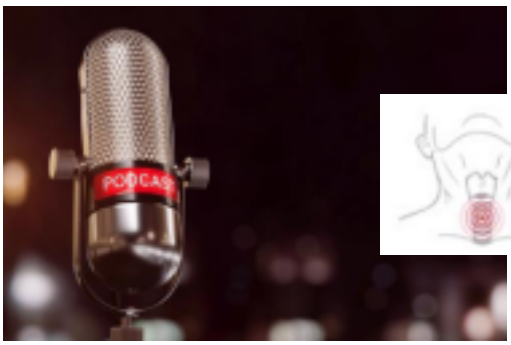
NTSP Podcast series



National Tracheostomy Safety Project

This month's top papers: June 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

Please note that the comments below and on the podcasts represent the individual authors' opinions and do not reflect the opinions of any of the organisations that the authors work for. Please leave any comments in the chat function or via X.

This month's top papers

- Tracheostomy Incidence and Complications: A National Database Analysis.
- Single-Stage Bronchoscopy-Guided Protocol for Tracheostomy Decannulation in Adult Patients.
- Feasibility of a virtual reality course on adult tracheostomy safety skills.

NTSP Podcast Series

Tracheostomy Incidence and Complications: A National Database Analysis.

Lay Summary:

This study used a massive national database of insurance claims to investigate how often patients have problems after a tracheostomy and what factors put them at the highest risk. A tracheostomy is a common surgical procedure to insert a breathing tube in the neck, but complications can occur even after the patient leaves the operating room.

The researchers identified nearly 200,000 tracheostomies performed over an 11-year period. They found that complications are a common problem, with at least one tracheostomy-related issue occurring within 90 days of the procedure in about 10.3% of cases. The study also noted a concerning trend: the overall rate of complications has increased by 2.3 times between 2010 and 2019.

Crucially, the analysis identified several factors that put patients at significantly higher risk. These factors include the patient's socio-economic status (linked to their insurance plan) and the hospital's geographic region. The study concludes that complications after tracheostomy are frequent and sicker patients are at higher risk. Identifying these risk factors can help improve counseling for patients and their families and guide efforts to improve quality and safety across the country.

Summary for Healthcare Professionals:

This study presents a retrospective cohort analysis utilizing the PearlDiver national administrative database (2010–2021) to quantify the incidence and identify prognostic risk factors for tracheostomy-related complications within 90 days of the procedure.

The analysis identified 198,143 tracheostomies and found that the overall 90-day complication rate was substantial, affecting 10.3% (22,802) of cases. A concerning trend was observed, with the proportion of complications increasing 2.3 times over the study period (2010–2019).

Multivariable analysis determined several independent risk factors for developing complications:

- Provider Specialty: Otolaryngologists were associated with a 2.22 higher adjusted odds ratio (OR) for complications compared to nonsurgical physicians.
- Hospital Region: The risk was highest in the Midwest compared to the West (OR=1.32).
- Payer Status: Insurance plan was independently associated with the risk of complications.

The authors conclude that complications are common and disproportionately affect sicker patients. These findings are critical for guiding quality improvement initiatives and informing patient and family counseling by identifying modifiable and non-modifiable risk factors across the care continuum.

NTSP Podcast Series

Single-Stage Bronchoscopy-Guided Protocol for Tracheostomy Decannulation in Adult Patients.

Lay Summary:

This study introduces a quick and effective way to remove a patient's neck breathing tube (tracheostomy), a process called decannulation, which often involves multiple uncomfortable clinic visits using traditional methods like tube downsizing. The new method is a single-stage protocol that uses a flexible camera (bronchoscopy) to look at the patient's windpipe just before the tube is removed.

Researchers reviewed the records of 58 adult patients who were ready to breathe on their own. After screening, 52 were deemed eligible and underwent the single-stage procedure. The results were overwhelmingly positive: 96.1% of patients were successfully weaned off the tube without needing to go through the slow, traditional process. Only two patients needed the tube reinserted during their hospital stay.

The camera test proved highly valuable because it uncovered hidden problems that might have caused failure. Although most airways looked normal, the procedure found abnormalities like scar tissue (granulation tissue) or vocal cord movement issues in over a third of the patients, providing critical information. By checking for these problems with the camera, the medical team could confidently remove the tube immediately if the airway was clear. The study concludes that this single-stage, camera-guided method is a safe, effective, and potentially less stressful way to achieve full airway independence for patients.

Summary for Healthcare Professionals:

This retrospective cohort study evaluated the efficacy and safety of a novel single-stage, bronchoscopy-guided protocol for tracheostomy decannulation in adult patients. The objective was to streamline the decannulation process, as traditional methods like downsizing and intermittent capping necessitate multiple clinical visits and contribute to patient discomfort.

The methodology involved performing Fiberoptic Bronchoscopy (FBS) on 52 eligible patients who met strict clinical criteria (e.g., ≥48 hours of spontaneous ventilation, adequate consciousness, and effective cough). Decannulation was performed immediately after FBS ruled out obstructive pathologies such as tracheomalacia, tracheitis with stenosis, or moderate-to-severe stenosis. The primary finding demonstrated a high success rate: 50 out of 52 patients (96.1%) were successfully weaned off the tube. The decannulation failure rate—defined as reinsertion during the hospital course—was low, at 3.8% (two cases).

The procedural benefit was diagnostic: FBS identified a 9.6% incidence of vocal cord movement issues and a 9.6% incidence of granulation tissue formation. This objective assessment is critical for predicting failure and guiding subsequent management. The authors conclude that single-stage bronchoscopic decannulation is a potentially beneficial tool that provides crucial airway insights, suggesting its superiority to traditional multi-step protocols. Further research is required to evaluate the long-term impact on patient stress and healthcare cost-effectiveness.

NTSP Podcast Series

Feasibility of a virtual reality course on adult tracheostomy safety skills.

Lay Summary:

This study investigated whether a new, remote Virtual Reality (VR) training course could teach hospital staff and students how to handle tracheostomy emergencies as effectively as the traditional, in-person courses. A tracheostomy is a life-saving breathing tube, and errors in emergency management can be fatal, making high-quality training essential.

The researchers conducted a randomized trial, comparing staff taking the face-to-face course with those taking the immersive VR course. The results were promising for expanding access to training. In terms of knowledge, the study found no significant difference between the VR and in-person groups immediately after the course and even four weeks later. Both training methods successfully increased the participants' knowledge.

The new VR course was rated highly by participants for its usability, indicating it was comfortable and easy to use. The main difference was in performance: while all participants solved the simulated emergency, the VR group was significantly slower in responding to the crisis. This suggests that while VR is excellent for learning the information, in-person practice may still be faster for emergency skills. Despite this, the authors conclude that VR is a safe, highly flexible, and immersive alternative that can reduce costs and travel for healthcare workers, ultimately making essential tracheostomy safety skills training available to a much wider audience.

Summary for Healthcare Professionals:

This study was a randomized controlled trial (RCT) designed to assess the educational non-inferiority and feasibility of a Virtual Reality (VR) course for adult tracheostomy safety skills compared to a traditional face-to-face (F2F) course. The VR course utilized fully immersive and remote deployment models.

The primary outcome of pre/post-course knowledge gain demonstrated no statistically significant difference between the F2F and combined VR groups. Both modalities were equally effective at improving knowledge, and retention was also found to be comparable when re-assessed at four weeks. Secondary outcome metrics revealed high acceptance of the new technology: the mean System Usability Scale (SUS) score for VR was 76.8 (indicating above-average usability), and self-reported simulator sickness was minimal. However, a key finding emerged in the simulated emergency performance: although all participants successfully resolved the primary clinical problem, the VR group was significantly slower overall (mean difference 61.8 seconds, $p=0.003$). This suggests a gap in transferring time-critical motor skills between the VR environment and the simulated real-world emergency.

The authors conclude that the VR course offers equivalent knowledge acquisition and retention. Clinically, VR represents a highly flexible, remote, and cost-effective solution for scaling specialized training. While acknowledging the time deficit in emergency skills, the study validates VR as a critical tool for initial cognitive priming and increasing training accessibility across the healthcare workforce.

NTSP Podcast Series

Scientific abstracts and references

Otolaryngol Head Neck Surg. 2024 Jun 1. doi: 10.1002/ohn.843. Online ahead of print.

Tracheostomy Incidence and Complications: A National Database Analysis.

Strober W(1), Kallogjeri D(1), Piccirillo JF(1), Rohlfing ML(1).

Author information: (1)Department of Otolaryngology, Washington University School of Medicine, St. Louis, USA.

OBJECTIVE: To describe the incidence of tracheostomy-related complications and identify prognostic risk factors. STUDY DESIGN: Administrative database analysis. SETTING: Outpatient and inpatient insurance claims records obtained from a national database. METHODS: PearlDiver, a private analytics database of insurance claims from Medicare, Medicaid, and commercial insurance companies, was used to identify patients who underwent tracheostomies and associated complications between January 2010 and October 2021 by CPT and ICD-9/ICD-10 codes. RESULTS: A total of 198,143 tracheostomies were identified from PearlDiver, and at least 1 tracheostomy-related complication occurred within 90 days of the procedure in 22,802 (10.3%) of these cases. The proportion of tracheostomy-related complications was 2.3 times higher in 2019 compared to 2010 (95% confidence interval [CI]: 2.18-2.52). The risk of developing tracheostomy-complications was associated with the hospital region (highest in the Midwest as compared to the West [odds ratio [OR] = 1.32; 95% CI: 1.25-1.39]), provider specialty (highest for otolaryngologists as compared to nonsurgical physicians [OR = 2.22; 95% CI: 2.10-2.34]), insurance plan type (lowest for cash payment compared to Medicaid [OR = 0.70, 95% CI: 0.50-0.94]), and Elixhauser Comorbidity Index (ECI) (highest in patients with ECI of 7+ compared to 0-1 [OR = 2.96; 95% CI: 2.17-3.24]), but was not significantly associated with patient age (OR = 0.99; 95% CI: 0.99-0.99), or gender (OR = 1.04; 95% CI: 1.01-1.07). CONCLUSIONS: Complications after tracheostomy are common and sicker patients are at higher risk for complications. Identifying factors associated with increased risk for complications could help to improve patient and family counseling, guide quality improvement initiatives, and inform future studies on tracheostomy outcomes.

DOI: 10.1002/ohn.843 PMID: 38822752

NTSP Podcast Series

J Surg Res. 2024 Jun 20;301:1-9. doi: 10.1016/j.jss.2024.05.035. Online ahead of print.

Single-Stage Bronchoscopy-Guided Protocol for Tracheostomy Decannulation in Adult Patients.

Mardani P(1), Naseri R(2), Mahram H(3), Alishavandi F(3), Amirian A(1), Ziaian B(1), Shahriarirad R(4).

Author information: (1)Thoracic and Vascular Surgery Research Center, Shiraz University of Medical Science, Shiraz, Iran; Shiraz Transplant Center, Abu-Ali Sina Hospital, Shiraz University of Medical Sciences, Shiraz, Iran. (2)Thoracic and Vascular Surgery Research Center, Shiraz University of Medical Science, Shiraz, Iran; School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran. Electronic address: reyhaneh.nsr97@gmail.com. (3)Student Research Committee, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran. (4)Thoracic and Vascular Surgery Research Center, Shiraz University of Medical Science, Shiraz, Iran; School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran. Electronic address: R.shahriari1995@gmail.com.

INTRODUCTION: Tracheostomy decannulation is a routine procedure in airway management. There is no standard decannulation method; however, the two commonly practiced approaches are tracheostomy downsizing and intermittent capping, which are both accompanied by multiple visits to the clinic and increase patient discomfort. Herein, we explore fiberoptic bronchoscopy application in a novel single-stage decannulation protocol. METHODS: We conducted a retrospective study on tracheostomy patients eligible for decannulation. Fiberoptic bronchoscopy was performed on patients with spontaneous ventilation for ≥48 h, age ≥18, hemodynamic stability, normal chest X-ray, adequate swallowing, effective cough, adequate consciousness, patent speaking valve, and absent history of recurrent aspiration. Tracheostomy removal occurred after evaluating the airway and ruling out tracheomalacia, tracheitis with stenosis, obstructive granulation tissue, and moderate-to-severe stenosis. We documented patients' demographic and clinical information, along with details of their post-decannulation course. RESULTS: Out of 58 patients admitted for tracheostomy removal, we excluded six patients (10.3%) from the study because, despite clinical indications for successful weaning, they exhibited abnormalities that interrupted the decannulation process. Of the remaining 52 patients, 50 (96.1%) were successfully weaned off, while two needed reinsertion during their hospital course. Bronchoscopy findings were unremarkable in 33 (63.5%) patients, and the most frequently observed abnormalities were paucity of vocal cord movement in 5 (9.6%) patients and granulation tissue formation in 5 (9.6%) patients. No further airway management was necessary after discharge. CONCLUSIONS: Our study introduces the innovative approach of single-stage bronchoscopic decannulation as a potentially beneficial tool for immediate decannulation. Based on our experience, we achieved a relatively satisfactory outcome following single-stage tracheostomy decannulation with bronchoscopy. The approach shows promise in providing valuable airway insights and predicting possible decannulation failures. Further research is needed to evaluate its impact on stress reduction for patients and surgeons, its superiority compared to traditional techniques, its long-term effects on healthcare, and its potential cost-effectiveness.

DOI: 10.1016/j.jss.2024.05.035 PMID: 38905767

Anaesth Rep. 2024 Jun 17;12(1):e12305. doi: 10.1002/anr3.12305. eCollection 2024 Jan-Jun.

Feasibility of a virtual reality course on adult tracheostomy safety skills.

Abbas JR(1)(2), Bertram-Ralph E(3), Hatton S(4), Garth T(4), Doherty C(5), Bruce IA(6), McGrath BA(3).

Author information: (1)Faculty of Biology Medicine and Human Health The University of Manchester Manchester UK. (2)Human Factors Academy, Manchester University NHS Foundation Trust Manchester UK. (3)Acute Intensive Care Unit, Wythenshawe Hospital Manchester University NHS Foundation Trust Manchester UK. (4)North West School of Anaesthesia Manchester UK. (5)Department of Anaesthesia Manchester University NHS Foundation Trust Manchester UK. (6)Department of Paediatric Otorhinolaryngology, Royal Manchester Children's Hospital Manchester University NHS Foundation Trust Manchester UK.

The National Tracheostomy Safety Project has run high-quality, face-to-face skills courses since 2009. The aim of this project was to produce a virtual reality version of the established course and evaluate its impact on participant learning, and participant and faculty satisfaction. Healthcare staff and students were recruited and randomised to attend one of (1) a face-to-face traditional course (control); (2) a virtual reality course at a conference centre with on-site technical support; (3) a fully remote virtual reality course; the virtual reality groups were combined for the analysis of learning outcomes and satisfaction. The primary outcome was the difference in pre/post-course knowledge scores on a 30-item questionnaire; secondary outcomes included knowledge retention, usability, comfort/side effects and participant performance in a simulated tracheostomy emergency. Thirty-seven participants and 15 faculty participated in this study. There was no significant difference between mean pre/post-course scores from the face-to-face (from 21.1 to 23.1; +2) and combined virtual reality (from 17.1 to 21.1; +4) groups, with both showing improvement ($p = 0.21$). The mean System Usability Scale score for virtual reality was 76.8 (SD 12.6), which is above average; the median Simulator Sickness Questionnaire score was 7.5 (IQR 3.7-22.4), indicating minimal symptoms. All participants resolved the primary clinical problem in the simulated emergency, but the virtual reality (VR) group was slower overall (mean difference 61.8 s, $p = 0.003$). This technical feasibility study demonstrated that there was no difference in participant knowledge immediately after and 4 weeks following face-to-face and virtual reality courses. Virtual reality offers an immersive experience that can be delivered remotely and offers potential benefits of reducing travel and venue costs for attendees, therefore increasing the flexibility of training opportunities.

DOI: 10.1002/anr3.12305 PMCID: PMC11182690 PMID: 38887533