



National
Tracheostomy
Safety Project

This month's top papers: January 2026

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.

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This month's top papers

- Open surgical tracheostomy and aspirin
- Out-of-pocket costs and potential surprise bills for tracheostomy
- Impact of tracheostomy follow-up care
- Effectiveness of VR training

Comparison of complications in open tracheostomy in patients taking low-dose aspirin.



Lay Summary:

This study looked at whether it is safe for patients to stay on **low-dose aspirin** when having an **open tracheostomy** (an operation to create an opening in the neck into the windpipe to help with breathing). Doctors often worry that aspirin, which reduces blood clotting, might increase bleeding during or after surgery. Because there is no clear agreement on what to do, the researchers reviewed the records of **47 patients** who had open tracheostomy over a 5-year period in a large hospital in Thailand. Fifteen patients continued aspirin, while 32 stopped it before surgery. Reassuringly, **none of the patients who stayed on aspirin had any bleeding problems**, while a small number of patients who stopped aspirin did have bleeding events. Overall, there were **no meaningful differences in bleeding or other complications** between the groups. The findings suggest that continuing **low-dose aspirin is likely to be safe for patients having an open tracheostomy**, which may help avoid the risks of stopping aspirin in people who need it for heart or stroke prevention.



Summary for Healthcare Professionals:

This retrospective single-centre cohort study evaluated the safety of continuing low-dose aspirin (81 mg) in patients undergoing open tracheostomy. Across 47 cases (15 aspirin continued, 32 aspirin withheld), the primary outcome of peri-operative bleeding showed no signal for increased haemorrhagic risk with aspirin continuation. Notably, the continuation cohort had no major or minor bleeding events, whereas the discontinuation cohort had 2 major and 2 minor bleeding episodes (6.3% each), although these differences did not reach statistical significance, likely reflecting the limited sample size. Secondary outcomes similarly demonstrated no significant between-group differences in other procedural complications. While the retrospective design and modest numbers limit definitive inference, the findings provide pragmatic reassurance that continuation of low-dose aspirin during open tracheostomy may be safe, particularly when balanced against thrombotic risk from interruption in patients receiving aspirin for secondary cardiovascular prevention.

Out-of-pocket costs and potential surprise bills for tracheostomy in commercially insured patients.



Lay Summary:

This study looked at the **financial cost to patients and families after a tracheostomy** in the United States. A tracheostomy is often lifesaving, but it also involves complex hospital care and follow-up, and the personal cost to patients has not been well described. Researchers reviewed insurance data from **8,950 adults aged 18–64** who had a tracheostomy between 2014 and 2022. On average, patients paid about **\$1,423 out of their own pocket within 30 days of surgery**, including deductibles, co-payments, and coinsurance, with **coinsurance making up nearly two-thirds of the total cost**. Around **1 in 11 patients (9.1%)** also received a possible “**surprise bill**”, where an out-of-network clinician charged extra despite the hospital and main surgeon being in-network. These bills were linked to even higher patient costs. People with **high-deductible insurance plans** faced the greatest financial burden. Reassuringly, surprise bills became less common over time, likely reflecting improvements in billing rules. Overall, the study shows that tracheostomy can create a **substantial financial strain for patients and families**, highlighting the importance of clear financial advice and fairer healthcare policies.



Summary for Healthcare Professionals:

This retrospective cohort analysis of the **Merative MarketScan database** quantified **30-day patient out-of-pocket (OOP) expenditure after tracheostomy** among **8,950 commercially insured US adults (18–64 years, 2014–2022)**. Mean OOP liability was **\$1,423 (SD \$2,029)**, with **coinsurance contributing 62.8%** of patient costs, identifying post-acute cost-sharing structures as the dominant driver of financial burden. **Potential surprise bills**, defined as out-of-network claims despite in-network surgeon and facility status, occurred in **9.1% of episodes** and were associated with significantly higher OOP costs (**\$1,909 vs \$1,444, $p < 0.001$**). Both **high-deductible health plans** and **fee-for-service insurance models** were strong independent predictors of higher OOP exposure (cost ratios **2.66** and **1.84**, respectively) and potential surprise billing (OR **2.07** and **2.78**, respectively). The temporal reduction in surprise billing incidence across the study period is consistent with the evolving impact of US balance-billing protections, including the No Surprises Act. These findings emphasise that tracheostomy-related care carries a **meaningful patient-level financial toxicity**, supporting the need for pre-procedural financial counselling, payer transparency, and continued policy interventions to mitigate avoidable economic harm.

The impact of follow-up care on tracheostomy management post-hospital discharge: a longitudinal cohort study of clinical outcomes, quality of life, and long-term recovery.

Lay Summary:



This study looked at whether **follow-up after leaving hospital helps people with a tracheostomy recover better in the long term**. A tracheostomy needs regular care at home, including cleaning the skin opening (the **stoma**, the opening in the neck) and changing the tube when needed. Researchers followed **220 adults** who had a tracheostomy and compared those who attended follow-up appointments with those who did not. About **three-quarters of patients received follow-up care**. These patients were **better at keeping up with regular stoma cleaning**, which is important for preventing infection and skin problems. They were also more likely to have breathing problems or infections identified early, suggesting that follow-up helps spot issues before they become serious. Over the longer term, patients who had follow-up were **more likely to have their tracheostomy tube removed at the right time** and had **better cosmetic healing of the neck site**. By three years, only a small number still needed the tube. Overall, the findings show that **regular follow-up care after discharge improves tracheostomy self-care, helps detect complications, and may support better long-term recovery**, although services should be made more consistent and easier for all patients to access.

Summary for Healthcare Professionals:



This longitudinal cohort study of **220 adult tracheostomy survivors** evaluated the association between structured post-discharge follow-up and **maintenance adherence, complications, decannulation trajectory, and HRQoL** at 3 months and 3 years. Follow-up attendance was high (**75.5%**), and was associated with significantly improved **stoma care adherence**, particularly routine cleaning practices (**p = 0.001**), although scheduled tube change frequency was unchanged. Patients engaged in follow-up had **higher rates of detected respiratory difficulties (39.1% vs 22.2%, p = 0.05)** and numerically greater stoma infection recognition, likely reflecting enhanced surveillance rather than increased true event burden. Importantly, follow-up was linked to **more timely decannulation, lower long-term tube dependence, and improved cosmetic stoma outcomes**, with only **6.8% remaining tracheostomy dependent at 3 years**, most commonly due to airway stenosis. HRQoL findings showed slightly lower physical component scores in the follow-up cohort (**PCS 44.4 vs 48.0, p = 0.03**) with similar mental health scores, which may reflect confounding by indication, whereby more complex patients preferentially re-engage with services. Overall, the data reinforce the value of **standardised multidisciplinary tracheostomy follow-up pathways** to optimise maintenance adherence, early complication recognition, and decannulation readiness, while highlighting the need for scalable delivery models such as telehealth to improve equity and long-term outcomes.

Effectiveness of virtual reality simulation for tracheostomy education among healthcare professionals.



Lay Summary:

This study looked at whether **virtual reality (VR) training can improve how healthcare staff learn tracheostomy emergency care**. All 26 healthcare professionals in the study received standard face-to-face teaching, but one group also completed an extra **40-minute VR simulation session** based on the National Tracheostomy Safety Project emergency algorithm. The researchers then tested knowledge straight after training and again **30 days later**. Staff who used the VR training scored **better immediately after the session**, showing that they learned more at the time. More importantly, they still remembered **much more of the key knowledge one month later** compared with those who had standard teaching alone. This suggests that VR helps staff **retain important emergency skills for longer**, which is especially valuable for rare but high-risk events such as tracheostomy emergencies. Overall, the findings support VR as a **powerful and practical way to strengthen staff education, improve confidence, and potentially make patient care safer**.



Summary for Healthcare Professionals:

This prospective educational study evaluated whether a **40-minute VR-enhanced hybrid simulation** improves **immediate knowledge acquisition and 30-day retention** following standard tracheostomy teaching. Among **26 healthcare professionals** (VR $n=17$; conventional teaching $n=9$), the VR cohort demonstrated significantly higher post-training MCQ performance on Day 0 (7.24 ± 0.75 vs 6.33 ± 0.87 , $p = 0.01$) and markedly superior retention at Day 30 (6.88 ± 0.93 vs 4.67 ± 1.00 , $p < 0.001$). The effect size appears particularly strong for medium-term retention, supporting the role of immersive rehearsal and contextual encoding in consolidating emergency airway management knowledge. Given the simulation was aligned to the **National Tracheostomy Safety Project algorithm**, the intervention also offers potential advantages in **standardisation of emergency response behaviours across multidisciplinary teams**. Although limited by modest sample size and knowledge-based rather than performance-based endpoints, the findings provide strong proof-of-concept that **VR simulation can augment conventional tracheostomy education**, improve confidence decay curves, and support safer recognition and management of airway emergencies in clinical practice.

Scientific abstracts and references



1. Sci Prog. 2026 Jan-Mar;109(1):368504251412578. doi: 10.1177/00368504251412578. Epub 2026 Jan 16.

Comparison of complications in open tracheostomy in patients taking low-dose aspirin.

Saowarot T(1), Tangjaturonrasme N(1).

Author information: (1)Department of Otolaryngology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand.

Objective The use of aspirin in patients undergoing open tracheostomy is an issue for which there is still no clear conclusion. This uncertainty leads surgeons to make decisions based on the risks and benefits of continuing versus discontinuing aspirin. Therefore, this study aims to investigate complications related to aspirin use. The primary outcome was bleeding complications, while other complications were secondary outcomes. **Methods** This was a retrospective study compiling data from patients who underwent open tracheostomy at the Department of Otolaryngology, Faculty of Medicine, Chulalongkorn university and King Chulalongkorn Memorial Hospital, Thai Red Cross Society, between January 2019 and December 2023. Demographic data, medical conditions, indications for tracheostomy, surgeon characteristics, operative time, aspirin use status, and complications were reviewed. **Results** There were 47 patients in total in this study: 15 patients in the aspirin continuation group and 32 patients in the aspirin discontinuation group. In the aspirin continuation group, there were no major or minor bleeding events. In the discontinuation group, there were two cases of major bleeding and two cases of minor bleeding (an incidence of 6.3% for each), although the differences observed were not statistically significant. There were no other complications that showed statistically significant differences between the two groups. **Conclusion** This study has shown that low-dose aspirin (81 mg) does not increase the risk of bleeding or other complications in patients who undergo open tracheostomy. These results support that the continuation of aspirin may be safe in patients undergoing this procedure.

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2. Tracheostomy. 2025;2(3):24-32. doi: 10.62905/001c.147777. Epub 2025 Dec 1.

Out-of-Pocket Costs and Potential Surprise Bills for Tracheostomy in Commercially Insured Patients.

Lenze NR(1), Kler JS(1), Perera CD(2), Chhabra KR(3), Goldenberg D(4), Pandian V(4)(5), Brenner MJ(1).

Author information: (1)Department of Otolaryngology-Head and Neck Surgery, University of Michigan Medical School, Ann Arbor, MI, USA. (2)Department of Biostatistics, University of Michigan, Ann Arbor, MI, USA. (3)Department of Surgery, New York University Grossman School of Medicine, New York, New York, USA. (4)Department of Otolaryngology-Head and Neck Surgery, Pennsylvania State University College of Medicine, Hershey, PA. (5)Ross and Carol Nese College of Nursing, The Pennsylvania State University, Hershey, PA.

INTRODUCTION: Tracheostomy involves complex, resource-intensive care. Yet, few data about the procedure-related cost burden for patients and their families are available. Passage of the No Surprises Act has been associated with changes in patient billing for certain healthcare services, but data on tracheostomy have not been investigated. **METHODS:** We conducted a retrospective cohort study using the Merative MarketScan database for commercially insured patients aged 18-64 who underwent tracheostomy from 2014-2022 in the United States. We estimated out-of-pocket (OOP) costs (sum of deductibles, copay, and coinsurance) and potential surprise bills (an out-of-network claim where both the primary surgeon and facility were in-network) within 30 days of surgery. Relationships between OOP costs, potential surprise bills, and patient- and system-level exposures were analyzed. **RESULTS:** Among 8,950 patients who underwent tracheostomy, the mean (SD) age was 49.3 (12.7) years; most patients were male (61.8%) and had fee-for-service based insurance (79.8%). The mean (SD) total OOP cost attributable to tracheostomy was \$1,423 (2,029), and coinsurance accounted for 62.8% of these costs. Potential surprise bills were present in 9.1% of surgical episodes overall and were associated with higher OOP costs (mean (SD) \$1909 (2433) vs. \$1444 (2021); $p<0.001$). High-deductible health plans and fee-for-service based plans were the largest predictors for overall OOP costs (cost ratio 2.66 and 1.84, respectively; $p<0.001$ for both) and potential surprise bills (odds ratio 2.07 and 2.78, respectively; $p<0.001$ for both). The incidence of potential surprise bills diminished over the course of the study period. **CONCLUSIONS:** Patients undergoing tracheostomy have significant exposure to OOP costs, predominantly attributable to coinsurance, with potential surprise bills representing an additional source of cost exposure. These findings highlight the need for financial counseling and policy reform to reduce patient cost burdens.

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3. Tracheostomy. 2025;2(1):29-42. doi: 10.62905/001c.132162. Epub 2025 Mar 31.

The Impact of Follow-Up Care on Tracheostomy Management Post-Hospital Discharge: A Longitudinal Cohort Study of Clinical Outcomes, Quality of Life, and Long-Term Recovery.

Pandian V(1)(2)(3), Maragos CS(4), Panickar A(3), Murmu J(5), Cole T(6), Mattare K(7), Williams L(8), Hillel AT(4), Haut ER(9), Feller-Kopman DJ(10).

Author information: (1)Ross and Carol Nese College of Nursing, Pennsylvania State University. (2)Department of Otolaryngology-Head and Neck Surgery, Pennsylvania State University. (3)Center for Immersive Learning and Digital Innovation, Pennsylvania State University. (4)Department of Otolaryngology Head and Neck Surgery, Johns Hopkins Hospital. (5)Edyth T. James Department of Nursing, Washington Adventist University. (6)Department of Physical Medicine and Rehabilitation, Johns Hopkins Hospital. (7)Department of Anesthesia Critical Care Medicine, Johns Hopkins Hospital. (8)Department of Respiratory Therapy, Penn State Milton S. Hershey Medical Center. (9)Department of Surgery, Johns Hopkins Hospital. (10)Department of Pulmonary and Critical Care Medicine, Dartmouth-Hitchcock Medical Center.

BACKGROUND: Tracheostomy is a life-saving procedure associated with complex long-term care needs and potential complications, including stoma infections, respiratory challenges, and impaired quality of life (QoL). While follow-up care is widely recommended, its impact on adherence to maintenance practices, clinical outcomes, and long-term recovery has not been thoroughly evaluated. **OBJECTIVES:** This study examined the influence of follow-up care on tracheostomy management, adherence to care routines, clinical outcomes, and QoL three months and three-years post-discharge. Key objectives included assessing adherence to stoma cleaning and tube changes, evaluating complication rates, tracheostomy retention, and analyzing QoL outcomes in patients who received follow-up care compared to those who did not. **METHODS:** A longitudinal cohort study was conducted at The Johns Hopkins Hospital, including 220 adult patients who underwent tracheostomy between 2007 and 2017. Data were collected through electronic health records and structured telephone surveys. Primary outcomes included adherence to maintenance practices, clinical complications, and health-related quality of life (HRQoL) measured using the SF-8 Health Survey. Statistical analyses included chi-square tests, t-tests, and multivariate regression. **RESULTS:** Among 220 patients who completed the study, 166 (75.5%) received follow-up care. Patients with follow-up care demonstrated significantly higher adherence to stoma cleaning protocols ($p = 0.001$), although tube change frequency did not differ between groups ($p = 0.37$). Follow-up care was associated with more frequent identification of complications, including stoma infections (7.8% vs. 1.9%, $p = 0.11$) and respiratory difficulties (39.1% vs. 22.2%, $p = 0.05$). However, these differences were not statistically significant except for breathing difficulties. HRQoL analyses revealed marginally lower physical component scores (PCS) in the follow-up group (44.4 vs. 48.0, $p = 0.03$), while mental component scores (MCS) were comparable between groups (42.1 vs. 42.8, $p = 0.66$). At three years post-discharge, tracheostomy tube retention was low (6.8%), with stenosis being the most common reason for long-term tracheostomy dependence. Follow-up care was associated with a higher likelihood of timely tracheostomy tube removal and improved cosmetic outcomes. **CONCLUSIONS:** Follow-up care plays a critical role in improving adherence to tracheostomy maintenance and ensuring timely management of complications. However, disparities in QoL outcomes and care protocols highlight the need for standardized, multidisciplinary follow-up systems. Future research should explore scalable interventions, such as telehealth, to optimize care for tracheostomy patients and address barriers to equitable access.

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4. Cureus. 2025 Nov 17;17(11):e97083. doi: 10.7759/cureus.97083. eCollection 2025 Nov.

Effectiveness of Virtual Reality Simulation for Tracheostomy Education Among Healthcare Professionals.

Siddique H(1), Abbas A(1), Abdul-Hamid A(1).

Author information: (1)Otolaryngology, Oxford University Hospitals NHS Foundation Trust, Oxford, GBR.

OBJECTIVE: The objective of this study is to evaluate the effectiveness of virtual reality (VR) simulation in tracheostomy teaching for healthcare professionals and its impact on short- and medium-term knowledge retention. **METHOD:** A prospective educational study was conducted among 26 healthcare professionals (17 VR; 9 non-VR). Both groups received standard face-to-face tracheostomy teaching, while the VR group additionally completed a 40-minute hybrid simulation using Goggleminds™ software based on the National Tracheostomy Safety Project algorithm. Knowledge was assessed using an eight-item multiple-choice questionnaire immediately after training (Day 0) and after 30 days (Day 30). Data were analysed using independent-samples t-tests and Mann-Whitney U tests to confirm robustness. **RESULTS:** Participants in the VR group achieved significantly higher mean scores immediately after training (7.24 ± 0.75) compared with the non-VR group (6.33 ± 0.87 ; $p = 0.01$). At 30 days, the VR group demonstrated superior knowledge retention (6.88 ± 0.93) compared with the non-VR group (4.67 ± 1.00 ; $p < 0.001$). These findings indicate that VR-based tracheostomy simulation enhances both learning and retention of knowledge compared with conventional teaching. **CONCLUSION:** VR-based tracheostomy simulation significantly improved knowledge acquisition and 30-day retention among healthcare professionals. Integrating VR into tracheostomy education may help to standardise training, improve confidence, and enhance patient safety in emergency airway management.

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