NTSP Podcast series

National Tracheostomy Safety Project

This month's top papers: May 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

- Evolution of the quality of life of total laryngectomy patients using electrolarynx.
- Tracheostomy in Patients with Acute Myocardial Infarction and Respiratory Failure.
- A Randomized Controlled Trial Comparing the Effect of Tracheostomy Training using Mannequin-Based Simulation and Smartphone Application on Self-Efficacy and Anxiety of Caregivers.
- Robotic and endoscopic trans-oral total laryngectomy, a systematic review and meta-analysis.
- Comparing ChatGPT and clinical nurses' performances on tracheostomy care: A cross-sectional study.

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Evolution of the quality of life of total laryngectomy patients using electrolarynx.

Lay Summary:

This study investigated how a patient's quality of life changes after undergoing a total laryngectomy (TL)—the surgical removal of the voice box—and beginning to use an electrolarynx (EL) for speech. TL is a major surgery often performed for laryngeal cancer, which drastically impacts a patient's life by permanently removing their ability to speak verbally. The EL is a device that produces mechanical vibrations to create a voice, serving as a critical tool for communication.

The researchers tracked 31 patients, mostly men aged 50 or older, in two phases: immediately after surgery and again after they had been regularly using the electrolarynx for at least two months. The study aimed to measure the long-term emotional and functional impact of this life-altering procedure.

The key finding was that the patients' quality of life improved significantly after they began using the electrolarynx. This outcome demonstrates the powerful positive effect that restoring the ability to communicate has on a patient's well-being following the loss of their natural voice. The authors conclude that integrating the electrolarynx into the rehabilitation process is essential for helping TL survivors adapt to their new way of life and for improving their emotional, social, and functional recovery. The study reinforces the importance of speech rehabilitation as a priority for all patients undergoing total laryngectomy.

Summary for Healthcare Professionals:

This observational study used a cross-sectional design and quantitative approach to evaluate the evolution of Quality of Life (QoL) in Total Laryngectomy (TL) patients using an electrolarynx (EL). The objective was to assess the impact of EL use on QoL metrics following surgery for laryngeal cancer.

The methodology involved administering a validated QoL questionnaire to 31 patients in two phases. Phase 1 took place 7 days post-TL, and Phase 2 was conducted after patients had used the EL for a minimum of 60 days (starting 70 days post-surgery). The cohort was predominantly male (approx. 84%) and aged 50 or older (approx. 93%).

The primary finding was that QoL scores improved significantly after the initiation and consistent use of the electrolarynx (Phase 2 compared to Phase 1). This result underscores the critical role of timely speech rehabilitation in mitigating the functional and psychological morbidity associated with TL. The authors conclude that the EL is an effective therapeutic tool for facilitating QoL evolution in survivors of laryngeal cancer. This evidence supports the proactive integration of electrolarynx training into the standard multidisciplinary rehabilitation pathway, prioritizing communication restoration as an essential component of post-TL patient management.

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Tracheostomy in Patients with Acute Myocardial Infarction and Respiratory Failure.

Lay Summary:

This large-scale study investigated the safety and outcomes of performing a tracheostomy on patients who have suffered a heart attack (Acute Myocardial Infarction, or AMI) and require long-term breathing support. These patients present a unique challenge because they must continue taking blood thinners (antiplatelet regimens) to prevent further heart problems, which raises the risk of severe bleeding during surgery.

The researchers analyzed over 26,400 AMI patients requiring ventilators and found that approximately 1 in 20 of these critically ill patients required a tracheostomy. A key finding related to the safety concern was that continuing the antiplatelet regimen on the day of the surgery did not increase the overall risk of complications. In fact, the study found a surprising correlation: patients who were kept on their dual antiplatelet therapy (DAPT) had a lower in-hospital death rate compared to those whose therapy was interrupted. The timing of the surgery (early vs. late) itself was found to make no difference to the mortality rate. The only difference in complications was a slightly higher rate of blood transfusions in the DAPT group.

The strong conclusion is that dual antiplatelet therapy should not be a barrier to performing a necessary tracheostomy. These results suggest that clinicians should prioritize the patient's heart condition and safely continue the blood thinner regimen, rather than interrupting it for the surgery.

Summary for Healthcare Professionals:

This retrospective cohort study utilized the Vizient Clinical Data Base to determine the incidence and assess the impact of dual antiplatelet therapy (DAPT) on outcomes for 26,435 patients with Acute Myocardial Infarction (AMI) requiring invasive mechanical ventilation (IMV). The tracheostomy incidence in this cohort was 6.0%.

The analysis revealed that the timing of tracheostomy (≤10 days vs. >10 days) was not associated with a difference in in-hospital mortality (22.5% vs 22.8%, P=0.94). However, the use of DAPT on the day of the procedure was a significant, independent predictor of outcome. Patients receiving DAPT on the day of tracheostomy had a lower in-hospital mortality compared to those not receiving DAPT (17.4% vs 23.7%, P=0.01). This association remained statistically significant after multivariable adjustment (Odds Ratio 0.68, P=0.02).

Regarding procedural safety, the overall incidence of tracheostomy complications was comparable between the DAPT and non-DAPT groups. A notable difference was that the DAPT cohort required post-tracheostomy blood transfusions more frequently (5.6% vs 2.7%, P=0.01). The authors conclude that the non-interruption of DAPT therapy is associated with lower in-hospital mortality, suggesting that DAPT should not be considered a contraindication or barrier to performing a necessary tracheostomy in AMI patients.

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A Randomized Controlled Trial Comparing the Effect of Tracheostomy Training using Mannequin-Based Simulation and Smartphone Application on Self-Efficacy and Anxiety of Caregivers.

Lay Summary:

This study, a randomized trial, compared different ways to teach primary caregivers how to look after a family member with a tracheostomy tube at home. Since poor training can cause anxiety and stress for caregivers, the research aimed to find the most effective education method to increase their confidence, or "self-efficacy". Researchers enrolled 126 caregivers and split them into three groups: one receiving training using a mannequin-based simulation, another receiving a smartphone application with educational videos, and a control group receiving only routine hospital instruction.

The findings showed that all intervention methods led to a statistically significant increase in caregiver self-efficacy (P≤.0001) and a significant decrease in anxiety (P≤.0001) compared to their initial scores. More importantly, both the mannequin and the smartphone app groups showed a significant improvement in confidence and a reduction in anxiety compared to the control group. The smartphone application proved to be the most effective, resulting in both the highest self-efficacy score and the lowest anxiety score one month after discharge. The application also offered advantages over mannequin training, such as being readily available 24 hours a day and allowing for practice in a calm, stress-free environment. The authors conclude that using technology-based training is an effective, readily available, and cost-efficient way to ensure safe home care.

Summary for Healthcare Professionals:

This randomized controlled trial (RCT) evaluated the comparative effectiveness of mannequin-based simulation and a smartphone application on self-efficacy (CGI) and anxiety (HAM-A) in 126 primary caregivers of patients transitioning to home tracheostomy care. The rationale was to address low self-efficacy and high anxiety, which negatively impact the quality of complex tracheostomy care.

The intervention groups showed a significant increase in self-efficacy and a significant decrease in anxiety post-intervention compared to baseline (P≤.0001). Crucially, both intervention groups demonstrated a significant difference in the change of both scores compared to the routine care control group (P<.001). The smartphone application cohort achieved the superior outcomes, recording the highest post-test mean self-efficacy score and the lowest post-test mean anxiety score. The study highlights that the smartphone application provides significant logistic advantages over simulation, such as 24-hour availability, repeatability, and cost-effectiveness. The authors conclude that technology-based approaches, like the developed application, are effective substitutes for labor-intensive training, optimizing caregiver preparedness and emotional well-being for independent home care.

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Robotic and endoscopic trans-oral total laryngectomy, a systematic review and meta-analysis.

Lay Summary:

This systematic review investigated a new, minimally invasive way to perform a total laryngectomy (TL), the surgical removal of the voice box, often used to treat laryngeal cancer. This modern technique, called Trans-oral Total Laryngectomy (TOTL), uses robotic or endoscopic tools inserted through the mouth, avoiding the large external neck incisions of traditional surgery. The goal was to determine if this novel approach is safe and effective in controlling cancer while minimizing surgical impact.

The researchers analyzed eight small studies involving 37 patients. The findings suggest that the technique is oncologically sound, as negative surgical margins were achieved in all patients, demonstrating effective cancer removal. The local recurrence rate was low, at 9.1%. In terms of safety, the procedure had acceptable complication rates. The most common surgical complication was a pharyngocutaneous fistula (an abnormal opening) at a rate of 21.6%, while severe complications like major bleeding were rare (2.7%). The authors conclude that TOTL is a feasible, safe, and viable alternative to traditional open surgery, offering comparable cancer control with the benefit of a minimally invasive approach.

Summary for Healthcare Professionals:

This systematic review and meta-analysis reviewed published data on robotic and endoscopic-assisted Trans-oral Total Laryngectomy (TOTL), with the objective of examining the oncologic, functional, and adverse outcomes of this novel minimally invasive approach for narrow-field laryngectomy. Eight studies were included in the analysis, totaling 37 patients, with the majority of cases performed for laryngeal squamous cell carcinoma (59.5%). The analysis utilized a proportional meta-analysis with a random effects model.

Oncologic outcomes were highly favorable, with negative margins achieved in all patients and a low overall recurrence rate of 9.1%. Functional and adverse outcomes demonstrated acceptable morbidity. All patients achieved primary closure. The most frequently reported surgical complication was pharyngocutaneous fistula (PCF), occurring in 21.6% of cases. Hemorrhage was infrequent (2.7%), as was chyle leak (2.7%), with only three robotic-assisted cases requiring conversion to an open approach. The authors conclude that TOTL is a feasible and safe surgical alternative to conventional TL, demonstrating encouraging short-term oncologic and adverse outcomes. The data supports considering this approach for carefully selected patients with laryngeal malignancy.

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Comparing ChatGPT and clinical nurses' performances on tracheostomy care: A cross-sectional study.

Lay Summary:

This study compared how accurately two versions of the artificial intelligence tool, ChatGPT (3.5 and 4.0), answered questions about tracheostomy care versus real-world clinical nurses. A tracheostomy is a critical procedure, and accurate knowledge is essential for preventing patient harm. Researchers tested the performance of 272 clinical nurses against the AI models using 43 multiple-choice questions covering all major care domains.

The findings were striking and highlight a critical gap in human competency. The advanced AI model, ChatGPT-4.0, provided the correct answer in 64.3% of attempts, significantly outperforming the clinical nurses, who answered only 36.7% of questions correctly (p<.001). The AI models performed better than nurses across nearly all domains, including high-risk areas like cuff management, suctioning, and complication management. This suggests that general hospital staff may lack the standardized knowledge needed for complex tracheostomy management.

The study also found that giving the AI different instructions, such as asking it to act as a nurse or patient, did not change the accuracy of its answers. The authors conclude that ChatGPT has significant potential to serve as an accessible and reliable complementary tool for both patients and physicians. It can quickly generate accurate information, thereby promoting accessibility and efficiency in health education where knowledge gaps exist.

Summary for Healthcare Professionals:

This cross-sectional study compared the performance of two large language models, ChatGPT-3.5 and ChatGPT-4.0, with 272 clinical nurses from mainland China on 43 multiple-choice questions assessing tracheostomy care knowledge across six domains. The objective was to identify inconsistencies in knowledge to inform targeted educational quality improvement initiatives.

The primary result demonstrated that ChatGPT-4.0 achieved the highest overall accuracy, with 64.3% correct responses, and significantly outperformed the clinical nurses, who scored 36.7% correct ($X^2=74.192, p<.001$). This deficit in nurse knowledge was statistically significant across five of the six domains, including critical areas like cuff management, suction technique, and complication management. Only in the domain of "care for the tracheostomy stoma and surrounding skin" did the scores not show a significant difference between the groups. Furthermore, the study determined that modifying the prompt (patient-friendly, act-as-nurse) had no impact on the accuracy of the responses generated by either ChatGPT model.

The authors conclude that the high performance of ChatGPT-4.0 suggests its viability as a complementary medical information tool for enhancing tracheostomy care knowledge and promoting health literacy among patients and providers. The findings underscore an urgent need for standardized, comprehensive interdisciplinary education within the acute care nursing workforce.

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Scientific abstracts and references

Rev Assoc Med Bras (1992). 2024 May 3;70(4):e20231146. doi: 10.1590/1806-9282.20231146. eCollection 2024.

Evolution of the quality of life of total laryngectomy patients using electrolarynx.

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OBJECTIVE: Therapy and vocal rehabilitation in laryngeal cancer impact patients' quality of life. The objective of this study was to evaluate the evolution of the quality of life of patients with laryngeal cancer submitted to total laryngectomy and using electrolarynx. METHODS: This is an observational study with a cross-sectional design and a quantitative approach. It was conducted between April 2022 and January 2023 in a Brazilian cancer hospital. For data collection, a quality of life questionnaire, validated for patients with head and neck cancer at the University of Washington, was applied in two phases: from 7 days after total laryngectomy and, subsequently, from 70 days after surgery using electronic larynx for at least 60 days. The inclusion criteria were patients undergoing total laryngectomy included on the Aldenora Bello Cancer Hospital's election list to receive the electronic larynx. Patients who did not sign the informed consent form were not included. RESULTS: The sample consisted of 31 patients, of which approximately 84% were men and approximately 93% at the age of 50 years or older. When comparing the phases, it is possible to observe that the item speech had the greatest progress, while chewing had the least. Only the item recreation, swallowing, taste, and saliva did not show any statistical significance. The score for the general quality of life questions increased. CONCLUSION: Electronic larynx is a viable and useful method of voice rehabilitation. Our data suggest that the use of the electrolarynx as a postlaryngectomy method of verbal communication is responsible for positive effects on patients' quality of life.

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Conflict of interest statement: Conflicts of interest: the authors declare there is no conflicts of interest.

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Tracheostomy in Patients with Acute Myocardial Infarction and Respiratory Failure.

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OBJECTIVE: Patients with acute myocardial infarction (AMI) complicated by respiratory failure require antiplatelet regimens which often cannot be stopped and may increase bleeding from tracheostomy. However, there is limited available data on both the proportion of patients undergoing tracheostomy and the impact on antiplatelet regimens on outcomes. METHODS: Utilizing the Vizient® Clinical Data Base, we identified patients ≥18 years admitted from 2015 to 2019 with a primary diagnosis of AMI and requiring invasive mechanical ventilation (IMV). We assessed for the incidence of patients undergoing tracheostomy, outcomes stratified by the timing of tracheostomy (≤10 vs >10 days), and the association between dual antiplatelet therapy (DAPT) use and in-hospital mortality. RESULTS: We identified 26 435 patients presenting with AMI requiring IMV. The mean (SD) age was 66.8 (12.3) years and 33.4% were women. The incidence of tracheostomy was 6.0% (n = 1573), and the median IMV time to tracheostomy was 12 days, 55.6% of which underwent percutaneous and 44.4% underwent open tracheostomy. Over 90% (n = 1424) underwent tracheostomy (>10 days) and had a similar mortality when compared to early (≤10 days) tracheostomy (22.5% vs 22.8%, P = 0.94). On the day of tracheostomy, only 24.7% were given DAPT, which was associated with a lower mortality than those not on DAPT (17.4% vs 23.7%, P = 0.01). After multivariable adjustment, DAPT use on the day of tracheostomy remained associated with lower in-hospital mortality (odds ratio 0.68; 95% confidence interval: 0.49-0.94, P = 0.02). Tracheostomy complications were not different between groups (P > 0.05), but more patients in the DAPT group required post-tracheostomy blood transfusions (5.6% vs 2.7%, P = 0.01). CONCLUSION: Approximately 1 in 20 intubated AMI patients requires tracheostomy. The lack of DAPT interruption on the day of tracheostomy but not the timing of tracheostomy was associated with a lower in-hospital mortality. Our results suggest that DAPT should not be a barrier to tracheostomy for patients with AMI.

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Conflict of interest statement: Declaration of Conflicting InterestsThe authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Home Healthc Now. 2024 May-Jun 01;42(3):161-167. doi: 10.1097/NHH.0000000000001245. Epub 2024 May 6.

A Randomized Controlled Trial Comparing the Effect of Tracheostomy Training using Mannequin-Based Simulation and Smartphone Application on Self-Efficacy and Anxiety of Caregivers.

Bahramnezhad F, Jackson AC, Mousavi M, Mirmoghtadaie ZS, Asgari A.

Inefficient education is a cause of anxiety and low self-efficacy among caregivers, especially for those caring for patients with tracheostomy. This randomized controlled trial aimed to compare the outcomes of tracheostomy care education by mannequin-based simulation and smartphone application. The participants were 126 primary caregivers of tracheostomy patients being discharged home from hospitals affiliated with Tehran University of Medical Sciences. The control group received routine care. Caregiver self-efficacy was assessed using the Caregiver Inventory and the Hamilton Anxiety Rating Scale prior to the education and 1 month after. There were significant differences among the three groups regarding the mean scores of self-efficacy and anxiety. There was a significant increase in self-efficacy ($P \leq .0001$) and a significant decrease in anxiety ($P \leq .0001$) scores after the intervention. The intergroup comparison showed a significant difference between the intervention groups and the control group in terms of changes in the anxiety and self-efficacy scores of caregivers ($P < .001$).

DOI: 10.1097/NHH.0000000000001245 PMID: 38709582 [Indexed for MEDLINE]

J Robot Surg. 2024 May 17;18(1):214. doi: 10.1007/s11701-024-01970-2.

Robotic and endoscopic trans-oral total laryngectomy, a systematic review and meta-analysis.

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Trans-oral total laryngectomy (TOTL) is a novel minimally invasive approach to narrow-field laryngectomy. The objective of this study was to review published data on robotic and endoscopic-assisted TOTL to examine oncologic, functional, and adverse outcomes. MEDLINE, Web of Science, and Cochrane databases were searched between January 2009 and December 2023. PRISMA guidelines were used for data abstraction independently by two reviewers. Proportional meta-analysis (random effects model) was used for analysis. Main outcomes included oncologic outcomes (margin status, recurrence rate) and surgical complications (fistula, hemorrhage, need for second operation). Eight studies were included (total of 37 patients). Cases included 31 robotic-assisted, 3 endoscopic-assisted, and 3 robotic cases which required conversion to open approach. Most cases were performed for laryngeal SCC (22 patients, 59.5%). Primary closure was achieved in all patients. Negative margins were achieved in 20 of 21 patients with LSCC. Recurrence data was reported in 20 LSCC patients with disease recurrence in 4 patients (20%). Follow-up was described for 15 patients (mean of 3.5 years, range 1.6-5.8 years). Eleven complications occurred including fistula, bleed, and stomal stenosis with a pooled rate of 33.7% (95% CI: 16.4-53.0%, I2 = 0). Six fistulas occurred with a pooled rate of 23.2% (95% CI: 5.8-45.4%, I2 = 0). TOTL is an emerging treatment modality appropriate for select patients requiring TL and offers a minimally invasive approach with less tissue disruption. This is the first systematic review and meta-analysis to examine its oncologic outcomes and complications. Larger case series with adequate follow-up are needed to better characterize TOTL outcomes.

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Comparing ChatGPT and clinical nurses' performances on tracheostomy care: A cross-sectional study.

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BACKGROUND: The release of ChatGPT for general use in 2023 by OpenAI has significantly expanded the possible applications of generative artificial intelligence in the healthcare sector, particularly in terms of information retrieval by patients, medical and nursing students, and healthcare personnel. OBJECTIVE: To compare the performance of ChatGPT-3.5 and ChatGPT-4.0 to clinical nurses on answering questions about tracheostomy care, as well as to determine whether using different prompts to pre-define the scope of the ChatGPT affects the accuracy of their responses. DESIGN: Cross-sectional study. SETTING: The data collected from the ChatGPT was collected using the ChatGPT-3.5 and 4.0 using access provided by the University of Hong Kong. The data from the clinical nurses working in mainland China was collected using the Qualtrics survey program. PARTICIPANTS: No participants were needed for collecting the ChatGPT responses. A total of 272 clinical nurses, with 98.5 % of them working in tertiary care hospitals in mainland China, were recruited using a snowball sampling approach. METHOD: We used 43 tracheostomy care-related questions in a multiple-choice format to evaluate the performance of ChatGPT-3.5, ChatGPT-4.0, and clinical nurses. ChatGPT-3.5 and GPT-4.0 were both queried three times with the same questions by different prompts: no prompt, patient-friendly prompt, and act-as-nurse prompt. All responses were independently graded by two qualified otorhinolaryngology nurses on a 3-point accuracy scale (correct, partially correct, and incorrect). The Chi-squared test and Fisher exact test with post-hoc Bonferroni adjustment were used to assess the differences in performance between the three groups, as well as the differences in accuracy between different prompts. RESULTS: ChatGPT-4.0 showed significantly higher accuracy, with 64.3 % of responses rated as 'correct', compared to 60.5 % in ChatGPT-3.5 and 36.7 % in clinical nurses ($X^2 = 74.192$, $p < .001$). Except for the 'care for the tracheostomy stoma and surrounding skin' domain ($X2 = 6.227$, $p = .156$), scores from ChatGPT-3.5 and -4.0 were significantly better than nurses' on domains related to airway humidification, cuff management, tracheostomy tube care, suction techniques, and management of complications. Overall, ChatGPT-4.0 consistently performed well in all domains, achieving over 50 % accuracy in each domain. Alterations to the prompt had no impact on the performance of ChatGPT-3.5 or -4.0. CONCLUSION: ChatGPT may serve as a complementary medical information tool for patients and physicians to improve knowledge in tracheostomy care. TWEETABLE ABSTRACT: ChatGPT-4.0 can answer tracheostomy care questions better than most clinical nurses. There is no reason nurses should not be using it.

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