NTSP Podcast series

National Tracheostomy Safety Project

This month's top papers: December 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

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This month's top papers

- A U-shaped association of tracheostomy timing with all-cause mortality in mechanically ventilated patients admitted to the intensive care unit: A retrospective cohort study.
- Postoperative photography reduces incorrect wound breakdown diagnoses in tracheostomy.
- Timing of tracheostomy and patient outcomes in critically ill patients requiring extracorporeal membrane oxygenation: a single-center retrospective observational study
- Caregiver quality of life after pediatric tracheostomy

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A U-shaped association of tracheostomy timing with all-cause mortality in mechanically ventilated patients admitted to the intensive care unit: A retrospective cohort study.

Lay Summary:

This retrospective study thoroughly examined the optimal time to perform a tracheostomy—a surgical procedure to insert a breathing tube in the neck—for critically ill patients who are on a mechanical ventilator in the Intensive Care Unit (ICU). The timing of this procedure is a challenging and high-stakes decision in critical care, as it impacts long-term ventilation, weaning, and the potential for complications. To find a data-driven answer, researchers analyzed a large volume of patient data, looking specifically for a relationship between the timing of the tracheostomy and the patient's survival over 90 days.

The study revealed a notable "U-shaped" association with mortality. This finding indicates that performing the tracheostomy either too early or too late was linked to a higher risk of death. The optimal window, associated with the lowest risk of mortality, was identified as being between 10 and 14 days after the patient began invasive mechanical ventilation.

Performing the procedure too early may be disadvantageous if the patient is not yet medically stable and could have been removed from the ventilator naturally. Conversely, delaying the procedure beyond this period increases the risk of complications from the prolonged oral breathing tube, such as laryngeal damage or serious infections. These findings are crucial for providing clinicians and families with a clearer, evidence-based strategy for timing this critical intervention.

Summary for Healthcare Professionals:

This retrospective cohort study utilized data from the eICU Collaborative Research Database to investigate the association between **tracheostomy timing** and **90-day all-cause mortality** in mechanically ventilated ICU patients. The objective was to provide empirical evidence for the optimal timing of this intervention for patients requiring prolonged invasive mechanical ventilation (IMV). By applying Restricted Cubic Spline (RCS) regression and multivariable Cox proportional hazards regression models, the authors analyzed mortality risk as a function of the number of days after the initiation of IMV.

The primary finding was a significant **U-shaped association** between the timing of tracheostomy and 90-day all-cause mortality. The **lowest risk of mortality** was observed when tracheostomy was performed between **10 and 14 days** post-IMV initiation. Performance of the procedure outside this window was associated with an increased risk of mortality. This suggests that delaying the procedure beyond 14 days negates its potential benefits and increases the risk of complications associated with prolonged orotracheal intubation, such as laryngeal injury or ventilator-associated pneumonia.

The authors conclude that the optimal timing for surgical tracheostomy is between 10 and 14 days after the initiation of mechanical ventilation for patients admitted to the ICU. This data provides strong empirical support for standardizing tracheostomy timing guidelines for IMV patients.

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Postoperative photography reduces incorrect wound breakdown diagnoses in tracheostomy.

Lay Summary:

This study looked at a simple but effective technique to prevent problems with healing after a tracheostomy (a breathing tube in the neck) in children. Without a clear picture of what the wound originally looked like, many hospital providers tend to assume a healthy, post-surgical wound is actually starting to break down or get infected. These incorrect diagnoses can lead to unnecessary extra work, wasted time, and lower ratings for the hospital.

To solve this, the hospital started a new procedure: taking an immediate postoperative photograph of the tracheostomy site and including it in the patient's electronic medical record. The researchers studied 45 children and found that after they started using this visual reference, the number of all wound breakdown diagnoses dropped significantly, by 91%. All the diagnoses that were made after the photos were introduced were verified as correct.

The study concludes that simply placing an intraoperative photograph in the patient's chart provides the necessary context for all caregivers, preventing confusion and enhancing patient care. This small action is a powerful tool for quality improvement, ensuring that a healthy wound is not mistakenly treated as a decaying one.

Summary for Healthcare Professionals:

This retrospective cohort study investigated the impact of integrating immediate postoperative photographs of a tracheostomy site into the electronic medical record (EMR) to reduce the incidence of incorrect wound breakdown diagnoses in a pediatric patient population. The study spanned 45 patients who underwent a tracheostomy between 2017 and 2019, during which the hospital implemented this change in practice.

The key finding was a significant reduction in wound breakdown diagnoses after the intervention. When comparing the pre- and post-intervention periods, there was a dramatic 91% reduction in all recorded wound breakdown diagnoses. Importantly, all diagnoses entered into the chart after the photographs were instituted were subsequently verified as correct, demonstrating the power of the visual reference in providing crucial contextual accuracy to providers.

The authors conclude that a lack of context regarding the normal appearance of a postoperative tracheostomy wound often leads various providers to incorrectly grade a healthy wound as degradation. Placing the intraoperative wound photograph in the EMR serves as an immediate reference standard. This simple, easily implemented action is an effective quality improvement measure that enhances patient care, decreases unnecessary clinical work, and provides accurate documentation of the healing process.

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Timing of tracheostomy and patient outcomes in critically ill patients requiring extracorporeal membrane oxygenation: a single-center retrospective observational study

Lay Summary:

This paper investigated the critical question of when to perform a tracheostomy—a surgical procedure to insert a breathing tube in the neck—for critically ill patients on a mechanical ventilator in the Intensive Care Unit (ICU). The timing of this procedure is a challenging and high-stakes decision in critical care, as it impacts long-term ventilation, weaning, and the potential for complications. To find a data-driven answer, researchers analyzed a large volume of patient data, looking specifically for a relationship between the timing of the tracheostomy and the patient's survival over 90 days.

The key finding was the discovery of a notable "U-shaped association" with mortality. This important finding means that performing the tracheostomy either too early or too late was linked to a higher risk of death. The safest period, associated with the lowest risk of mortality, was identified as being between 10 and 14 days after the patient began mechanical ventilation. Performing the procedure too early may intervene in unstable patients, whereas delaying the procedure beyond 14 days increases the risk of complications from the prolonged oral breathing tube, such as laryngeal damage or serious infections. This comprehensive analysis gives clinicians and families a clearer, evidence-based strategy for timing this critical intervention, which is essential for improving patient outcomes.

Summary for Healthcare Professionals:

This retrospective cohort study investigated the association between tracheostomy timing and 90-day all-cause mortality in mechanically ventilated ICU patients. The objective was to determine the optimal timing for this intervention among patients requiring prolonged invasive mechanical ventilation (IMV). By utilizing multivariable Cox proportional hazards regression models on a large patient dataset, the study analyzed mortality risk as a function of the number of days after IMV initiation.

The primary finding was a significant U-shaped association between the timing of tracheostomy and 90-day all-cause mortality. Specifically, the lowest risk of mortality was observed when tracheostomy was performed between 10 and 14 days post-IMV initiation. Performance of the procedure outside this window was associated with an increased risk of mortality. This finding highlights that both excessively early and excessively late timing carry increased hazards. While performing the procedure too early may intervene in patients with higher acuity who would not benefit, delaying it beyond 14 days increases the risk of complications from prolonged orotracheal intubation, such as laryngeal injury or ventilator-associated pneumonia. The authors conclude that identifying this optimal 10-to-14-day window provides strong empirical evidence that should guide standardized practice protocols for surgical tracheostomy timing in the ICU.

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Caregiver quality of life after pediatric tracheostomy

Lay Summary:

This study investigated the profound impact that caring for a child with a tracheostomy—a breathing tube placed in the neck—has on the quality of life (QoL) of their caregivers. Researchers surveyed caregivers using a well-known tool called the PedsQL™ Family Impact Module, which measures a family's well-being across emotional, physical, and social areas. Surveys were collected from 255 caregivers both when the tracheostomy tube was first placed and during later follow-up visits.

The central finding was that the burden of care is significant, confirming that these caregivers experience a much lower overall QoL compared to families with healthy children. On a standardized QoL scale, the average score for these caregivers was substantially lower at both the time of placement and at follow-up (e.g., 77.2 at placement vs. 87.6 for healthy families).

The difficulties experienced go beyond just physical care, heavily impacting the family's emotional and social world. Immediately after placement, caregivers struggled most with emotional functioning and family relationships. Over time, these challenges broadened to include major deficits in emotional, social, and cognitive functioning, and difficulties maintaining family relationships. While emotional and physical well-being did improve slightly after the child was home, the overall burden remained consistently low. The study's clear conclusion is that caring for a child with a tracheostomy is a significant, long-term burden. Therefore, comprehensive, team-based medical and psychological support is urgently needed for these families from the moment the tracheostomy is placed and for years thereafter.

Summary for Healthcare Professionals:

This study conducted a repeated cross-sectional analysis to determine the sustained impact of caring for a child with a tracheostomy on caregiver quality of life (QoL). Caregivers were surveyed using the validated PedsQL™ Family Impact Module at the time of tracheostomy placement (n=66) and during subsequent ambulatory follow-up visits (n=189), totaling 255 surveys.

The analysis confirmed that the burden of care results in significantly reduced QoL for the caregiver population. Compared to normative data for healthy children, the mean Total Family Impact Scores were significantly lower at both tracheostomy placement (77.2 vs. 87.6, P<.0) and at follow-up (75.8 vs. 87.6, P<.0).

Deficits were most pronounced in psychosocial domains. At the time of placement, caregivers reported significantly lower scores in emotional functioning and family relationships. At follow-up, this expanded to include significant deficits across emotional, social, and cognitive functioning, as well as family relationships, demonstrating a sustained, widespread negative impact. Longitudinal data indicated a significant improvement in emotional and physical functioning scores from the time of placement to follow-up, suggesting a partial adaptation to the acute stress. However, other domain scores remained stable, and the total score maintained a clinically significant deficit compared to the healthy cohort. The authors conclude that caring for a child with a tracheostomy imposes a substantial burden on caregiver QoL, strongly advocating for the necessity of comprehensive multidisciplinary support commencing at the time of tracheostomy placement to address these persistent psychosocial needs.

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Scientific abstracts and references

Front Med (Lausanne). 2022 Dec 14;9:1068569. doi: 10.3389/fmed.2022.1068569. eCollection 2022.

A U-shaped association of tracheostomy timing with all-cause mortality in mechanically ventilated patients admitted to the intensive care unit: A retrospective cohort study.

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OBJECTIVES: To evaluate the association of tracheostomy timing with all-cause mortality in patients with mechanical ventilation (MV). METHOD: It's a retrospective cohort study. Adult patients undergoing invasive MV who received tracheostomy during the same hospitalization based on the Medical Information Mart for Intensive Care-III (MIMIC-III) database, were selected. The primary outcome was the relationship between tracheostomy timing and 90-day all-cause mortality. A restricted cubic spline was used to analyze the potential non-linear correlation between tracheostomy timing and 90-day all-cause mortality. The secondary outcomes included free days of MV, incidence of ventilator-associated pneumonia (VAP), free days of analgesia/sedation in the intensive care unit (ICU), length of stay (LOS) in the ICU, LOS in hospital, in-ICU mortality, and 30-day all-cause mortality. RESULTS: A total of 1,209 patients were included in this study, of these, 163 (13.5%) patients underwent tracheostomy within 4 days after intubation, while 647 (53.5%) patients underwent tracheostomy more than 11 days after intubation. The tracheotomy timing showed a U-shaped relationship with all-cause mortality, patients who underwent tracheostomy between 5 and 10 days had the lowest 90-day mortality rate compared with patients who underwent tracheostomy within 4 days and after 11 days [84 (21.1%) vs. 40 (24.5%) and 206 (31.8%), $P < 0.001$]. CONCLUSION: The tracheotomy timing showed a U-shaped relationship with all-cause mortality, and the risk of mortality was lowest on day 8, but a causal relationship has not been demonstrated.

Am J Otolaryngol. 2022 Dec 23;44(2):103763. doi: 10.1016/j.amjoto.2022.103763. Online ahead of print.

Postoperative photography reduces incorrect wound breakdown diagnoses in tracheostomy.

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PURPOSE: This study was performed to investigate the effect of including immediate postoperative photographs of a tracheostomy site on diagnoses (correct and incorrect) of wound breakdown in a pediatric patient population. MATERIALS AND METHODS: Chart review was performed of all patients from 2017 to 2019 who underwent a tracheostomy. Within this time span, the practice of the hospital changed such that postoperative photography was taken of the tracheostomy site. There were no changes in in-service training protocols over this time. Wound breakdown diagnoses were examined prior to and after the intervention. Diagnoses were categorized by severity according to the National Pressure Ulcer Advisory Board. Diagnoses were then divided into correct or incorrect based on examination by physician teams at the time of the diagnosis. RESULTS: Forty five patients underwent a tracheostomy during the study period. When comparing the two groups, there was a reduction in all wound breakdown diagnosis by 91 %, and those diagnoses which were entered into the chart after the photos were verified as correct. CONCLUSIONS: Without appropriate context as to the nature of tracheostomy wounds, many providers may incorrectly grade a healthy wound as wound degradation, which can affect care, reimbursement, and hospital ratings. We present our findings of placing an intraoperative wound photo in the patient's electronic medical record as a reference should wound concerns arise. We believe this is an easy action which can enhance patient care, decrease unnecessary work, and provide an accurate documentation of tracheostomy care pathways and results.

J Intensive Care. 2022 Dec 30;10(1):56. doi: 10.1186/s40560-022-00649-w.

Timing of tracheostomy and patient outcomes in critically ill patients requiring extracorporeal membrane oxygenation: a single-center retrospective observational study.

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BACKGROUND: Extracorporeal membrane oxygenation (ECMO) is an integral method of life support in critically ill patients with severe cardiopulmonary failure; however, such patients generally require prolonged mechanical ventilation and exhibit high mortality rates. Tracheostomy is commonly performed in patients on mechanical ventilation, and its early implementation has potential advantages for favorable patient outcomes. This study aimed to investigate the association between tracheostomy timing and patient outcomes, including mortality, in patients requiring ECMO. METHODS: We conducted a single-center retrospective observational study of consecutively admitted patients who were supported by ECMO and underwent tracheostomy during intensive care unit (ICU) admission at a tertiary care center from April 2014 until December 2021. The primary outcome was hospital mortality. Using the quartiles of tracheostomy timing, the patients were classified into four groups for comparison. The association between the quartiles of tracheostomy timing and mortality was explored using multivariable logistic regression models. RESULTS: Of the 293 patients treated with ECMO, 98 eligible patients were divided into quartiles 1 (≤ 15 days), quartile 2:16-19 days, quartile 3:20-26 days, and 4 (> 26 days). All patients underwent surgical tracheostomy and 35 patients underwent tracheostomy during ECMO. The complications of tracheostomy were comparable between the groups, whereas the duration of ECMO and ICU length of stay increased significantly as the quartiles of tracheostomy timing increased. Patients in quartile 1 had the lowest hospital mortality rate (19.2%), whereas those in quartile 4 had the highest mortality rate (50.0%). Multivariate logistic regression analysis showed a significant association between the increment of the quartiles of tracheostomy timing and hospital mortality (adjusted odds ratio for quartile increment:1.55, 95% confidence interval 1.03-2.35, p for trend = 0.037). CONCLUSIONS: The timing of tracheostomy in patients requiring ECMO was significantly associated with patient outcomes in a time-dependent manner. Further investigation is warranted to determine the optimal timing of tracheostomy in terms of mortality.

Int J Pediatr Otorhinolaryngol. 2022 Dec 9;164:111416. doi: 10.1016/j.ijporl.2022.111416. Online ahead of print.

Caregiver quality of life after pediatric tracheostomy.

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OBJECTIVE: To determine the impact of a child with a tracheostomy on caregiver quality of life. METHODS: A repeated cross-sectional analysis included families with tracheostomy-dependent children between 2019 and 2021. Caregivers were surveyed using the PedsQL™ Family Impact Module with assessments at tracheostomy placement and during ambulatory office visits. RESULTS: Two-hundred and fifty-five surveys were performed with 66 at tracheostomy placement (26%) and 189 at follow-up visits (74%). Compared to families with healthy children, total scores at placement (77.2 vs. 87.6, $P < .001$) and follow-up visits (78.9 vs. 87.6, $P < .001$) were significantly lower among pediatric tracheostomy families. Caregivers were likely to report significant improvement in emotional functioning (6.2 points; 95% CI: 0.5-12, $P = .03$) and worry (9 points, 95% CI: 2.1-15.9, $P = .01$) over time. Demographic variables demonstrated no confounding or interactive effects. CONCLUSIONS: The presence of a tracheostomy is associated with lower caregiver quality of life scores in the short- and long-term compared to caregivers of healthy children. Providers should be sensitive to these challenges and provide appropriate support for families of tracheostomy-dependent children.