NTSP Podcast series

National Tracheostomy Safety Project

This month's top papers: January 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

- Influencing factors for tracheostomy in patients with acute traumatic C3-C5 spinal cord injury and acute respiratory failure.
- Retrospective analysis of post-tracheostomy complications.
- Tracheostomy care and communication during COVID-19: Global interprofessional perspectives.
- Immersive virtual reality (VR) training increases the self-efficacy of in-hospital healthcare providers and patient families regarding tracheostomy-related knowledge and care skills: A prospective pre-post study.
- Conflicts between parents and clinicians: Tracheotomy decisions and clinical bioethics consultation.
- Pediatric tracheostomy speaking valves: A multidisciplinary protocol leads to earlier initial trials.

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Influencing factors for tracheostomy in patients with acute traumatic C3-C5 spinal cord injury and acute respiratory failure.

Lay Summary:

This study looked at what factors influence the decision to perform a tracheostomy (a breathing tube in the neck) on patients with a traumatic spinal cord injury in the neck (specifically at the C3-C5 level). This type of injury can weaken the breathing muscles, making it difficult for patients to be taken off a ventilator.

Researchers reviewed the cases of 101 patients and compared those who received a tracheostomy to those who did not. They found two main factors that strongly predicted the need for a tracheostomy:

1. A low score on the Glasgow Coma Scale (GCS) when the patient was admitted to the hospital. This indicates a lower level of consciousness and more severe injury.
2. A high Rapid Shallow Breathing Index (RSBI) score during the first attempt to take them off the breathing machine. A high RSBI score means the patient is breathing quickly and shallowly, which is a sign of respiratory muscle weakness.

The study also found that when a patient had both of these factors—a low GCS and a high RSBI—the likelihood of needing a tracheostomy increased dramatically. Patients who received a tracheostomy also had longer stays in the ICU and hospital and a higher rate of complications like pneumonia and infections. The authors conclude that these two factors can help doctors make more informed decisions about when a tracheostomy is necessary for this specific group of patients.

Summary for Healthcare Professionals:

This retrospective case-control study investigated the factors influencing the decision to perform a tracheostomy (TCO) in 101 patients with acute traumatic C3-C5 spinal cord injury (SCI) and acute respiratory failure (ARF) requiring invasive mechanical ventilation (IMV). The study compared a TCO group (n=42) with a no-tracheostomy (No-TCO) group (n=59).

Multivariate logistic regression analysis revealed two independent risk factors for TCO:

- Low Glasgow Coma Scale (GCS) at admission: Patients in the TCO group had a lower GCS score.
- High initial Rapid Shallow Breathing Index (RSBI): The TCO group had a significantly higher RSBI during their first weaning attempt.

The study found a synergistic effect when both factors were present, leading to a greatly increased odds ratio for tracheostomy. Additionally, patients in the TCO group experienced longer durations of IMV, ICU stay, and hospitalization compared to the No-TCO group. They also had a higher incidence of complications, including ventilator-associated pneumonia (VAP), bacteremia, urinary tract infection (UTI), and acute kidney injury (AKI). The authors conclude that these two independent factors are valuable in clinical decision-making for this specific patient population.

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Retrospective analysis of post-tracheostomy complications.

Lay Summary:

This study examined the frequency and severity of complications from tracheostomy surgery. A tracheostomy is a procedure that creates an opening in the neck to insert a breathing tube. The research looked back at the records of 697 patients who had this surgery and found that while complications are not common, they can be very serious.

Key findings include:

- Complication Rate: 10% of patients had a complication within 90 days.
- Mortality: 40% of patients died within 30 days of the procedure. However, the study notes that only a very small number of these deaths (3 patients) were directly caused by a complication.
- Risk Factor: The only factor that was strongly linked to a complication was a documented "difficult tracheostomy placement." This could be due to previous neck surgery or infections that cause scarring.

The study concludes that hospitals and doctors should be especially prepared for emergencies like bleeding or the tube coming out accidentally if a patient's procedure was noted as difficult. It also highlights the high death rate among these patients and emphasizes the importance of a team approach, including palliative care, to make sure the surgery is the right choice for each patient.

Summary for Healthcare Professionals:

This retrospective case series investigated patient, disease, and surgical factors associated with 90-day tracheostomy complications, readmissions, and mortality in 697 patients at a single academic tertiary care center.

The study found that 10% of patients experienced a tracheostomy-related complication within 90 days, with hemorrhage being the most common. Complications occurred at a median of post-operative day 11, with all three deaths directly attributed to a complication occurring within 3 days of placement. The 30-day mortality rate was high at 40%, but the study suggests this is not necessarily a direct result of complications.

Multivariable analysis revealed that a documented difficult tracheostomy placement was the only factor significantly associated with a 90-day complication. The study's findings highlight the need for a heightened level of preparedness to manage potential emergencies like accidental decannulation or hemorrhage in patients with a history of difficult placement. The authors also emphasize the importance of a multidisciplinary approach, including palliative care, to determine appropriate candidacy for tracheostomy given the high 30-day mortality rate.

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Tracheostomy care and communication during COVID-19: Global interprofessional perspectives.

Lay Summary:

This study explores the challenges faced by healthcare professionals, patients, and families in providing tracheostomy care during the COVID-19 pandemic. A tracheostomy is a tube placed in the neck to help someone breathe, and the pandemic created new problems like personal protective equipment (PPE) shortages and isolation.

Researchers conducted a global survey of 115 people, including doctors, nurses, speech therapists, and patient caregivers from 20 countries. They found that while safety issues like PPE shortages were a major concern, the biggest problem reported was the

inability to communicate (33.9% of respondents). Other significant issues included getting necessary supplies and having reduced access to care.

The study also highlighted that teamwork was perceived differently in various countries and was often seen as limited or fragmented. Patients and families reported feeling isolated, and healthcare workers noted the emotional toll of providing care in masks and other gear that make it difficult to show empathy.

The main conclusion is that while safety is a top priority, patient-centered issues like communication and access to supplies are just as important. The authors suggest that hospitals need to prioritize these "softer" issues by fostering better teamwork and finding creative solutions to support patients and staff during and after the pandemic.

Summary for Healthcare Professionals:

This cross-sectional, anonymous survey investigated the perspectives of healthcare providers, caregivers, and patients on tracheostomy care challenges during the COVID-19 pandemic. The survey included 115 respondents from 20 countries, primarily from the United States, United Kingdom, and Australia. The respondent pool was diverse, including nurses, otolaryngologists, speech-language pathologists, respiratory therapists, and patients/caregivers.

The most frequently reported problem was the inability to communicate (33.9%), followed by mucus plugging and wound care. Other prominent concerns included access to disposable supplies and community-based care. The importance of managing tracheostomy cuffs and initiating speech trials was rated highly by a majority of respondents. Perceptions of teamwork varied geographically, with Australia and the UK reporting a higher rate of "maximally integrated teamwork" (66.7% and 60.0% respectively) compared to the US (51%). A significant percentage of respondents expressed concern about personal protective equipment (PPE) availability (40%) and emphasized the importance of its proper use (70%).

The study concludes that while safety concerns regarding PPE and resources are prominent, patient-centered issues, particularly communication, must also be prioritized. The authors recommend that healthcare stakeholders collaborate to identify creative solutions for communication barriers, supply chain disruptions, and reduced access to care in both inpatient and community settings. They also highlight the need for continuous assessment of barriers to safe and effective tracheostomy care to inform robust intervention strategies.

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Immersive virtual reality (VR) training increases the self-efficacy of in-hospital healthcare providers and patient families regarding tracheostomy-related knowledge and care skills: A prospective pre-post study.

Lay Summary:

This study explores how using virtual reality (VR) training can help hospital staff and patient families become more confident and skilled at providing tracheostomy care. A tracheostomy is a procedure where a breathing tube is placed in the neck, and proper care is crucial to prevent serious problems.

The researchers compared traditional text-based training with a new VR-based program that used both head-mounted displays and web-based materials. They trained 60 healthcare providers and found that the VR group had much better results. The VR training significantly increased their confidence and familiarity with tracheostomy care and also reduced their anxiety about it. The VR group also had higher scores on both written and hands-on skills tests.

Importantly, the healthcare providers in the study were able to use the web-based VR materials to teach their patients and families. Both the staff and the families reported that the VR materials provided clear, accurate information and made them feel less anxious about the procedure. The study concludes that VR is a powerful tool for teaching complex medical skills and can help improve the quality of care for tracheostomy patients and their families.

Summary for Healthcare Professionals:

This prospective pre-post study evaluated the effectiveness of a newly developed virtual reality (VR)-based training program for tracheostomy care compared to traditional text-based training. The study included 60 healthcare providers, including physicians, nurses, and respiratory therapists, from a single hospital in Taiwan.

The VR intervention, which utilized both head-mounted display (HMD) and web-based VR materials, was found to significantly enhance the self-efficacy and satisfaction of trainees. Compared to the regular training group, a higher percentage of trainees in the VR group reported feeling "strongly agree" or "somewhat agree" that the intervention increased their **familiarity and confidence** and reduced their **anxiety** about tracheostomy-related knowledge and care skills.

Key findings include:

- Improved Knowledge and Skills: The VR group showed a significant increase in both written test scores and hands-on tracheostomy care skills scores compared to the regular group.
- Patient and Family Satisfaction: Trainees in the VR group were more likely to report that their patients and families were satisfied with the educational materials and felt less anxious about the procedure.
- Sustainability: The benefits of the VR training persisted for up to 3 to 4 weeks after the intervention.

The study concludes that VR materials are a highly effective educational tool for enhancing self-efficacy and satisfaction among healthcare providers. This technology can also be used to provide accessible and continuous education to patients and families, which may reduce anxiety and improve overall care quality.

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Conflicts between parents and clinicians: Tracheotomy decisions and clinical bioethics consultation.

Lay Summary:

This study looked at disagreements between parents and doctors about whether a child with a severe cognitive disability should have a tracheostomy, which is a surgical procedure to help with breathing. When these disagreements happen, they often require a special bioethics consultation to help resolve the conflict.

The researchers reviewed 248 bioethics consultations over a six-year period. They found that a total of 31 of these consultations mentioned the word tracheostomy, and 13 of them involved children with profound cognitive disabilities.

The study concludes that when doctors talk to parents about a tracheostomy, they need to be mindful of their own personal beliefs and how those might influence their advice about the child's prognosis. At the same time, they need to make an effort to understand what the parents value and what they consider to be an acceptable quality of life and level of burden for both the child and themselves. This awareness is key to having productive discussions and resolving conflicts.

Summary for Healthcare Professionals:

This retrospective cohort study explored conflicts surrounding tracheostomy decisions for pediatric patients with profound cognitive disabilities that required a bioethics consult. The study reviewed 248 clinical bioethics consults that occurred between April 2010 and December 2016.

The results showed that 31 consults involving 21 children mentioned tracheostomy, and of these, 13 were for children with profound cognitive disability. The discussion and conclusion of the study emphasize the need for clinicians to be aware of their own biases when discussing a child's prognosis and treatment options. The authors also highlight the importance of understanding the parents' values and what they consider to be a burdensome level of care, both for the child and for the parents themselves. This understanding is crucial for navigating conflicts and facilitating shared decision-making.

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Pediatric tracheostomy speaking valves: A multidisciplinary protocol leads to earlier initial trials.

Lay Summary:

This study looked at how a new hospital protocol affected when children with tracheostomies began using a speaking valve. A speaking valve is a device attached to the tracheostomy tube that helps a child talk, which is important for their development.

The study compared two time periods: before and after the new protocol was put in place.
The results showed that the new protocol made a big difference in how quickly a child was able to try a speaking valve.

- Before the protocol: It took a median of 34.1 months after the tracheostomy was inserted for a child to have a speaking valve trial.
- After the protocol: This time was significantly reduced to 12.9 months.

The study also found that the reason a child had a tracheostomy (such as a blocked airway or a complex medical condition) did not affect how quickly they were able to try a speaking valve after the protocol was implemented. The authors conclude that having a team of specialists follow a specific plan can greatly speed up the process of getting a speaking valve to a child with a tracheostomy, which is beneficial for their language development.

Summary for Healthcare Professionals:

This retrospective study examined the impact of an institutional multidisciplinary protocol on the timelines for speaking valve trials in pediatric patients with tracheostomies. The study compared patient populations and timelines at a quaternary hospital over a 12-year period, before and after a protocol was instituted.

The primary finding was a significant decrease in the median time between tracheostomy insertion and speaking valve trial after the protocol was implemented:

- Before protocol: 34.1 months (IQR 40.5).
- After protocol: 12.9 months (IQR 8.4).

The study found no significant change in the median time between tracheostomy insertion and the initial speech-language pathologist (SLP) consultation, which remained at approximately 1.8 months in both periods. The time to speaking valve trial also did not differ based on the reason for the tracheostomy (upper airway obstruction, complex medical condition, or invasive ventilation) after the protocol was in place. The authors conclude that an institutional multidisciplinary protocol is effective in reducing the time to speaking valve trial for pediatric patients, regardless of their tracheostomy classification.

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Scientific abstracts and references

J Chin Med Assoc. 2021 Dec 21. doi: 10.1097/JCMA.0000000000000656. Online ahead of print.

Influencing factors for tracheostomy in patients with acute traumatic C3-C5 spinal cord injury and acute respiratory failure.

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BACKGROUND: Patients with traumatic spinal cord injury (SCI) at C3-C5 have a wide range of tracheostomy rates (27%-75%), and the influencing factors for tracheostomy remain unclear. We conducted a retrospective case-control study to identify the influencing factors for tracheostomy in this subset of patient population. METHODS: A total of 101 acute traumatic C3-C5 SCI patients with acute respiratory failure requiring translaryngeal intubation and invasive mechanical ventilation (IMV) for more than 48 hours were identified and divided into the no tracheostomy (No-TCO, n = 59) and tracheostomy group (TCO, n = 42) groups. Clinical data were retrospectively reviewed and analyzed. RESULTS: Compared with the No-TCO patients, the TCO patients had a higher proportion of C3 level injury, lower Glasgow Coma Scale (GCS), and lower blood hemoglobin levels at admission. During the first weaning attempt, the TCO patients had lower levels of maximal inspiratory pressure, maximal expiratory pressure, and minute ventilation but had a higher level of rapid shallow breathing index (RSBI). The TCO patients had longer durations of IMV, ICU stay, and hospitalization compared with the No-TCO patients. Moreover, due to prolonged IMV, the TCO patients had a higher incidence of complications, including ventilator-associated pneumonia, bacteremia, urinary tract infection, and acute kidney injury compared with the No-TCO patients. Multivariate logistic regression analysis revealed that low GCS at admission and high initial RSBI were independent risk factors for tracheostomy. Importantly, a combination of these two influencing factors synergistically increased the odds ratio for tracheostomy. CONCLUSION: Low GCS at admission and high initial RSBI are two independent influencing factors that synergistically impact tracheostomy in our patients. These findings are helpful for making the decision of performing tracheostomy in this subset of patient population.

Am J Otolaryngol. 2021 Dec 24;43(2):103350. doi: 10.1016/j.amjoto.2021.103350. Online ahead of print.

Retrospective analysis of post-tracheostomy complications.

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OBJECTIVE: To elucidate patient, disease, and surgical factors that are significantly associated with 90-day tracheostomy complications, readmissions, and mortality. STUDY DESIGN: Retrospective case series with chart review. SETTING: A single academic tertiary care center between 2011 and 2018. METHODS: Patients who underwent tracheostomy by any technique for any indication were included. Demographic, disease, and operative details were examined. Multivariable analysis was performed to determine factors associated with 90-day complications, 90-day readmissions, and overall mortality. RESULTS: 697 patients were included. 75% of patients had severe comorbidity (ACE-27 score of 3).1 Patients were intubated for 12 days prior to tracheostomy placement on average. The primary indication was ventilator dependence due to critical illness (85%). 74% were performed open and 26% percutaneous. 10% of patients had a tracheostomy-related complication within 90 days. Complications occurred at a median of post-operative day 11, and hemorrhage was most common (n = 35). 14 patients required immediate return to the operating room, and 3 patients died of their complication, all within 3 days of tracheostomy placement. 40% of patients undergoing tracheostomy died within 30 days. In multivariable analysis, only a documented difficult tracheostomy placement was significantly associated with a 90-day complication. CONCLUSIONS: While complications after tracheostomy are infrequent, they are often severe. A heightened level of preparedness to immediately manage accidental tracheostomy decannulation or hemorrhage is required for patients with a difficult tracheostomy placement. 30-day mortality is high, which reinforces the need for multi-disciplinary evaluation, including palliative care, to determine appropriate candidacy for tracheostomy.

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Tracheostomy care and communication during COVID-19: Global interprofessional perspectives.

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OBJECTIVE: Investigate healthcare providers, caregivers, and patient perspectives on tracheostomy care barriers during COVID-19. STUDY DESIGN: Cross-sectional anonymous survey SETTING: Global Tracheostomy Collaborative Learning Community METHODS: A 17-item questionnaire was electronically distributed, assessing demographic and occupational data; challenges in ten domains of tracheostomy care; and perceptions regarding knowledge and preparedness for navigating the COVID-19 pandemic. RESULTS: Respondents (n = 115) were from 20 countries, consisting of patients/caregivers (10.4%) and healthcare professionals (87.0%), including primarily otolaryngologists (20.9%), nurses (24.3%), speech-language pathologists (18.3%), respiratory therapists (11.3%), and other physicians (12.2%). The most common tracheostomy care problem was inability to communicate (33.9%), followed by mucus plugging and wound care. Need for information on how to manage cuffs and initiate speech trials was rated highly by most respondents, along with other technical and knowledge areas. Access to care and disposable supplies were also prominent concerns, reflecting competition between community needs for routine tracheostomy supplies and shortages in intensive care units. Integrated teamwork was reported in 40 to 67% of respondents, depending on geography. Forty percent of respondents reported concern regarding personal protective equipment (PPE), and 70% emphasized proper PPE use. CONCLUSION: While safety concerns, centering on personal protective equipment and pandemic resources are prominent concerns in COVID-19 tracheostomy care, patient-centered concerns must also be prioritized. Communication and speech, adequate supplies, and care standards are critical considerations in tracheostomy. Stakeholders in tracheostomy care can partner to identify creative solutions for delays in restoring communication, supply disruptions, and reduced access to tracheostomy care in both inpatient and community settings.

Medicine (Baltimore). 2022 Jan 14;101(2):e28570. doi: 10.1097/MD.0000000000028570.

Immersive virtual reality (VR) training increases the self-efficacy of in-hospital healthcare providers and patient families regarding tracheostomy-related knowledge and care skills: A prospective pre-post study.

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BACKGROUND: Virtual reality (VR)-based simulation in hospital settings facilitates the acquisition of skills without compromising patient safety. Despite regular text-based training, a baseline survey of randomly selected healthcare providers revealed deficiencies in their knowledge, confidence, comfort, and care skills regarding tracheostomy. This prospective pre-post study compared the effectiveness of regular text- and VR-based intervention modules in training healthcare providers' self-efficacy in tracheostomy care skills. METHODS: Between January 2018 and January 2020, 60 healthcare providers, including physicians, nurses, and respiratory therapists, were enrolled. For the intervention, a newly developed head-mounted display (HMD) and web VR materials were implemented in training and clinical services. Subsequently, in-hospital healthcare providers were trained using either text or head-mounted display virtual reality (HMD-VR) materials in the regular and intervention modules, respectively. For tracheostomy care skills, preceptors directly audited the performance of trainees and provided feedback. RESULTS: At baseline, the degree of trainees' agreement with the self-efficacy-related statements, including the aspects of familiarity, confidence, and anxiety about tracheostomy-related knowledge and care skills, were not different between the control and intervention groups. At follow-up stage, compared with the regular group, a higher percentage of intervention group' trainees reported that they are "strongly agree" or "somewhat agree" that the HMD-VR simulation increases their self-efficacy, including the aspects of familiarity and confidence, and reduced their anxiety about tracheostomy-related knowledge and care skills. After implementation, a higher degree of trainees' average satisfaction with VR-based training and VR materials was observed in the intervention group than in the regular group. Most reported that VR materials enabled accurate messaging and decreased anxiety. The increasing trend of the average written test and hands-on tracheostomy care skills scores among the intervention group trainees was significant compared to those in the regular group. The benefits of HMD-VR simulations and web-VR material-based clinical services for in-hospital healthcare providers and patient families persisted until 3 to 4 weeks later. CONCLUSION: The current study suggests that VR materials significantly enhance trainees' self-efficacy (increased familiarity, increased confidence, and reduced anxiety) and their satisfaction with the training, while motivating them to use acquired knowledge and skills in clinical practice.

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Nurs Ethics. 2022 Jan 31:9697330211023986. doi: 10.1177/09697330211023986. Online ahead of print.

Conflicts between parents and clinicians: Tracheotomy decisions and clinical bioethics consultation.

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BACKGROUND: The parent of a child with profound cognitive disability will have complex decisions to consider throughout the life of their child. An especially complex decision is whether to place a tracheotomy to support the child's airway. The decision may involve the parent wanting a tracheotomy and the clinician advising against this intervention or the clinician recommending a tracheotomy while the parent is opposed to the intervention. This conflict over what is best for the child may lead to a bioethics consult. OBJECTIVE: The study explores the conflicts that may arise around tracheotomy placements. RESEARCH DESIGN: This study is a retrospective cohort study of pediatric patients for whom a tracheotomy decision required a bioethics consult. PARTICIPANTS AND RESEARCH CONTEXT: Pediatric patients aged birth to 18 years old with a bioethics consult for a tracheotomy decision conflict between April 2010 and December 2016. A standardized data collection tool was used to review notes entered by the palliative care team, social workers, primary clinical team interim summaries, and the bioethics consult service. ETHICAL CONSIDERATIONS: The study was reviewed and approved by the medical center's institutional review board. RESULTS: There were 248 clinical bioethics consults during the identified study period. There were 31 consults involving 21 children where the word tracheotomy was mentioned in the consult, and 13 of the 21 consults were for children with profound cognitive disability. DISCUSSION AND CONCLUSION: Clinicians need to be aware of their own biases when discussing a child's prognosis and treatment options while also understanding the parents' values and what the parent might consider to be burdensome in the care of their child and the acceptable burden for the child to experience.

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Pediatric tracheostomy speaking valves: A multidisciplinary protocol leads to earlier initial trials.

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Early speaking valve application in children with tracheostomies is encouraged for language development. Whether an institutional multidisciplinary protocol impacts the patient population and timelines for which a speaking valve is trialed has not been studied. This retrospective study compared speaking valve trials performed at a pediatric quaternary hospital over a 12-year period. Timelines (time between tracheostomy insertion, speech-language pathologist (SLP) consultation, speaking valve order, and trial) and patient characteristics (demographics, tracheostomy classification, and feeding status) were collected. Medians (IQRs) compared timelines before and after a protocol was instituted and compared the timelines between tracheostomy classifications. Median time between tracheostomy insertion and SLP consultation did not change: before protocol-1.8 (7.7) months and after protocol-1.8 (2.4) months. Time between tracheostomy insertion and speaking valve trial decreased: before protocol-34.1 (40.5) months and after protocol-12.9 (8.4) months. Time between tracheostomy insertion and trial was not different between tracheostomy classifications: upper airway obstruction-16.0 (27.1) months, complex medical condition-36.3 (45.8) months, and invasive ventilation-17.5 (22.3) months. An institutional multidisciplinary protocol decreases the time between tracheostomy insertion and speaking valve trial, regardless of the reason the tracheostomy is needed in the pediatric population.