

NTSP Podcast series



This month's top papers: November 2025

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.

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:

- Feasibility of intratracheal tracheostomy sealing: anatomical adaptation and biocompatibility of a second-generation prototype in cadaveric and porcine models.
- Development and validation of the STeP score for predicting tracheostomy in patients with sepsis using a nationwide ICU database: a retrospective observational study.
- Teaching Foundation Doctors How to Manage Tracheostomy Emergencies.

Feasibility of intratracheal tracheostomy sealing: anatomical adaptation and biocompatibility of a second-generation prototype in cadaveric and porcine models.

Lay Summary

This study explores a new device designed to temporarily seal a tracheostomy from the inside of the windpipe after the tracheostomy tube has been removed. Normally, once a tracheostomy is taken out, the opening in the neck is covered with a dressing and allowed to close naturally over several days. During this time, air can leak through the opening, which may affect coughing, voice, and breathing - particularly in patients who are already vulnerable.



Researchers tested a second-generation silicone sealing disc in human cadavers and in pigs to see whether it could safely block the opening without causing airway obstruction or inflammation. The device successfully sealed the tracheostomy in mechanical tests and did not cause significant tissue reaction over seven days in the animal model. These early findings suggest that internal sealing after tracheostomy removal may be feasible, but clinical studies in human patients are needed before it could be used in practice.

Summary for Healthcare Professionals

This preclinical feasibility study evaluated a second-generation intratracheal silicone sealing disc intended to restore airway integrity immediately following decannulation. Using a cadaveric model, the authors demonstrated appropriate anatomical conformity, effective sealing at cough-equivalent pressures of 140–180 cmH₂O, absence of airway obstruction on bronchoscopy, and removal forces of approximately 5 newtons.



A complementary seven-day porcine implantation model assessed short-term biocompatibility. Blinded histological analysis showed no excess inflammatory response, necrosis, or foreign body reaction compared with sham controls. The findings demonstrate anatomical feasibility and short-term biocompatibility of intratracheal stoma sealing. Further clinical studies are required to determine safety, functional respiratory impact, and potential benefits in high-risk decannulated patients.

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Development and validation of the STeP score for predicting tracheostomy in patients with sepsis using a nationwide ICU database: a retrospective observational study.

Lay Summary

This study developed a new scoring system called the STeP score to help predict which patients with severe infection (sepsis) in intensive care are likely to need a tracheostomy - a breathing tube placed through the neck for long term breathing support.



Some patients with sepsis require prolonged time on a ventilator. It can be difficult early on to know who will recover quickly and who may need longer-term breathing support. Using data from a large national ICU database in Japan, researchers identified early clinical factors linked to the need for tracheostomy and created a practical scoring tool.

The STeP score may help healthcare teams identify higher-risk patients earlier, allowing for better planning, clearer communication with families, and more timely decision-making. Further research is needed to confirm how well the score works in other healthcare systems.

Summary for Healthcare Professionals

Kikutani et al. from Hiroshima University report the development and internal validation of the STeP score, a prediction model for tracheostomy in mechanically ventilated patients with sepsis.



Using a large nationwide Japanese ICU database (JIPAD), the authors conducted a retrospective observational study including adult patients with sepsis requiring invasive ventilation. The primary outcome was performance of tracheostomy during the ICU stay. Early ICU variables were incorporated into a multivariable model and translated into a bedside scoring system. The STeP score demonstrated acceptable discriminatory performance for predicting tracheostomy during ICU stay.

While the study benefits from a large national dataset and clinically pragmatic design, limitations include its retrospective methodology, potential variability in tracheostomy practice patterns, and lack of external validation. The score may support earlier risk stratification and multidisciplinary planning in sepsis-related prolonged ventilation.

Teaching Foundation Doctors How to Manage Tracheostomy Emergencies.

Lay Summary

Tracheostomies are increasingly common in hospitals, and when problems occur - such as a blocked or displaced tube - they can quickly become life-threatening. Resident doctors, including foundation doctors in their first two years of training following graduation, are often among the first to respond to these emergencies on general wards, but previous research suggests many feel underprepared.



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This UK study looked at whether a short teaching session combining a lecture with hands-on simulation training could improve foundation doctors' knowledge of tracheostomy emergencies. Before the session, many participants struggled with key concepts, including the difference between a tracheostomy and a laryngectomy and the correct steps to take in a tracheostomy emergency.

After the training, knowledge and confidence improved significantly, and many of these gains were still present one month later - particularly in practical emergency management steps. The study suggests that focused simulation-based teaching may help better prepare frontline doctors to manage airway emergencies safely.

Summary for Healthcare Professionals

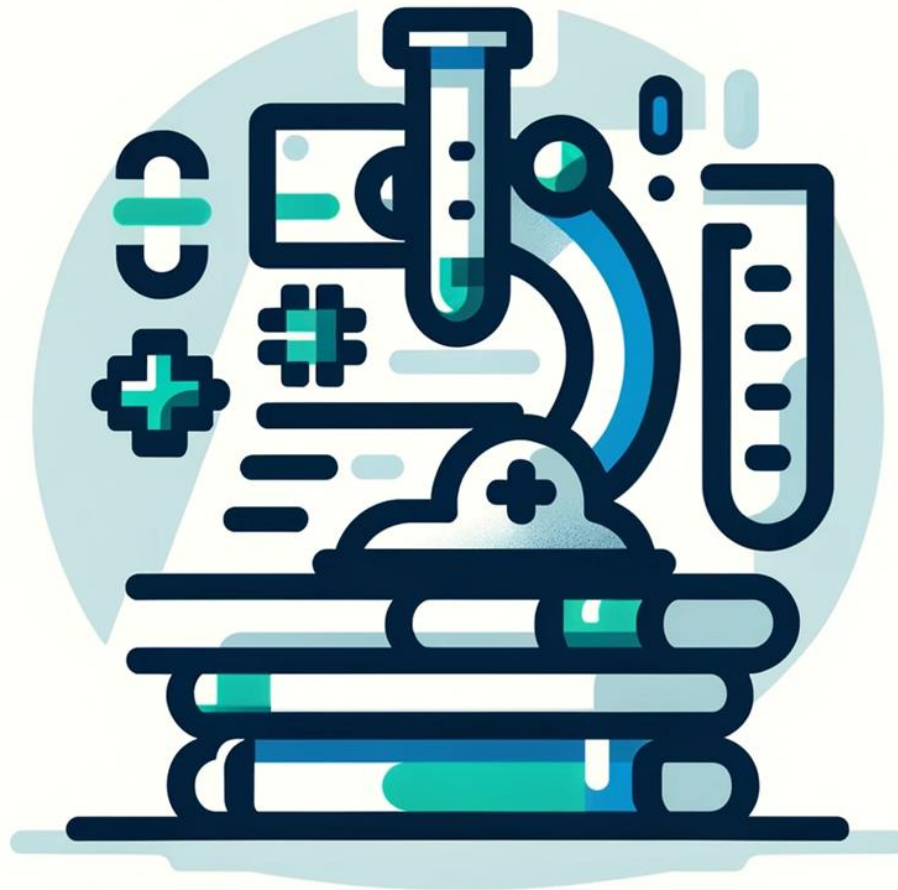
Wragg et al. evaluated a single-centre educational intervention designed to improve Foundation Year 1 doctors' knowledge of tracheostomy and laryngectomy emergencies. The programme combined a 30-minute didactic session covering surgical airway anatomy and the National Tracheostomy Safety Project (NTSP) algorithm with small-group, high-fidelity simulation scenarios.



Using a quasi-experimental pre-, post-, and one-month follow-up written assessment design, the authors demonstrated significant immediate improvements in anatomical knowledge and emergency management recall. While detailed anatomical understanding declined at one month, applied knowledge - particularly specific emergency management steps aligned with the NTSP algorithm - showed sustained improvement.

Although limited by small sample size, lack of control group, and reliance on knowledge-based assessment, the study supports the integration of structured, simulation-based tracheostomy emergency training within foundation curricula and highlights the relative durability of applied learning compared with conceptual recall.

Scientific abstracts and references



Sci Rep. 2025 Oct 28;15(1):37685. doi: 10.1038/s41598-025-21640-z.

Feasibility of intratracheal tracheostomy sealing: anatomical adaptation and biocompatibility of a second-generation prototype in cadaveric and porcine models

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Abstract

After decannulation, air leak through the tracheostoma can impair cough and voice. We evaluated a second-generation temporary intratracheal sealing disc that seals the stoma from within. Two preclinical sub-studies were performed: Sub-study 1 cadaveric deployment to assess anatomical fit, seal integrity, and removability; and Sub-study 2, a 7-day porcine implantation with anatomical compatibility and blinded histology. In cadavers, the sealing disc maintained airway patency and sealed the stoma, withstanding peak intratracheal pressures up to 180 cmH₂O; removal through a near-healed opening required approximately 5 N traction. In the porcine model, no airway obstruction or clinical distress was observed, and histology (Phase Two) showed no excess inflammation or foreign body reaction versus sham. The sealing disc provided intraluminal sealing of the tracheostomy with feasible insertion and removal characteristics and a favorable short-term tissue response in preclinical models. These findings support clinical feasibility testing of this approach to maintain an intact airway dynamic during early post-decannulation healing.

Keywords: Cough efficacy; Decannulation failure; Mechanical ventilators; Pulmonary rehabilitation; Respiratory insufficiency; Tracheostomy.

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Conflict of interest statement

Declarations. Competing interests: KJC holds a patent for the sealing disc prototype. JHM, KJC, MP, and Technolution A/S are co-owners of IntraCair ApS, working to commercialize the sealing disc prototype. AEK, EBG, JTV, LWN, REK, and SD declare no competing interests.

J Intensive Care. 2025 Nov 14;13(1):64. doi: 10.1186/s40560-025-00833-8.

Development and validation of the STeP score for predicting tracheostomy in patients with sepsis using a nationwide ICU database: a retrospective observational study

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Abstract

Background: Among patients with sepsis admitted to the intensive care unit (ICU), a substantial proportion require mechanical ventilation, and a subset eventually undergo tracheostomy. Early identification of patients at high risk for tracheostomy may facilitate timely decision-making and improve clinical communication.

Methods: We conducted a nationwide, retrospective study using the Japanese Intensive care Patient Database (JIPAD). Adult patients with sepsis (Sequential Organ Failure Assessment score of ≥ 2 , excluding viral pneumonia) who required mechanical ventilation between 2018 and 2022 were included. The primary outcome was tracheostomy within 14 days of ICU admission. Seventy-five variables available within 24 h of ICU admission were collected. Using least absolute shrinkage and selection operator (LASSO) regression with tenfold cross-validation, we selected predictors to build a multivariable logistic regression model (Sepsis Tracheostomy early Prediction [STeP] model). A simplified scoring system (STeP score) was also derived. Predictive performance was assessed using the area under the curve (AUC) of the receiver operating characteristic (ROC) in a temporally independent validation cohort.

Results: Among 7357 eligible patients (training: 5374; validation: 1983), 1013 (13.8%) underwent tracheostomy. The STeP model, based on 8 LASSO-selected variables, demonstrated good discrimination (AUC: 0.76 in training, 0.74 in validation). The simplified STeP score (range, 0-17), derived from the same predictors, achieved an AUC of 0.73 in the validation cohort. Patients were stratified into low (≤ 2 points), moderate (3-6 points), and high (≥ 7 points) risk groups for tracheostomy, with corresponding tracheostomy rates of 4.0%, 13.6%, and 27.1%, respectively.

Conclusions: We developed and validated a robust prediction model and simplified risk score (STeP score) for tracheostomy within 14 days in ICU patients with sepsis. Early risk stratification using variables available within 24 h may support timely tracheostomy planning. A web-based calculator is publicly available to facilitate bedside implementation.

Keywords: Airway management; Mechanical ventilation; Sepsis; Tracheostomy.

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Conflict of interest statement

Declarations. Ethics approval and consent to participate: This study was conducted with the approval of the Hiroshima University Institutional Review Board (IRB number: E2023-0274-02). The requirement for obtaining informed consent from study participants was waived to ensure participant anonymity, in accordance with Japanese government guidelines. Consent for publication: Not applicable. Competing interests: The authors declare no competing interests.

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Teaching Foundation Doctors How to Manage Tracheostomy Emergencies

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Abstract

Background and objective Tracheostomies are increasingly common in both acute and long-term clinical settings. As more and more patients with tracheostomies are being managed on general wards, Foundation Year 1 (FY1) doctors - often the first responders - require competency in managing life-threatening tracheostomy emergencies. This study aimed to investigate whether a short, targeted educational intervention can improve FY1 doctors' knowledge and confidence in this area. Methods A single-centre pilot educational intervention was delivered to 34 FY1 doctors in a UK teaching hospital. The intervention included a 30-minute lecture on surgical airway anatomy and the National Tracheostomy Safety Project (NTSP) algorithm, followed by small-group, high-fidelity simulation scenarios. To evidence improvement in knowledge, a quasi-experimental, single-arm study was undertaken, involving assessment of FY1s' knowledge via a written examination at three time points: pre-educational intervention, immediate post-educational intervention, and one month after the educational intervention. Results Baseline knowledge was poor, with only eight (25%) of 32 FY1 doctors correctly identifying the difference between tracheostomy and laryngectomy, 14 (41%) correctly identifying the breathing route in laryngectomy patients, and only 11 (10%) of the 103 proposed management actions when managing a tracheostomy emergency actions they suggested were specifically correct. Post-intervention, correct responses rose across all domains, with sustained improvements seen one month later for the answers to the second and third questions. Conclusions An educational intervention combining didactic teaching with simulation improved and sustained FY1 doctors' knowledge and preparedness for dealing with tracheostomy emergencies. Despite limitations such as sample size and knowledge-based assessments, these findings suggest that this was a successful pilot intervention. Future efforts should include broader implementation and performance-based assessments.

Keywords: foundation doctors; medical education; near peer teaching; simulation; tracheostomy; tracheostomy complications.

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Conflict of interest statement

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Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. NHS Health Research Authority issued approval N/A. This work did not require formal ethical review by an NHS Research & Ethics Committee, in line with NHS Health Research Authority guidance. Prior to commencement, the project was reviewed and approved by the Trust's Director of Medical Education, Dr Reshad Khodabocus, who has provided ongoing oversight throughout. Participation in feedback is entirely voluntary. At the time of collection, participants are informed that their anonymised responses may be used in publications and that they may withdraw their consent at any point. Animal subjects: All authors have confirmed that this study did not involve animal subjects or tissue. Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: Payment/services info: All authors have declared that no financial support was received from any organization for the submitted work. Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.