NTSP Podcast series

National Tracheostomy Safety Project

This month's top papers: December 2024

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

- Tracheoesophageal puncture and quality of life after total laryngectomy: A systematic review and meta-analysis.
- Enhancing Tracheostomy Care: Knowledge Among Nurses in Intensive Care Units.
- Accidental tracheostomy decannulation: Risk factors and complications in pediatric patients using the NSQIP-P database.
- Effect of inspiratory and expiratory muscle training on respiratory function and decannulation outcome in patients with tracheostomy after stroke: a randomized controlled trial.
- Quality of life improvement in 3 dogs with sleep-disordered breathing managed by permanent (crico)tracheostomy.

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Tracheoesophageal puncture and quality of life after total laryngectomy: A systematic review and meta-analysis.

Lay Summary:

This study is a comprehensive review and analysis of research on the positive effects of the Tracheoesophageal Puncture (TEP) procedure on the quality of life (QoL) for patients who have undergone a Total Laryngectomy (TL), which is the surgical removal of the voice box. Since TL causes a permanent loss of the natural voice, TEP—where a small puncture is made to insert a voice prosthesis—is a critical intervention for restoring verbal communication.

The researchers systematically analyzed six studies, combining the data from 253 patients. The collective evidence strongly concluded that patients who received TEP experienced an improved QoL compared to both their state before the procedure and those who used non-TEP methods for speech restoration. This significant improvement was confirmed through a meta-analysis, showing a strong positive change when QoL was measured using the University of Washington-Quality of Life Index ($p<.0001$).

The study concludes that TEP is an invaluable intervention that directly enhances patient satisfaction and overall QoL following TL. This provides clear evidence that restoring the ability to speak is essential for the long-term well-being and successful recovery of survivors of laryngeal cancer.

Summary for Healthcare Professionals:

This study is a systematic review and meta-analysis conducted to evaluate the effect of Tracheoesophageal Puncture (TEP) on Quality of Life (QoL) in patients following Total Laryngectomy (TL). Utilizing PRISMA methodology, the review synthesized six studies with a collective sample size of 253 post-TL patients.

The analysis found that TEP is associated with enhanced QoL compared to both pre-procedure baseline and non-TEP methods of speech rehabilitation. A meta-analysis of the University of Washington-Quality of Life Index (UW-QOL) demonstrated a statistically significant improvement in QoL ($p<.0001$). However, improvement measured by the Voice Handicap Index (VHI) was statistically insignificant ($p=.07$). All additional indices reviewed, despite being present in only one study each, consistently indicated improved QoL post-TEP.

The authors conclude that TEP is a valuable intervention that improves patient QoL and satisfaction following TL. They recommend that, due to the lack of a single standardized tool for describing QoL in this population, instruments should be chosen based on the specific aspects of QoL they represent.

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Enhancing Tracheostomy Care: Knowledge Among Nurses in Intensive Care Units.

Lay Summary:

This study investigated how well nurses working in Intensive Care Units (ICUs) understand the essential procedures for caring for patients with a tracheostomy (a breathing tube in the neck). Because managing a tracheostomy is a complex task, inadequate knowledge can lead to serious complications like infections and airway blockages. Researchers surveyed 237 ICU nurses in the southern West Bank of Palestine to assess their level of competency. The findings showed that most nurses had a moderate level of knowledge about tracheostomy care. The study also found that certain factors—such as a nurse's age, gender, number of years working, and level of education—were linked to differences in their knowledge scores. This outcome suggests that while basic competency is present, there is a risk of inconsistent care among different staff members. The authors conclude that to significantly improve patient safety and overall outcomes, it is absolutely essential for nurses to be provided with continuous education and ongoing training programs that are specifically focused on tracheostomy management. These programs are necessary to ensure all nurses possess the high level of knowledge required to prevent life-threatening complications for vulnerable patients in the ICU. The research underscores the direct link between staff education and patient safety in this critical care environment.

Summary for Healthcare Professionals:

This cross-sectional study evaluated the level of tracheostomy care knowledge among 237 registered nurses working in Intensive Care Units (ICUs) in the southern West Bank of Palestine. The objective was to assess competency gaps, given that inadequate management of the tracheostomy is a known precursor to severe complications, such as infections and airway blockages. The methodology involved administering a structured questionnaire, followed by descriptive and inferential statistical analysis. The key finding was that the majority of nurses demonstrated a moderate level of knowledge regarding tracheostomy care. Furthermore, the analysis revealed statistically significant differences in knowledge levels based on demographic and professional variables, including age, gender, years of experience, and educational level. This variance suggests an inconsistency in expertise across the workforce, which can compromise the standardization of high-quality care. The authors conclude that proficiency in tracheostomy care is currently inadequate, creating an imperative for quality improvement. They strongly advocate for the implementation of continuous education and mandatory training programs tailored to the specific complexities of tracheostomy management to enhance nurse competency and significantly improve safety and patient outcomes in the ICU setting.

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Accidental tracheostomy decannulation: Risk factors and complications in pediatric patients using the NSQIP-P database.

Lay Summary:

This study looked at a major safety issue for children with a tracheostomy (a breathing tube in the neck): the tube accidentally coming out, a life-threatening event called Accidental Tracheostomy Decannulation (ATD). Since ATD requires immediate action to prevent severe harm, the research aimed to find out how often it happens and what puts a child at the highest risk. Researchers analyzed a national surgical database of 5,229 pediatric patients who had a tracheostomy over a ten-year period.

The findings showed that ATD occurred in 1.8% of patients, with nearly half of all events (42%) happening in the critical first two days after surgery. The study identified two key factors that significantly increased a child's risk of ATD:

- Structural Airway Abnormalities: Children with pre-existing problems in their airway or lungs were at higher risk.
- Gender: Female patients were independently associated with a higher risk of ATD.

When ATD occurred, the consequences were serious. It was found to be directly associated with an increased risk of requiring an unplanned second surgery and an increased risk of developing pneumonia. The authors conclude that ATD is a major postoperative complication. By identifying the characteristics of the highest-risk patients and the most dangerous time window (the first 48 hours), healthcare providers can implement more intense monitoring and preventative measures to save lives.

Summary for Healthcare Professionals:

This retrospective cohort study utilized the National Surgical Quality Improvement Program Pediatric (NSQIP-P) dataset to identify the incidence and associated risk factors of Accidental Tracheostomy Decannulation (ATD) in 5,229 pediatric patients who underwent tracheostomy between 2012 and 2021. The study confirmed ATD as a serious postoperative complication.

The incidence of ATD was 1.8% (n=93). A critical finding regarding timing was that 42% of these events occurred within the first two postoperative days. Multivariable logistic regression analysis, confirmed by propensity score matching, identified two independent patient factors associated with increased risk of ATD:

- Female gender (P=0.002).
- Structural pulmonary/airway abnormality (P=0.016).

The study also quantified the morbidity associated with ATD. The complication was significantly associated with an increased need for unplanned reoperation (P<0.001) and a higher incidence of postoperative pneumonia (P=0.024). The authors conclude that ATD is a significant postoperative adverse event. Identifying the highest-risk demographic and clinical factors—particularly those with structural airway abnormalities—along with the critical 48-hour risk period, is essential for implementing targeted safety measures and quality improvement initiatives to mitigate the associated morbidity.

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Effect of inspiratory and expiratory muscle training on respiratory function and decannulation outcome in patients with tracheostomy after stroke: a randomized controlled trial.

Lay Summary:

This study investigated the effectiveness of adding a specific exercise program to the rehabilitation of stroke patients who required a tracheostomy (a breathing tube in the neck). Since stroke often weakens the breathing muscles, these patients frequently struggle to breathe on their own, delaying the removal of the tube. The specialized intervention, called Inspiratory and Expiratory Muscle Training (IEMT), uses targeted resistance devices to strengthen both the inhalation and exhalation muscles over a period of three weeks.

The randomized controlled trial found that this training was highly effective in improving both the patients' respiratory function and their chance of successful recovery. The success rate for permanently removing the tracheostomy tube (decannulation) was dramatically higher in the trained group, increasing from only 8% in the control group to 36% in the IEMT group (p=0.019). Furthermore, the training significantly increased the strength of both the inspiratory and expiratory muscles and was associated with a lower rate of developing new pulmonary infections during the intervention period. The authors conclude that incorporating IEMT into standard care is a simple, safe, and beneficial strategy that directly improves the clinical outcome and speeds up the journey to full independence for post-stroke tracheostomy patients.

Summary for Healthcare Professionals:

This investigator-initiated, single-center, evaluator-blinded Randomized Clinical Trial (RCT) evaluated the efficacy and safety of Inspiratory and Expiratory Muscle Training (IEMT) as an adjunct therapy for post-stroke tracheostomy patients. The study cohort of 50 patients received IEMT for three weeks in addition to conventional rehabilitation. The primary outcomes were Maximal Inspiratory Pressure (MIP), Maximal Expiratory Pressure (MEP), and the tracheal tube extraction success rate (decannulation).

At three weeks post-intervention, the IEMT group demonstrated statistically significant improvements in respiratory function and outcomes:

- MIP increased significantly (56.28 vs 39.04 cmH2O, $p<0.001$).
- MEP increased significantly (62.16 vs 43.48 cmH2O, $p<0.001$).
- The decannulation success rate was four times higher in the IEMT group (36% vs 8%, $p=0.019$).

The IEMT intervention was also associated with a significantly reduced rate of new pulmonary infections compared to the control group (all $p<0.05$). The authors conclude that IEMT is a highly effective, safe intervention that significantly improves both respiratory muscle strength and the likelihood of successful decannulation. This evidence supports the integration of IEMT as a standard component of the multidisciplinary rehabilitation protocol for tracheostomized stroke patients.

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Quality of life improvement in 3 dogs with sleep-disordered breathing managed by permanent (crico)tracheostomy.

Lay Summary:

This study explores the outcomes of a major surgical procedure—a permanent tracheostomy (PT)—as a last resort treatment for pet dogs suffering from severe sleep-disordered breathing (SDB). SDB is a serious condition in these dogs, causing frightening and frequent episodes where they stop breathing at night (apneic episodes), which severely degrades their quality of sleep and overall well-being. For the three dogs included in this study, the nighttime symptoms were so severe that the owners were considering euthanasia.

The medical team performed the permanent tracheostomy, which creates a stable, artificial airway in the neck, bypassing the obstructed upper airway. The owners of all three dogs were given a survey to assess the dogs' recovery and quality of life after the surgery. The results were highly encouraging: every owner reported a distinct and measurable improvement in the severity and frequency of the SDB-related clinical signs. Crucially, the owners unanimously confirmed a significant improvement in their dogs' overall quality of life following the procedure. This research suggests that permanent tracheostomy is a viable, successful, and life-extending option for managing severe, debilitating sleep-disordered breathing in pet dogs.

Summary for Healthcare Professionals:

This retrospective case series investigated the management, efficacy, and outcome of Permanent (Crico)Tracheostomy (PT) as an intervention for severe, refractory Sleep-Disordered Breathing (SDB) in the canine population. The rationale for this study stems from the lack of data supporting PT when conventional management, such as brachycephalic airway surgery, has failed to alleviate nocturnal SDB. The sample comprised three client-owned dogs with confirmed SDB, characterized by high-frequency apneic episodes and severely compromised quality of sleep. Owner surveys confirmed that the severity of nighttime signs had led them to consider euthanasia prior to the elective PT procedure. Post-procedural assessment via medical record review and standardized owner surveys demonstrated successful outcomes in all three cases. Specifically, all owners reported a discernible improvement in the severity and frequency of SDB-related clinical signs. More broadly, the owners confirmed a subsequent enhancement in the dogs' quality of life. The authors conclude that PT is a technically feasible, safe, and effective long-term surgical strategy for managing severe, life-limiting SDB in dogs. The documented improvement in patient quality of life is a significant finding that supports the recommendation of PT as a viable salvage option when morbidity is high and conventional medical or surgical approaches have been exhausted.

Scientific abstracts and references

Laryngoscope Investig Otolaryngol. 2024 Dec 5;9(6):e70050. doi: 10.1002/lio2.70050. eCollection 2024 Dec.

Tracheoesophageal puncture and quality of life after total laryngectomy: A systematic review and meta-analysis.

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OBJECTIVE: Total laryngectomy (TL) is a standard induction treatment for laryngeal cancer. Patients have shown decreased quality of life (QOL) following laryngectomy potentially due to its impact on communication. This study is a systematic review of the effects of TEP on QOL in TL patients. METHODS: Data was extracted from PubMed, Ovid Medline, and Web of Science. A systematic review of literature assessing QOL after TEP within the last decade was conducted using PRISMA methodology. The initial search yielded 71 publications filtered to 15 after removing duplicates, non-English publications, and title screening. Two researchers independently reviewed abstracts, and 11 articles were retained. After a full article review, 6 examined QOL in TEP patients. RESULTS: The studies concluded that post-TL, patients with TEP experienced improved QOL than before the procedure or non-TEP alternatives for speech. The collective sample size yielded 253 patients. Meta-analysis demonstrated significant improvement in QOL described by the University of Washington-Quality of Life Index ($p < .0001$) and insignificant improvement defined by the Voice Handicap Index ($p = .07$). Several additional indices were included in the articles, all of which indicated improved QOL in TL patients post-TEP. These scales could not undergo meta-analysis due to their presence in only 1 study each. CONCLUSION: TEP is a valuable intervention in improving patient QOL and satisfaction following TL. There is no standardized tool for describing QOL in TL patients, so the authors recommend tools be chosen based on the specific aspects of QOL they represent. LEVEL OF EVIDENCE: 2a.

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

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Crit Care Nurs Q. 2025 Jan-Mar 01;48(1):43-51. doi: 10.1097/CNQ.0000000000000533. Epub 2024 Dec 2.

Enhancing Tracheostomy Care: Knowledge Among Nurses in Intensive Care Units.

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Patients requiring continuous mechanical ventilation benefit from easier airway management through tracheostomy, a standard treatment in critical care. However, gaps in nurses' comprehension of tracheostomy car can lead to complications such as infections and airway blockages. Therefore, understanding nurses' competency in tracheostomy care is essential for enhancing patient outcomes in intensive care units (ICUs). A cross-sectional study was conducted in the southern West Bank of Palestine among 237 nurses working in ICUs to assess their level of knowledge in tracheostomy care. Data were gathered via a structured questionnaire and analyzed using inferential tests and descriptive. Most nurses showed moderate knowledge of tracheostomy care, with significant differences observed based on age, gender, years of experience, and educational level. To significantly improve patient outcomes and safety in ICUs, it is imperative that nurses participate in continuous education and training programs focused on tracheostomy care.

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Conflict of interest statement: Researchers declare no conflict of interest with any organization regarding the materials discussed in this paper.

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Int J Pediatr Otorhinolaryngol. 2024 Nov 28;187:112174. doi: 10.1016/j.ijporl.2024.112174. Online ahead of print.

Accidental tracheostomy decannulation: Risk factors and complications in pediatric patients using the NSQIP-P database.

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BACKGROUND: Accidental tracheostomy decannulation (ATD) is a life-threatening event in pediatric patients. The factors associated with ATD in children are largely unknown. Utilizing the National Surgical Quality Improvement Pediatric (NSQIP-P) dataset, we sought to identify the incidence of ATD and associated factors. METHODS: Patients who underwent surgery at continuously enrolled American College of Surgeons NSQIP-P hospitals from January 1, 2012, to December 31, 2021, were included. Those who underwent a tracheostomy (CPT 31600 or 31601) as a primary or concurrent procedure were analyzed. ATD was defined by the NSQIP-P REINTUB variable. Multivariable logistic regression analysis and propensity score matching were performed to identify independent associations between demographic variables, relevant comorbidities, intraoperative factors, and ATD. Multivariable regression analyses were performed to identify any association between ATD and unplanned reoperation, pneumonia, extended length of stay, and death in 30 days in both pre-matched and matched cohorts. RESULTS: A total of 5229 patients undergoing tracheostomy were included in the final analysis for the pre-matched cohort. ATD occurred in 93 (1.8 %) patients, with 42 % (n = 39) of these cases occurring within the first two postoperative days. In the matched cohort, female gender (P = 0.002) and structural pulmonary/airway abnormality (P = 0.016) were independently associated with ATD. Additionally, ATD was associated with unplanned reoperation (P < 0.001) and pneumonia (P = 0.024). The pre-matched cohort showed consistent results with the matched cohort. DISCUSSION: Accidental decannulation is a serious complication following pediatric tracheostomy. By identifying patients at higher risk for ATD and the timing of its occurrence, providers can employ measures targeting these patients during their highest risk period. The sequelae associated with ATD further emphasize the importance of preventing this complication.

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Conflict of interest statement: Declaration of competing interest No conflicts of interest.

NTSP Podcast Series

Top Stroke Rehabil. 2024 Dec 9:1-10. doi: 10.1080/10749357.2024.2437328. Online ahead of print.

Effect of inspiratory and expiratory muscle training on respiratory function and decannulation outcome in patients with tracheostomy after stroke: a randomized controlled trial.

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BACKGROUND: This study aimed to evaluate the clinical efficacy and safety of inspiratory and expiratory muscle training (IEMT) for patients who underwent tracheostomy after stroke.METHODS: The study was an investigator-initiated, single-center, two-arm, evaluator-blinded, randomized clinical trial conducted at West China Hospital of Sichuan University, China, from January 2022 to June 2022. The patients were randomly divided into the intervention group and control group. Patients in both groups received conventional clinical, rehabilitation treatment and usual care. The intervention group also received IEMT for three weeks. There were three primary outcomes including maximal inspiratory pressure (MIP, cmH2O), maximal expiratory pressure (MEP, cmH2O) and decannulation outcome after intervention (n, %). The secondary outcomes were other respiratory function outcomes, motor function, activities of daily living (ADL), quality of life (QoL) and the new pulmonary infection rate after the intervention at three weeks. RESULTS: A total of 50 participants were enrolled [25 in each group; 39 (78%) were men; mean (SD) age, 55.94 (11.97) years]. At three weeks, significant differences were found in the MIP [control vs IEMT: 39.04 (6.21) vs 56.28 (10.41), $p < 0.001$]; MEP [43.48 (5.36) vs 62.16 (10.18), $p < 0.001$], and tracheal tube extraction success rate [2 (8%) vs 9 (36%), $p = 0.019$] between the two groups. In addition, the new pulmonary infection rate in the intervention groups were significantly different (all $p < 0.05$) from those in the control group. CONCLUSIONS: IEMT can improve respiratory function, decannulation outcome, among patients with tracheostomy after stroke.

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Am J Vet Res. 2024 Dec 20:1-9. doi: 10.2460/ajvr.24.09.0270. Online ahead of print.

Quality of life improvement in 3 dogs with sleep-disordered breathing managed by permanent (crico)tracheostomy.

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OBJECTIVE: To retrospectively describe the management of sleep-disordered breathing (SDB) via permanent (crico)tracheostomy (PT). METHODS: The sample was 3 client-owned dogs. Each of the dogs had variable clinical signs related to their SDB with all having severely affected quality of sleep and experiencing multiple apneic episodes a night in the study period from January 1, 2019, to December 31, 2023. Two of the 3 dogs showed minimal daytime clinical signs, with 1 owner reporting no noticeable changes in breathing, activity, or alertness, while another noted only mild alterations. Despite previous brachycephalic airway surgery, clinical signs persisted or recurred, and all owners considered euthanasia secondary to nighttime signs. Permanent (crico)tracheostomy was elected in all cases. RESULTS: Medical records were reviewed, and a standardized survey was administered to owners. All cases demonstrated variable degrees of improvement in the severity and frequency of clinical signs relating to SDB following PT, and overall quality of life improved from poor to good in all cases. All cases experienced surgical complications ranging from moderate to severe following PT, with 2 of 3 dogs requiring revision surgeries for skin-fold occlusion and stenosis of the PT. CONCLUSIONS: Sleep-disordered breathing may be an underrecognized component of brachycephalic obstructive airway syndrome, with nighttime clinical signs significantly impacting quality of life. CLINICAL RELEVANCE: Permanent (crico)tracheostomy may be considered in cases that either do not respond to initial brachycephalic airway surgery or in cases where clinical signs recur years after initial surgery. Owners should be aware of the likelihood of revision surgeries to achieve optimal outcomes.

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