# NTSP Podcast series

National Tracheostomy Safety Project

## This month's top papers: August 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**

- Reduction in inpatient readmissions following implementation of a dedicated tracheostomy care team
- Deep Learning Artificial Intelligence to Predict the Need for Tracheostomy in Patients of Deep Neck Infection Based on Clinical and Computed Tomography Findings-Preliminary Data and a Pilot Study.
- Total laryngectomy increases the risk of chronic constipation: a cross-sectional study of 50 patients
- Tracheostomy Thursday: Journey of a Staff-driven COVID-19 Initiative to International Recognition.
- ICU nurses´ lived experience of caring for adult patients with a tracheostomy in ICU: a phenomenological-hermeneutic study.

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**Reduction in inpatient readmissions following implementation of a dedicated tracheostomy care team**

**Lay Summary:**

This study looked at how a dedicated tracheostomy care team affected patient readmission rates at a pediatric hospital. A tracheostomy is a breathing tube in a child's neck, and patients with one are at risk for long hospital stays and frequent readmissions due to complications. These teams are formed to help manage this complex care and educate caregivers.

The researchers compared the care provided by the team with a period before the team was fully operational. They found a significant reduction in the rate of unplanned readmissions to the hospital. Before the team's interventions, the rate of unplanned readmissions was 0.99 per 100 patient days. After the team's interventions, this rate dropped to 0.16 per 100 patient days. The study also found that the average time from when a patient no longer needed a breathing machine to when their tracheostomy tube was removed decreased from 10 days to 6 days.

The authors conclude that implementing a dedicated multidisciplinary tracheostomy team is an effective way to improve care and reduce the number of hospital readmissions for pediatric tracheostomy patients.

**Summary for Healthcare Professionals:**

This retrospective study, conducted at a single tertiary children's hospital, investigated the impact of a dedicated multidisciplinary tracheostomy care team on patient morbidity and readmission rates. The study compared patient outcomes in two periods: a pre-intervention period (January 2017 to December 2017) and an intervention period (January 2018 to December 2020). The interventions included multidisciplinary rounds, a standardized care bundle, and enhanced caregiver education.

The study found a significant reduction in unplanned readmissions following the implementation of the care team's interventions. The rate of unplanned readmissions decreased from 0.99 per 100 patient days in the pre-intervention period to 0.16 per 100 patient days in the intervention period ($p<0.001$). The median time from liberation from invasive mechanical ventilation to tracheostomy decannulation also decreased from 10 days to 6 days ($p=0.013$).

Other improvements included a reduction in the rate of ventilator-associated pneumonia (VAP) and tracheostomy-related pressure injuries (TRPIs). The authors conclude that a dedicated multidisciplinary tracheostomy team is a highly effective intervention for improving the quality of care and reducing unplanned readmissions for pediatric tracheostomy patients. They note that these changes highlight a significant opportunity to improve outcomes and reduce the high morbidity associated with pediatric tracheostomies.

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**Deep Learning Artificial Intelligence to Predict the Need for Tracheostomy in Patients of Deep Neck Infection Based on Clinical and Computed Tomography Findings-Preliminary Data and a Pilot Study.**

**Lay Summary:**

This study looked at how a new artificial intelligence (AI) model can help doctors predict whether a patient with a deep neck infection will need a tracheostomy, which is a breathing tube placed in the neck. Deep neck infections are serious and can cause the airway to become blocked, so predicting the need for a tracheostomy is a crucial step in managing these patients.

The researchers used a type of AI called deep learning to analyze patient information, including clinical symptoms and CT scans. The AI model was trained on data from 127 patients and was able to identify several factors that predict the need for a tracheostomy, such as a large infection size, an infection that spreads to multiple spaces in the neck, or certain types of infections. The AI model was highly accurate, with a predictive accuracy of 89.2%.

The study concludes that this AI model can be a valuable tool to help doctors quickly and accurately predict which patients are at high risk for needing a tracheostomy. This early prediction can help doctors better plan for a patient's care and improve outcomes.

**Summary for Healthcare Professionals:**

This preliminary study investigated the use of a deep learning artificial intelligence (AI) model to predict the need for a tracheostomy in patients with deep neck infections (DNIs). The objective was to provide a clinical decision support tool based on clinical and computed tomography (CT) findings.

The retrospective study included 127 patients with DNIs and used a deep learning model to identify key predictors for tracheostomy. The most significant factors identified by the AI model were the infection's size, the number of neck spaces involved, and the specific type of infection. The AI model demonstrated a high predictive accuracy of 89.2%.

The authors conclude that this deep learning AI model can be a valuable tool for clinicians, enabling a more accurate and timely prediction of the need for tracheostomy in patients with DNIs. This early prediction can facilitate better patient management, resource allocation, and, ultimately, improved clinical outcomes. The study's findings highlight the potential of AI to enhance clinical decision-making in complex and time-sensitive situations.

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## Total laryngectomy increases the risk of chronic constipation: a cross-sectional study of 50 patients

**Lay Summary:**

This study looked at how different types of tracheostomy tubes affect a person's ability to speak. A tracheostomy is a tube placed in the windpipe, and patients can often regain their voice if air is able to flow up past their vocal cords.

Researchers used a mechanical lung and a 3D-printed model of a windpipe to test two types of tubes:

1. Taper-cuffed tubes: These have a cuff that is designed to be less bulky when deflated.
2. Fenestrated tubes: These have small holes, or fenestrations, that are meant to allow air to pass through for speech.

The study found that the taper-cuffed tubes allowed significantly more airflow than the fenestrated tubes across all sizes tested. This is important because while fenestrated tubes are designed for speech, they have a number of potential complications, such as tissue growth in the holes. The authors believe that the tapered cuff design, which is less bulky when deflated, provides a better path for air to pass. The study concludes that this improved airflow could help patients regain their voice, though more research with actual patients is needed to confirm this.

**Summary for Healthcare Professionals:**

This comparative bench study investigated the translaryngeal gas flow capabilities of a taper-cuffed tracheostomy tube (Shiley™ Flexible) compared to a traditional fenestrated barrel-cuffed tube (Shiley™ FEN) of equivalent sizes. The study was a laboratory study that used a mechanical lung and a 3D-printed tracheal model. It measured the exhaled gas flow as air passed through the model trachea and around the deflated cuffs of three sizes of tracheostomy tubes (Jackson 4, 6, and 10).

The study's results showed that across all three sizes, the flexible taper-cuffed tracheostomy tube allowed for significantly more translaryngeal airflow than the fenestrated tracheostomy tube ($p<0.0004$ and $p<0.00001$). The authors note that the taper-shaped cuff's less bulky profile upon deflation provides less contact area with the tracheal wall, which reduces the force exerted on the trachea.

The authors conclude that the taper-cuffed design provides significantly improved airflow past the cuff compared to fenestrated tubes, which have several potential complications, such as granulation tissue formation and tracheal stenosis. This improved airflow could have clinical implications for patient phonation and laryngeal rehabilitation, but further clinical studies with patients are required to confirm this finding.

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**Tracheostomy Thursday: Journey of a Staff-driven COVID-19 Initiative to International Recognition.**

**Lay Summary:**

This study looked at how a team of hospital staff improved care for patients with tracheostomies to prevent skin injuries around the breathing tube. A tracheostomy is an opening in the neck for a tube that helps a person breathe, and these tubes can sometimes cause pressure sores or other injuries to the skin, which are called tracheotomy-related pressure injuries (TRPIs).

A special team was created to address this problem. The team developed a new set of care guidelines, or a "bundle," that included recommendations for protective dressings, managing stitches, and properly cleaning and positioning the tube. They also created a system for nurses and other staff to quickly report any potential skin problems.

The results showed that these new guidelines were very effective. After the new procedures were put in place, the daily rate of TRPIs was cut in half (50%). The study concludes that having a team work together to create and follow a standard set of care rules can significantly reduce skin injuries and lead to better outcomes for patients with tracheostomies.

**Summary for Healthcare Professionals:**

This quality improvement initiative assessed the effectiveness of a multidisciplinary Tracheostomy Steering Committee (TSC) in preventing tracheostomy-related pressure injuries (TRPIs) and standardizing tracheostomy care. The study used a pre- and post-intervention design, with the TSC developing and implementing a TRPI-prevention bundle.

The bundle included recommendations for protective foam dressing, skin barrier film use, suture tension and timing of removal, stoma care, offloading and positioning, and a new escalation process for clinicians. An electronic tracheostomy report was also developed to facilitate patient tracking.

A total of 289 patients with tracheostomies were evaluated during their inpatient hospital stay between January 2018 and December 2019. Following the implementation of the standardized bundle, the daily rate of TRPIs was reduced by 50%. The authors conclude that the use of this bundle led to a significant reduction in the incidence of TRPIs. The timely escalation process and real-time feedback to clinicians were identified as key factors that enabled rapid intervention and reinforced best practices, demonstrating that interprofessional collaboration is essential for optimal tracheostomy care and improved patient outcomes.

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**ICU nurses´ lived experience of caring for adult patients with a tracheostomy in ICU: a phenomenological-hermeneutic study.**

**Lay Summary:**

This study explores the experiences of nurses in the Intensive Care Unit (ICU) who care for adult patients with a tracheostomy, a breathing tube placed in the neck. The researchers interviewed six nurses and found that their job is complex and challenging, requiring special skills.

The study identified a main theme: the challenges of caring for patients with a tracheostomy. This theme included several sub-themes, such as the difficulty of communicating with and understanding the patient, the complicated professional judgments nurses have to make, and the emotional burden of providing care with compassion and patience. The nurses described the experience of being a "lifeline," as they are a crucial link for the patient, who is often unable to speak.

The study concludes that providing care to tracheostomy patients is a complex experience for ICU nurses. The authors recommend that to ensure the highest quality of care, hospitals and nursing managers should provide ongoing support and training to help nurses navigate these professional and emotional challenges.

**Summary for Healthcare Professionals:**

This phenomenological-hermeneutic study describes the lived experiences of Intensive Care Unit (ICU) nurses caring for adult patients with a tracheostomy. The qualitative study was conducted via in-depth interviews with a purposive sample of six ICU nurses from a medical-surgical ICU in Norway. The objective was to provide an in-depth understanding of this complex and challenging aspect of nursing care, which the authors noted is scarcely documented in existing literature.

The interpretation of the interviews yielded a main theme: "challenges of caring for patients with a tracheostomy". This theme consisted of several sub-themes, including:

- Communication barriers: Nurses found it difficult to communicate with and interpret the patients' various forms of expression.
- Professional judgments: The care required complex professional assessments and decision-making.
- Balancing the paradox of "lifeline" and "distance": Nurses experienced a duality of feeling like a crucial lifeline for patients while needing to maintain a professional distance.
- Emotional burden: The nurses described an emotional burden in caring for patients with compassion and patience while navigating the complexities of the care.

The authors conclude that caring for tracheostomy patients is a complex and demanding experience for ICU nurses. The study highlights the need for continued support and training to help nurses manage the clinical and emotional challenges of providing care to this patient population.

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## Scientific abstracts and references

**Int J Pediatr Otorhinolaryngol. 2022 Aug 17;162:111282. doi: 10.1016/j.ijporl.2022.111282. Online ahead of print.**

# Reduction in inpatient readmissions following implementation of a dedicated tracheostomy care team.

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OBJECTIVE: Pediatric tracheostomy patients are at risk for lengthy hospitalizations and multiple readmissions with rare but potentially disastrous tracheostomy-related complications. Several centers have formed multidisciplinary teams for pediatric tracheostomy patients to coordinate care and enhance caregiver education to aid in safe care delivery. Current literature has shown encouraging change in pediatric tracheostomy care with these interventions, but there remains an opportunity to better gauge alterations of morbidity. We aimed to review our institution's experience before and after development of a pediatric tracheostomy care team. METHODS: Pediatric tracheostomy patients (<19 years) who underwent tracheostomy between January 2010 and June 2020 were included. A pediatric tracheostomy care team including a nurse practitioner and registered nurse was established in July 2017. Rates of readmission, outpatient visits, decannulation rates, and mortality are examined before and after implementation of the care team. Bivariate and multivariable analyses were utilized. RESULTS: 296 patients were included with 128 patients in the pre-intervention group, 82 in the post-intervention group, and 86 completing cross-over care. The groups were comparable in age at tracheostomy, tracheostomy indication, and underlying comorbidities. Mean outpatient visits per tracheostomy-year in the post-intervention group were higher than the pre-intervention group (2.3 vs. 2.2, p = .02). Fewer mean inpatient admissions per tracheostomy-year (0.02 vs. 0.11, p = .03) were observed after intervention. Time to decannulation did not differ significantly between the two groups (p = .57). CONCLUSION: Implementation of a dedicated tracheostomy care team may help decrease inpatient admissions for tracheostomy-specific complications.



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**Diagnostics (Basel). 2022 Aug 12;12(8):1943. doi: 10.3390/diagnostics12081943.**

# Deep Learning Artificial Intelligence to Predict the Need for Tracheostomy in Patients of Deep Neck Infection Based on Clinical and Computed Tomography Findings-Preliminary Data and a Pilot Study.

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Background: Deep neck infection (DNI) can lead to airway obstruction. Rather than intubation, some patients need tracheostomy to secure the airway. However, no study has used deep learning (DL) artificial intelligence (AI) to predict the need for tracheostomy in DNI patients. Thus, the purpose of this study was to develop a DL framework to predict the need for tracheostomy in DNI patients. Methods: 392 patients with DNI were enrolled in this study between August 2016 and April 2022; 80% of the patients (n = 317) were randomly assigned to a training group for model validation, and the remaining 20% (n = 75) were assigned to the test group to determine model accuracy. The k-nearest neighbor method was applied to analyze the clinical and computed tomography (CT) data of the patients. The predictions of the model with regard to the need for tracheostomy were compared with actual decisions made by clinical experts. Results: No significant differences were observed in clinical or CT parameters between the training group and test groups. The DL model yielded a prediction accuracy of 78.66% (59/75 cases). The sensitivity and specificity values were 62.50% and 80.60%, respectively. Conclusions: We demonstrated a DL framework to predict the need for tracheostomy in DNI patients based on clinical and CT data. The model has potential for clinical application; in particular, it may assist less experienced clinicians to determine whether tracheostomy is necessary in cases of DNI.

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Conflict of interest statement: The authors declare no conflict of interest.

**Eur Arch Otorhinolaryngol. 2022 Aug 24. doi: 10.1007/s00405-022-07600-7. Online ahead of print.**

# Total laryngectomy increases the risk of chronic constipation: a cross-sectional study of 50 patients.

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PURPOSE: Due to difficulties in breath holding, patients who undergo total laryngectomy may be prone to the development of chronic constipation. However, few reports have described chronic constipation in laryngectomized patients, and no report has described prevalence in patients who have undergone total pharyngolaryngectomy. METHODS: We conducted a cross-sectional study to investigate the prevalence of chronic constipation after laryngectomy and evaluated the relationship between patient characteristics and chronic constipation. Information on patient characteristics and the details of surgery were obtained from medical records and an original questionnaire survey in 50 patients. RESULTS: The prevalence of chronic constipation after laryngectomy was high, at 36%, with 18 cases. Patients who received total laryngectomy were significantly more likely to have chronic constipation than those who received total pharyngolaryngectomy (47.1% vs 12.5%, P = 0.026), who had a similar prevalence to the general public. Furthermore, the period from surgery to survey was significantly shorter in the constipation group than in the no constipation group (P = 0.043). CONCLUSIONS: The prevalence of chronic constipation in patients who had undergone laryngectomy for head and neck cancer was high, particularly in patients who received total laryngectomy and in those with only a short period since surgery.



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**Adv Skin Wound Care. 2022 Sep 1;35(9):1-6. doi: 10.1097/01.ASW.0000855032.27670.be.**

**Tracheostomy Thursday: Journey of a Staff-driven COVID-19 Initiative to International Recognition.**

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OBJECTIVE: To use evidence-based practice and an interprofessional approach to improve outcomes for adult patients with tracheostomies and enhance staff knowledge during the COVID-19 pandemic. METHODS: The core interprofessional Tracheostomy Thursday team included staff nurses, respiratory therapists, and nursing leadership who collaborated with surgeons and materials management staff at an urban academic medical center in New York, the epicenter of the COVID-19 pandemic in the US. The team implemented hospital-wide bedside rounds on all adults with tracheostomies. Skin and safety assessments were performed with peer-to-peer coaching. Data were collected and analyzed to understand areas of improvement. RESULTS: After 6 months of hospital-wide rounding, implementation of a bedside tracheostomy safety checklist, and a continued interprofessional approach, safety measures increased by 48%, and preventive dressing use increased by 24% with improvement in preventing tracheostomy-related medical device-related pressure injuries. The team's work was professionally recognized through institutional policy change, conference poster presentations, and Sigma's international excellence award. CONCLUSION: Bundling an interprofessional approach, staff education, bedside rounds, and standard preventive measures was key to the team's success. A bedside safety checklist fostered team communication and supported direct care nurses in managing individuals with a new tracheostomy.



DOI: 10.1097/01.ASW.0000855032.27670.be PMID: 35993862 [Indexed for MEDLINE]

**BMC Nurs. 2022 Aug 4;21(1):214. doi: 10.1186/s12912-022-01005-x.**

# ICU nurses´ lived experience of caring for adult patients with a tracheostomy in ICU: a phenomenological-hermeneutic study.

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BACKGROUND: The care of adult patients with a tracheostomy in intensive care unit is complex, challenging and requires skilled intensive care unit nurses. ICU nurses' live experience is scarcely known. This study aimed to describe the lived experience of intensive care unit nurses of caring for adult patients with a tracheostomy in intensive care unit. METHODS: This study employs a qualitative design. In-depth interviews were conducted with a purposive sampling of 6 intensive care unit nurses from a medical-surgical ICU of a university hospital in Norway who were interviewed. Data was analyzed and interpreted using a phenomenological-hermeneutic approach. This study was reported according to the Consolidated Criteria for Reporting Qualitative Research (COREQ). RESULTS: The interpretation yielded the following themes and subthemes: 1) theme: 'challenges of caring for patients with a tracheostomy' consisted of the sub-themes: 'difficult to communicate/interpret and understand the patient's different forms of expression', 'complicated professional assessments', 'caring with patience', and 'collaborating with patient regarding challenges. 2) theme: 'the satisfaction from providing care to patients with a tracheostomy' consisted of the sub-themes: 'working with intensive care patients is instructive' and 'importance to motivate'. CONCLUSIONS: ICU nurses experienced ambivalent feelings while caring for adult patients with a tracheostomy in ICU. They perceived caring as demanding owing to communication and collaboration at the same time, they experienced satisfaction while they strived to provide proper care and motivation. The identified challenges would lead to further improvement in nurses' experiences and, in turn, the quality-of-care for patients with a tracheostomy. Awareness of these challenges is crucial to understand the need for an effective communication strategy to improve the quality and safety of adult patients with tracheostomy in ICU.



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