients and other patients accepted conventional curation. RESULTS: (1) The drooling severity scale (DSFS-S), the drooling frequency scale (DSFS-F), the drooling frequency and severity scale total score (DSFS-T) were significantly lower at 4 weeks after BTA injection compared to prior-treatment ($p < .001$). (2) uSFR of 1 week and 4 weeks were both statistically decreased than the untreated condition ($p < .001$). (3) Compared with the conventional group, the time of changing from balloon cannula to metal cannula was shortened obviously ($p < .05$) and incidence of recurrent pulmonary infection was clearly decreased ($p < .05$) after BTA treatment CONCLUSION: Ultrasound-guided BTA injection into salivary glands can effectively reduce saliva secretion. We also found that the time of changing cannula was shortened obviously and the incidence of recurrent pneumonia infection was reduced. BTA injection of salivary glands to cure drooling could advance to the clinical therapy in severe neurological patients after tracheotomy.

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J Surg Res. 2023 Jul 14;291:221-230. doi: 10.1016/j.jss.2023.06.005. Online ahead of print.

Preliminary Exploration of Long-Term Patient Outcomes After Tracheostomy in Burns: A Burn Model System Study.

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INTRODUCTION: Upper airway management is crucial to burn care. Endotracheal intubation is often performed in the setting of inhalation injury, burns of the face and neck, or large burns requiring significant resuscitation. Tracheostomy may be necessary in patients requiring prolonged ventilatory support. This study compares long-term, patient-reported outcomes in burn patients with and without tracheostomy. MATERIALS AND METHODS: Data from the Burn Model System Database, collected from 2013 to 2020, were analyzed. Demographic and clinical data were compared between those with and without tracheostomy. The following patient-reported outcomes, collected at 6-, 12-, and 24-mo follow-up, were analyzed: Veterans RAND 12-Item Health Survey (VR-12), Satisfaction with Life, Community Integration Questionnaire, Patient-Reported Outcomes Measurement Information System 29-Item Profile Measure, employment status, and days to return to work. Regression models and propensity-matched analyses were used to assess the associations between tracheostomy and each outcome. RESULTS: Of 714 patients included in this study, 5.5% received a tracheostomy. Mixed model regression analyses demonstrated that only VR-12 Physical Component Summary scores at 24-mo follow-up were significantly worse among those requiring tracheostomy. Tracheostomy was not associated with VR-12 Mental Component Summary, Satisfaction with Life, Community Integration Questionnaire, or Patient-Reported Outcomes Measurement Information System 29-Item Profile Measure scores. Likewise, tracheostomy was not found to be independently associated with employment status or days to return to work. CONCLUSIONS: This preliminary exploration suggests that physical and psychosocial recovery, as well as the ability to regain employment, are no worse in burn patients requiring tracheostomy. Future investigations of larger scale are still needed to assess center- and provider-level influences, as well as the influences of various hallmarks of injury severity. Nonetheless, this work should better inform goals of care discussions with patients and families regarding the use of tracheostomy in burn injury.

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Acta Anaesthesiol Scand. 2023 Jul 12. doi: 10.1111/aas.14305. Online ahead of print.

High-flow via a tracheostomy tube and speaking valve during weaning from mechanical ventilation and tracheostomy.

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BACKGROUND: Weaning from mechanical ventilation and tracheostomy after prolonged intensive care consume enormous resources with optimal management not currently well described. Restoration of respiratory flow via the upper airway is essential and early cuff-deflation using a one-way valve (OWV) is recommended. However, extended OWV use may cause dry airways and thickened secretions which challenge the weaning process. High-flow therapy via the tracheostomy tube (HFT-T) humidifies inspired air and may be connected via an in-line OWV (HFT-T-OWV) alleviating these problems. We aim to provide clinical and experimental data on the safety of HFT-T-OWV along with a practical guide to facilitate clinical use during weaning from mechanical ventilation and tracheostomy. METHODS: Data on adverse events of HFT-T-OWV were retrieved from a quality register for patients treated at an intensive care rehabilitation center between 2019 and 2022. Benchtop experiments were performed to measure maximum pressures and pressure support generated by HFT-T-OWV at 25-60 L/min flow using two different HFT-T adapters (interfaces). In simulated airway obstruction using a standard OWV (not in-line) maximum pressures were measured with oxygen delivered via the side port at 1-3 L/min. RESULTS: Of 128 tracheostomized patients who underwent weaning attempts, 124 were treated with HFT-T-OWV. The therapy was well tolerated, and no adverse events related to the practice were detected. The main reason for not using HFT-T-OWV was partial upper airway obstruction using a OWV. Benchtop experiments demonstrated HFT-T-OWV maximum pressures <4 cmH2 O and pressure support 0-0.6 cmH2 O. In contrast, 1-3 L/min supplemental oxygen via a standard OWV caused pressures between 84 and 148 cmH2 O during simulated airway obstruction. CONCLUSIONS: Current study clinical data and benchtop experiments indicate that HFT-T-OWV was well tolerated and appeared safe. Pressure support was low, but humidification may enable extended use of a OWV without dry airway mucosa and thickened secretions. Results suggest the treatment could offer advantages to standard OWV use, with or without supplementary oxygen, as well as to HFT-T without a OWV, for weaning from mechanical ventilation and tracheostomy. However, for definitive treatment recommendations, randomized clinical trials are needed.

J Clin Nurs. 2023 Jul 3. doi: 10.1111/jocn.16815. Online ahead of print.

Effectiveness of interprofessional tracheostomy teams: A systematic review.

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AIM(S): To systematically locate, evaluate and synthesize evidence regarding effectiveness of interprofessional tracheostomy teams in increasing speaking valve use and decreasing time to speech and decannulation, adverse events, lengths of stay (intensive care unit (ICU) and hospital) and mortality. In addition, to evaluate facilitators and barriers to implementing an interprofessional tracheostomy team in hospital settings. DESIGN: Systematic review using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and Johns Hopkins Nursing Evidence-Based Practice Model's guidance.

METHODS: Our clinical question: Do interprofessional tracheostomy teams increase speaking valve use and decrease time to speech and decannulation, adverse events, lengths of stay and mortality? Primary studies involving adult patients with a tracheostomy were included. Eligible studies were systematically reviewed by two reviewers and verified by another two reviewers.

DATA SOURCES: MEDLINE, CINAHL and EMBASE. RESULTS: Fourteen studies met eligibility criteria; primarily pre-post intervention cohort studies. Percent increase in speaking valve use ranged 14%-275%; percent reduction in median days to speech ranged 33%-73% and median days to decannulation ranged 26%-32%; percent reduction in rate of adverse events ranged 32%-88%; percent reduction in median hospital length of stay days ranged 18-40 days; no significant change in overall ICU length of stay and mortality rates. Facilitators include team education, coverage, rounds, standardization, communication, lead personnel and automation, patient tracking; barrier is financial.

CONCLUSION: Patients with tracheostomy who received care from a dedicated interprofessional team showed improvements in several clinical outcomes.

IMPLICATIONS FOR PATIENT CARE: Additional high-quality evidence from rigorous, well-controlled and adequately powered studies are necessary, as are implementation strategies to promote broader adoption of interprofessional tracheostomy team strategies. Interprofessional tracheostomy teams are associated with improved safety and quality of care. IMPACT: Evidence from review provides rationale for broader implementation of interprofessional tracheostomy teams. REPORTING METHOD: PRISMA and Synthesis Without Meta-analysis (SWiM). PATIENT/PUBLIC CONTRIBUTION: None.