National Tracheostomy Safety Project

This month's top papers: September 2021

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

- Taking a Chance to Recover: Families Look Back on the Decision to Pursue Tracheostomy After Severe Acute Brain Injury
- Tracheostomy for COVID-19: evolving best practice
- Bench testing of tracheostomy tube-related insults using an instrumented manikin
- The ISPAT Project: Implementation of a standardized training program for caregivers of children with tracheostomy

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Taking a Chance to Recover: Families Look Back on the Decision to Pursue Tracheostomy After Severe Acute Brain Injury

Lay Summary:

This study explores the emotional and mental state of families who had to decide whether to give their loved one a tracheostomy after a severe brain injury, such as a stroke or traumatic brain injury. A tracheostomy is a tube placed in the neck to help a person breathe, and it's a major decision because the patient might need it for a long time.

Researchers interviewed 20 family members of 18 patients who received a tracheostomy. The interviews took place, on average, 16 months after the hospitalization. The study found two main things:

1. It didn't feel like a choice. Families felt they had to pursue the tracheostomy because the alternative—death—was unacceptable. They believed they had to give their loved one "a chance," especially since the long-term outcome of a severe brain injury is often very uncertain.
2. Communication was everything. Families who felt that the hospital staff communicated with compassion, hope, and clarity were able to look back on their decision with a sense of peace, regardless of whether their loved one eventually recovered or passed away. In contrast, families felt rushed, confused, or that doctors were too negative often struggled with the memory of the decision.

The study concludes that for families, the uncertainty of a severe brain injury makes the decision feel like a non-choice. Therefore, the quality of communication from the medical team is extremely important for helping families cope with this difficult and stressful time.

Summary for Healthcare Professionals:

This qualitative study investigated the long-term reflections of family decision-makers regarding the choice to pursue a tracheostomy for loved ones with severe acute brain injury (SABI). The study included 38 patients who underwent a tracheostomy, with semi-structured telephone interviews conducted with 20 family members of 18 of these patients at a mean of 16 months post-hospitalization.

Two key themes emerged from the interviews. One, Tracheostomy was not perceived as a choice. Families' decision-making was dominated by the profound prognostic uncertainty of SABI. They felt compelled to "take a chance" on an uncertain recovery because the alternative, certain death, was unacceptable. This perceived lack of choice was equated with giving their loved one an opportunity for survival and a chance to recover. And two, The quality of clinician communication was paramount. Families identified a fundamental need for communication that was compassionate, hopeful, and clear. When clinicians demonstrated compassion by not rushing decisions and conveying a sense of emotional support, families were able to reflect on the tracheostomy decision with peace, regardless of the patient's eventual outcome. They also needed clinicians to balance hope with realism and provide a unified, consistent message in understandable terms to mitigate confusion and distress.

The study's findings suggest that for families of patients with SABI, prognostic uncertainty can "transcend the concept of choice" when faced with life-or-death decisions. High-quality communication, characterized by compassion, hope, and clarity, is a critical component of high-quality care that may help mitigate the stress associated with these high-stakes decisions. The authors recommend that future studies explore the perspectives of families who declined tracheostomy and the clinicians involved in these conversations to further standardize and improve the decision-making process.

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Tracheostomy for COVID-19: evolving best practice

Lay Summary:

This review paper discusses how the COVID-19 pandemic changed the way doctors think about and perform tracheostomies, which is a common procedure for critically ill patients who need long-term breathing support. The pandemic presented new challenges, as patients often required ventilators for longer periods and there was a risk of spreading the virus to healthcare staff.

The authors explain that while tracheostomy is a well-established procedure, decisions about when and how to do it became more complicated with COVID-19. They highlight a key debate: should the procedure be done early to help the patient and free up hospital resources, or should it be delayed to reduce the risk of infection for staff? The review notes that delaying the procedure might be safer for staff, as the amount of virus in a patient's body decreases over time. However, performing it early can benefit the patient by reducing the need for sedatives, preventing damage to the voice box from the breathing tube, and helping them start rehabilitation, like eating and talking, sooner.

The paper concludes that while there was a steep learning curve, a balance has been reached. Hospitals have found ways to protect their staff while still providing the best care for patients who need a tracheostomy. The authors stress the importance of a team-based approach and local expertise in making these complex decisions.

Summary for Healthcare Professionals:

This state-of-the-art review discusses the evolving best practices for tracheostomy in patients with COVID-19, addressing the balance between patient benefits and staff safety. The COVID-19 pandemic has led to a significant increase in the use of tracheostomies in critically ill patients, with reported rates ranging from 16% to 61%.

The review highlights the complex considerations for tracheostomy in this patient population. Patient factors favoring early tracheostomy include reduced sedation, prevention of laryngeal injury associated with prolonged intubation, improved pulmonary hygiene, and earlier engagement in rehabilitation. However, these benefits must be weighed against the risks to staff due to the aerosol-generating nature of the procedure. Virological evidence indicates that viral load declines after symptom onset, suggesting that delaying the procedure may reduce the risk of transmission to staff.

The authors note that while international protocols varied, most converged on a timeframe of at least 14 days of mechanical ventilation before performing a tracheostomy, balancing patient benefits with staff risk. They also discuss the importance of patient selection, recommending that the procedure be performed only on those who are clinically improving and who do not require prone positioning. The review emphasizes the importance of a multidisciplinary approach and local expertise in determining the optimal timing and technique for tracheostomy. The authors conclude that with appropriate planning, PPE, and a team-based approach, it is possible to protect healthcare staff while providing optimal care for patients who will benefit from a tracheostomy.

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Bench testing of tracheostomy tube-related insults using an instrumented manikin

Lay Summary:

This study investigated how different types of tracheostomy tubes, which are used to help a patient breathe, can cause injury to the windpipe. The researchers used a special manikin, or medical dummy, with a pressure sensor in its windpipe to measure the force and pressure exerted by 17 different tube models.

The findings were concerning. The study found that most of the tubes they tested applied pressures to the windpipe that are known to cause tissue damage. In fact, only 2 of the 17 tubes generated pressures below the recommended safety limit. The force and pressure were not only high when the tube was in place but were also much higher during the process of inserting the tube. This initial high pressure and the friction of insertion could cause immediate damage that would make it harder for the tissue to heal later on.

The study highlights that many commercially available tubes might not be ideal for all patients and could be a source of complications like tissue damage and scarring. The authors stress that doctors must carefully choose the right tube for each patient based on their experience and the patient's specific anatomy to avoid these risks.

Summary for Healthcare Professionals:

This bench study utilized an instrumented manikin to assess the mechanical forces and pressures applied to the posterior tracheal wall by 17 commercially available tracheostomy tube (TT) models of size 7. The objective was to determine the frequency of pressures capable of causing tracheal tissue injury and to benchmark TT performance.

The study's primary finding was that most TT models generated forces that, when converted to pressure, exceeded the accepted threshold for tracheal injury, which is 3.99 kPa (30 mmHg). Only 2 of the 17 tested tubes remained below this threshold in the intratracheal position. The force applied during tube insertion was found to be significantly higher than the residual force with the tube in place and was also above the injury cutoff. The forces applied, both during insertion and in situ, varied widely across different TT models.

The authors raise concerns that these pressures can lead to local ischemia and tissue necrosis, potentially contributing to late complications such as granulation tissue formation and tracheal stenosis. The study also notes that the initial mucosal lesion caused by high pressure and friction during insertion may impair subsequent healing. The authors conclude that a large number of TTs on the market may be capable of inducing tracheal injury if not selected with care based on the patient's individual anatomy and the clinician's experience.

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The ISPAT Project: Implementation of a standardized training program for caregivers of children with tracheostomy

Lay Summary:

This study looked at how a special training program could help parents and guardians of children with a tracheostomy tube. A tracheostomy is a breathing tube placed in a child's neck, and care for it at home can be challenging for families. The study's main goal was to see if a single, standardized training session could improve a caregiver's knowledge and practical skills, like changing and suctioning the tube.

The study included 65 caregivers who first took a written test and a practical test on a manikin to see what they already knew. Then, they received a one-hour training session that included videos, diagrams, and hands-on practice. Immediately after, they took the same tests again.

The results were impressive:

- The average score on the written test jumped by 26%.
- The score for correctly changing the tracheostomy tube increased by 44%.
- The score for correctly suctioning the tube also improved by 44%.
- After the training, nearly all caregivers (98%) felt the course was good or excellent.

The study found that these types of hands-on training programs are very effective. The authors recommend that all caregivers receive this kind of standardized training, including hands-on practice, before their child is sent home from the hospital.

Summary for Healthcare Professionals:

This quasi-experimental, multi-center study evaluated the effectiveness of a standardized training program on the knowledge and practical skills of caregivers of children with tracheostomies. The study included 65 caregivers from six pediatric pulmonology divisions in Istanbul.

Participants were assessed with a written test and practical manikin-based tests for tracheostomy tube change and suctioning before and after a single one-hour training session. The training included theoretical instruction, practical hands-on training (HOT), and educational materials like videos and diagrams.

The results showed a statistically significant improvement in all areas of assessment. The median written test score increased by 26% (from 12 to 18 out of 23 questions, $p < 0.001$). Practical skills also saw significant gains, with the median score for tracheostomy tube change increasing by 44% (from 9 to 16 correct steps out of 16, $p < 0.001$) and for suctioning also increasing by 44% (from 9 to 17 out of 18 steps, $p < 0.001$). The proportion of caregivers who correctly performed all steps of the tube change increased from 3% to 50.8%. Caregiver satisfaction was high, with 98% rating the course as good or excellent.

The authors conclude that standardized training programs, particularly those incorporating hands-on training, are highly effective for improving caregiver knowledge and skills in tracheostomy care. They advocate for the implementation of such programs before hospital discharge to potentially reduce tracheostomy-related morbidity and mortality in the long term, acknowledging the need for further research on long-term outcomes and the impact on clinical events.

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Scientific abstracts and references

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Neurocrit Care. 2021 Sep 2:1-7. doi: 10.1007/s12028-021-01335-9. Online ahead of print.

Taking a Chance to Recover: Families Look Back on the Decision to Pursue Tracheostomy After Severe Acute Brain Injury.

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BACKGROUND: Tracheostomy represents one important and value-laden treatment decision after severe acute brain injury (SABI). Whether to pursue this life-sustaining treatment typically hinges on intense conversations between family and clinicians. The aim of this study was, among a cohort of patient who had undergone tracheostomy after SABI, to explore the long-term reflections of patients and their families as they look back on this decision. METHODS: For this qualitative study, we reviewed the electronic medical records of patients with SABI who underwent tracheostomy. We included all patients who were admitted to our 30-bed neuro-intensive care unit with SABI and underwent tracheostomy between November 2017 and October 2019. Using purposive sampling, we invited survivors and family members to participate in telephone interviews greater than 3 months after SABI until thematic saturation was reached. Interviews were audiotaped, transcribed, and analyzed by using thematic analysis. RESULTS: Overall, 38 patients with SABI in the neuro-intensive care unit underwent tracheostomy. The mean age of patients was 49 (range 18-81), with 19 of 38 patients diagnosed with traumatic brain injury and 19 of 38 with stroke. We interviewed 20 family members of 18 of 38 patients at a mean of 16 (SD 9) months after hospitalization. The mean patient age among those with an interview was 50 (range 18-76); the mean modified Rankin Scale score (mRS) was 4.7 (SD 0.8) at hospital discharge. At the time of the interview, ten patients lived at home and two in a skilled nursing facility and had a mean mRS of 2.6 (SD 0.9), and six had died. As families reflected on the decision to proceed with a tracheostomy, two themes emerged. First, families did not remember tracheostomy as a choice because the uncertain chance of recovery rendered the certain alternative of death unacceptable or because they valued survival above all and therefore could not perceive an alternative to life-sustaining treatment. Second, families identified a fundamental need to receive supportive, consistent communication centering around compassion, clarity, and hope. When this need was met, families were able to reflect on the tracheostomy decision with peace, regardless of their loved one's eventual outcome. CONCLUSIONS: After SABI, prognostic uncertainty almost transcends the concept of choice. Families who proceeded with a tracheostomy saw it as the only option at the time. High-quality communication may mitigate the stress surrounding this high-stakes decision.

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Crit Care. 2021 Aug 31;25(1):316. doi: 10.1186/s13054-021-03674-7.

Tracheostomy for COVID-19: evolving best practice.

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This article is one of ten reviews selected from the Annual Update in Intensive Care and Emergency Medicine 2021. Other selected articles can be found online at https://www.biomedcentral.com/collections/annualupdate2021 . Further information about the Annual Update in Intensive Care and Emergency Medicine is available from https://link.springer.com/bookseries/8901 **.**

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Eur Arch Otorhinolaryngol. 2021 Sep 9. doi: 10.1007/s00405-021-07054-3. Online ahead of print.

Bench testing of tracheostomy tube-related insults using an instrumented manikin.

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PURPOSE: Choosing the right tracheal tube for the right patient is a daily preoccupation for intensivists and emergency physicians. Tracheal tubes can generate severe complications, which are chiefly due to the pressures applied by the tube to the trachea. We designed a bench study to assess the frequency of pressure levels likely to cause tracheal injury. METHODS: We tested the pressure applied on the trachea by 17 tube models of a given size range. To this end, we added a pressure sensor to the posterior tracheal wall of a standardized manikin. RESULTS: Only 2 of the 17 tubes generated pressures under the threshold likely to induce tracheal injury (30 mmHg/3.99 kPa). The force exerted on the posterior wall of the trachea varied widely across tube models. CONCLUSION: Most models of tracheal tubes resulted in forces applied to the trachea that are usually considered capable of causing tracheal tissue injury. LEVEL OF EVIDENCE: Oxford Centre for Evidence-Based Medicine 2011 Levels of Evidence: How common is the problem?: step 1; Is this diagnostic or monitoring test accurate? (Diagnosis) step 5; What will happen if we do not add a therapy? (Prognosis) n/a; Does this intervention help? (Treatment Benefits) step 5; What are the COMMON harms?(Treatment Harms) step 5; What are the RARE harms? (Treatment Harms) step 5; Is this (early detection) test worthwhile? (Screening) step 5.

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Pediatr Pulmonol. 2021 Sep 25. doi: 10.1002/ppul.25704. Online ahead of print.

THE ISPAT PROJECT: IMPLEMENTATION OF A STANDARDIZED TRAINING PROGRAM FOR CAREGIVERS OF CHILDREN WITH TRACHEOSTOMY.

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BACKGROUND: Tracheostomy-related morbidity and mortality mainly occur due to decannulation, misplacement or obstruction of the tube. A standardized training can improve the skills and confidence of the caregivers in tracheostomy care (TC). OBJECTIVE: Our primary aim was to evaluate the efficiency of standardized training program on the knowledge and skills (changing-suctioning the tracheostomy tube) of the participants regarding TC. MATERIALS-METHODS: Sixty-five caregivers of children with tracheostomy were included. First, participants were evaluated with written test about TC and participated in the practical tests. Then, they were asked to participate in a standardized training session, including theoretical and practical parts. Baseline and post-intervention assessments were compared through written and practical tests conducted on the same day. RESULTS: A significant improvement was observed in the written test score after the training. The median number of correct answers of the written test including 23 questions increased 26%, from 12 to 18 ($p<0.001$). The median number of correct steps in tracheostomy tube change (from 9 to 16 correct steps out of 16 steps, 44% increase) and suctioning the tracheostomy tube (from 9 to 17 correct steps out of 18 steps, 44% increase) also improved significantly after the training ($p<0.001$, for both). CONCLUSION: Theoretical courses and practical hands-on-training (HOT) courses are highly effective in improving the practices in TC. A standardized training program including HOT should be implemented before discharge from the hospital. Still there is a need to assess the impact of the program on tracheostomy-related complications, morbidity, and mortality in the long term.