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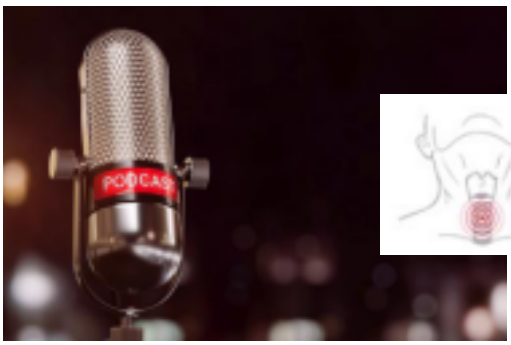

National Tracheostomy Safety Project

This month's top papers: October 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

- Benefits of Bedside Open Tracheostomy: A Safe and Cost-Effective Alternative to the Operating Room.
- Accuracy of ChatGPT responses on tracheotomy for patient education.
- TrachGPT: Appraisal of tracheostomy care recommendations from an artificial intelligent Chatbot.
- Incidence of Pediatric to Adult Transition Among Tracheotomy Patients.
- Tracheostomy - A Comparative Study of Decannulation with Gradual Blocking of the Tube vs. Reduction of the Size of Tube - A Prospective Study.

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Benefits of Bedside Open Tracheostomy: A Safe and Cost-Effective Alternative to the Operating Room.

Lay Summary:

This study investigated whether performing a standard surgical procedure to insert a breathing tube, called a Bedside Open Tracheostomy (OBT), is as safe and more cost-effective when done right at the patient's bedside in the Intensive Care Unit (ICU) compared to performing it in a hospital Operating Room (OR). Transferring critically ill patients to the OR can be risky and ties up valuable resources. The researchers analyzed the records of 165 adult ICU patients, finding that the majority (81.2%) received the procedure at their bedside.

The findings showed that the OBT procedure offers major benefits in terms of efficiency and cost without compromising patient safety. When performed at the bedside, the average time from when the need was identified to when the procedure was completed was significantly shorter. The actual operative time for the OBT was also significantly quicker than for the OR procedure. Crucially, there was no difference in patient outcomes; rates of postoperative complications, 30-day mortality, and the length of time patients stayed in the ICU or the hospital overall were the same for both groups. Furthermore, performing the surgery at the bedside resulted in a substantial 73.1% cost reduction for the hospital compared to the OR procedure, with one study estimating a crude saving of approximately $1902 per procedure. The study concludes that OBT is a safe, efficient, and cost-saving alternative that should be strongly considered for appropriate ICU patients.

Summary for Healthcare Professionals:

This retrospective cohort study evaluated the safety, efficiency, and cost efficacy of Bedside Open Tracheostomy (OBT) versus Operating Room Tracheostomy (ORT) in 165 adult Intensive Care Unit (ICU) patients. The study aimed to provide evidence supporting OBT as a resource-effective alternative.

The analysis identified significant operational advantages for the bedside approach. The mean operative time and the time from consult to procedure were significantly shorter for OBT compared to ORT (p=0.03;0.008). The financial analysis demonstrated substantial cost benefits for the health system: OBT provided a 73.1% cost reduction compared to the procedure performed in the OR. A key finding regarding patient outcomes established the non-inferiority of the OBT technique. There were no statistically significant differences between the OBT and ORT groups for postoperative complications, 30-day mortality, ICU length of stay (LOS), or overall hospital LOS. The cohorts were found to be comparable in age, sex, and BMI.

The authors conclude that OBT is a safe, effective, and underutilized alternative. Its advantages, including the decrease in operative time and substantial cost reduction, advocate for OBT to be the preferred method when clinically appropriate. This implementation is crucial for improving resource utilization and efficiency in acute care settings.

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Accuracy of ChatGPT responses on tracheotomy for patient education.

Lay Summary:

This study investigated how accurate and helpful the advanced artificial intelligence (AI) tool, ChatGPT-4.0, is at answering common questions from patients about tracheotomy. Since many patients and families turn to the internet for health information, the quality of these online resources is critical for safety and proper home care. Researchers created 20 questions that patients frequently ask and submitted them to ChatGPT-4.0 twice over a week to test the stability of its answers. The answers were then carefully checked by two medical specialists: an ICU doctor and an ENT surgeon. They used a special scoring tool to rate the responses on their accuracy, clarity, relevance, and overall usefulness. The results showed that the information provided by ChatGPT-4.0 was acceptable for patient education. This means the AI tool can provide generally reliable, clear, and relevant answers to complex questions, helping patients better understand their condition and care procedures. The consistency of the answers over the seven-day period was also found to be reliable. The study concludes that this AI could be used as a helpful, initial source of medical information for patients, but patients should always rely on their doctors for final treatment decisions.

Summary for Healthcare Professionals:

This study conducted a rigorous assessment of the information provided by ChatGPT-4.0 to patients regarding tracheotomy, aiming to determine the AI's accuracy and utility as a health information tool. The methodology involved submitting 20 common patient-posed questions to the Large Language Model (LLM) at two distinct time points (7-day interval). The resultant responses were independently evaluated by two board-certified clinicians (an otolaryngologist and an intensivist) using the Quality Analysis of Medical Artificial Intelligence (QAMAI) tool. The QAMAI tool assessed six critical domains, including accuracy, clarity, relevance, completeness, referencing, and overall usefulness. The mean total QAMAI scores were high and consistent between the two reviewers (22.85±4.75 and 21.45±3.95), which demonstrated strong interrater reliability and confirmed the stability of the ChatGPT-4.0 responses over time. The authors conclude that the responses generated by ChatGPT-4.0 demonstrated acceptable accuracy, clarity, and usefulness for patient education purposes. This evidence suggests that LLMs can serve as a reliable and accessible complementary medical information resource for patients, which is critical for enhancing health literacy outside of the clinical setting.

NTSP Podcast Series

TrachGPT: Appraisal of tracheostomy care recommendations from an artificial intelligent Chatbot.

Lay Summary:

This study looked at the effectiveness of the advanced artificial intelligence tool, ChatGPT-4.0, in answering 20 common questions that patients ask about tracheostomy care. Since many people seek health advice online, the goal was to check if the AI is a safe and reliable source of information. Two medical specialists—an ICU doctor and an ENT surgeon—independently rated the answers based on their accuracy, clarity, and usefulness. The overall results showed that the information was of moderate-to-high quality in terms of clarity and usefulness. The AI's answers were also found to be stable when asked again a week later.

However, the researchers found significant problems that make the AI unsafe for sole use. Critical errors included the AI giving inaccurate information on surgical steps, such as wrongly mentioning the need for a suture to close the skin or a sterile bandage after the procedure. The AI also provided incomplete or erroneous information on specialized topics like post-laryngectomy tracheostomy and failed to mention the importance of nurse training or specialized breathing tubes. The conclusion is that although ChatGPT-4.0 can be a helpful, accessible tool, patients must be extremely cautious. The information provided should never replace a doctor's advice, especially regarding care steps and the difference between temporary and permanent breathing openings. Doctors are urged to caution patients and provide high-quality materials to prevent reliance on potentially misleading AI guidance.

Summary for Healthcare Professionals:

This study rigorously assessed the quality and safety of ChatGPT-4.0 responses to 20 common patient inquiries regarding tracheostomy through a cross-sectional design. The assessment utilized the Quality Analysis of Medical Artificial Intelligence (QAMAI) tool, with independent evaluation by a board-certified otolaryngologist and an intensivist. This investigation addressed the critical clinical concern of patients seeking specialized health information from unregulated Large Language Models (LLMs).

The analysis yielded a moderate-to-high overall QAMAI score (mean total scores ranging from 21.45 to 22.85), confirming acceptable clarity and usefulness. The LLM also demonstrated high stability in its response generation over a 7-day interval. However, the core clinical issue was the low score in the accuracy and referencing domains. Specific factual errors included procedural inaccuracies, such as wrongly mentioning the need for a suture to close the skin orifice or a sterile bandage post-procedure. Furthermore, the LLM provided incomplete or erroneous information regarding complex topics like post-laryngectomy stoma management and failed to mention the essential role of specialized nursing education. The authors conclude that while ChatGPT-4.0 holds promise as an accessible, complementary tool, its current limitations in clinical accuracy and lack of nuance pose a dire clinical risk. These findings necessitate that clinicians actively caution patients against sole reliance on AI-generated health information and proactively implement high-quality, trustworthy educational resources.

NTSP Podcast Series

Incidence of Pediatric to Adult Transition Among Tracheotomy Patients.

Lay Summary:

This study investigated the long-term journey of children who received a tracheostomy (a breathing tube in the neck) to determine how many require the tube throughout their childhood and transition into the adult healthcare system. Researchers looked back at the records of 663 children and found that 15.5% would have reached adulthood during the study period. Of that group, one quarter (25%) were still alive with a tracheostomy tube in place, meaning they require specialized adult care.

The study found that a patient's characteristics were significant predictors of whether they would transition to adult care still dependent on the tube. Those who retained their tracheostomies were statistically more likely to have received the procedure at an older age compared to those who were successfully weaned.

This research highlights a major challenge in care continuity, as adult healthcare systems are often not prepared to manage the complex needs of patients transitioning from dedicated pediatric services. The study concludes that accurately identifying these children is crucial. The findings strongly emphasize the urgent need for specialized transition programs tailored to the unique medical and psychosocial needs of this growing and highly vulnerable population.

Summary for Healthcare Professionals:

This retrospective cohort analysis investigated the incidence and predictors of pediatric-to-adult transition among tracheostomy patients, utilizing a single tertiary care pediatric hospital database spanning 2009 to 2022. Of the 663 children who underwent a tracheostomy, 103 (15.5%) comprised the cohort that reached or surpassed 18 years of age during the follow-up period. The primary outcome revealed that 25% of this group were alive and still tracheostomy-dependent, necessitating transfer to adult services. Conversely, 34% were successfully decannulated, and 24% had died prior to the follow-up date.

The study identified statistically significant patient characteristics predicting tracheostomy retention into adulthood. Patients who retained their tracheostomies were more likely to have been placed on a tracheostomy at an older age compared to the decannulated cohort ($p<0.001$).

The authors conclude that these predictive factors are critical for early risk stratification. The high incidence of patients transitioning with a long-term tracheostomy underscores the urgent need for specialized transition programs. These programs must be tailored to address the high complexity and unique psychosocial and technological needs of this vulnerable population to ensure continuity and quality of care within the adult system.

NTSP Podcast Series

Tracheostomy - A Comparative Study of Decannulation with Gradual Blocking of the Tube vs. Reduction of the Size of Tube - A Prospective Study.

Lay Summary:

This study compared two different methods for safely removing a patient's breathing tube (tracheostomy) after they no longer needed it, a critical final step called decannulation. The research focused on 50 critically ill adult patients who were randomly assigned to one of two protocols: the Gradual Blocking (GB) method, where the tube is slowly blocked off, or the Reduction of Size (RS) method, where the tube is replaced with progressively smaller tubes (downsizing). The aim was to determine which technique is more effective, faster, and safer for this important transition.

The researchers found clear and compelling evidence that the Gradual Blocking technique was significantly better and faster. The success rate for permanently removing the tube was 96% in the GB group, compared to 80% in the RS group. Furthermore, the total time required for the decannulation process was substantially reduced using the GB method, taking an average of 4.56 days versus 7.55 days for the downsizing technique. Most critically, the downsizing method (RS) led to a significantly higher number of total complications. Specifically, the RS group had multiple cases of severe scar tissue and growths in the windpipe (subglottic stenosis and granuloma formation), complications which were absent in the GB group. The authors conclude that gradual blocking is a faster, more effective, and safer procedure that should be considered the preferred method for achieving full airway independence.

Summary for Healthcare Professionals:

This prospective, randomized, observational study compared the efficacy, safety, and time metrics of two tracheostomy decannulation strategies: Gradual Blocking (GB) versus Reduction of Size (RS) or downsizing. The study included 50 adult patients who were tracheostomized for more than 7 days and met standard decannulation criteria.

The primary finding established the statistical superiority of the GB technique. The decannulation success rate was significantly higher in the GB group (96%) compared to the RS group (80%), with a corresponding lower failure rate (4% vs. 20%). Time-to-decannulation was substantially reduced in the GB group, averaging 4.56±2.85 days versus 7.55±5.17 days in the RS group.

Furthermore, the RS strategy was associated with significantly increased postoperative morbidity. Specifically, the RS group had a higher incidence of subglottic stenosis (n=2) and peristomal granuloma formation (n=3), complications which were absent in the GB cohort. The total complication rate was higher in the RS group (16 complications vs. 1 complication). The authors conclude that the GB method is a faster, more effective, and safer procedure. This evidence strongly advocates for the adoption of the Gradual Blocking technique as the preferred decannulation method for achieving spontaneous respiration.

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Scientific abstracts and references

Head Neck. 2024 Oct 3. doi: 10.1002/hed.27948. Online ahead of print.

Benefits of Bedside Open Tracheostomy: A Safe and Cost-Effective Alternative to the Operating Room.

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INTRODUCTION: Tracheostomy is a commonly performed procedure in Otolaryngology and can be performed in different settings. We evaluate patient characteristics and cost efficacy of tracheostomy at the bedside versus operating room (OR). MATERIALS AND METHODS: Retrospective chart review was performed for adult intensive care unit (ICU) patients who underwent tracheostomy from 2020 to 2023. Data and cost of procedures were analyzed using descriptive statistics. RESULTS: One hundred and sixty-five patients were included. One hundred and thirty-four (81.2%) patients underwent bedside tracheostomy. Age, sex, and BMI were not significantly different. Average time from consult to procedure and operative time was significantly shorter ($p = 0.03$; 0.008). There were no differences in postoperative complications, 30-day mortality, ICU length of stay (LOS), or overall LOS. Tracheostomy at the bedside offered a 73.1% cost reduction compared with performed in the OR. CONCLUSION: Advantages of bedside tracheostomy include decreased operative time, time from consult to procedure, and cost reduction for the hospital system. We advocate for consideration of bedside tracheostomy when appropriate.

DOI: 10.1002/hed.27948 PMID: 39360577

NTSP Podcast Series

Eur Arch Otorhinolaryngol. 2024 Oct 2. doi: 10.1007/s00405-024-08859-8. Online ahead of print. (see next paper too)

Accuracy of ChatGPT responses on tracheotomy for patient education.

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OBJECTIVE: To investigate the accuracy of information provided by ChatGPT-4o to patients about tracheotomy. METHODS: Twenty common questions of patients about tracheotomy were presented to ChatGPT-4o twice (7-day intervals). The accuracy, clarity, relevance, completeness, referencing, and usefulness of responses were assessed by a board-certified otolaryngologist and a board-certified intensive care unit practitioner with the Quality Analysis of Medical Artificial Intelligence (QAMAI) tool. The interrater reliability and the stability of the ChatGPT-4o responses were evaluated with intraclass correlation coefficient (ICC) and Pearson correlation analysis. RESULTS: The total scores of QAMAI were 22.85 ± 4.75 for the intensive care practitioner and 21.45 ± 3.95 for the otolaryngologist, which consists of moderate-to-high accuracy. The otolaryngologist and the ICU practitioner reported high ICC (0.807; 95%CI: 0.655-0.911). The highest QAMAI scores have been found for clarity and completeness of explanations. The QAMAI scores for the accuracy of the information and the referencing were the lowest. The information related to the post-laryngectomy tracheostomy remains incomplete or erroneous. ChatGPT-4o did not provide references for their responses. The stability analysis reported high stability in regenerated questions. CONCLUSION: The accuracy of ChatGPT-4o is moderate-to-high in providing information related to the tracheotomy. However, patients using ChatGPT-4o need to be cautious about the information related to tracheotomy care, steps, and the differences between temporary and permanent tracheotomies.

DOI: 10.1007/s00405-024-08859-8 PMID: 39356355

NTSP Podcast Series

Laryngoscope Investig Otolaryngol. 2024 Jul 16;9(4):e1300. doi: 10.1002/lio2.1300. eCollection 2024 Aug. (see prev paper too)

TrachGPT: Appraisal of tracheostomy care recommendations from an artificial intelligent Chatbot.

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OBJECTIVE: Safe home tracheostomy care requires engagement and troubleshooting by patients, who may turn to online, AI-generated information sources. This study assessed the quality of ChatGPT responses to such queries. METHODS: In this cross-sectional study, ChatGPT was prompted with 10 hypothetical tracheostomy care questions in three domains (complication management, self-care advice, and lifestyle adjustment). Responses were graded by four otolaryngologists for appropriateness, accuracy, and overall score. The readability of responses was evaluated using the Flesch Reading Ease (FRE) and Flesch-Kincaid Reading Grade Level (FKRGL). Descriptive statistics and ANOVA testing were performed with statistical significance set to $p < .05$. RESULTS: On a scale of 1-5, with 5 representing the greatest appropriateness or overall score and a 4-point scale with 4 representing the highest accuracy, the responses exhibited moderately high appropriateness (mean = 4.10, SD = 0.90), high accuracy (mean = 3.55, SD = 0.50), and moderately high overall scores (mean = 4.02, SD = 0.86). Scoring between response categories (self-care recommendations, complication recommendations, lifestyle adjustments, and special device considerations) revealed no significant scoring differences. Suboptimal responses lacked nuance and contained incorrect information and recommendations. Readability indicated college and advanced levels for FRE (Mean = 39.5, SD = 7.17) and FKRGL (Mean = 13.1, SD = 1.47), higher than the sixth-grade level recommended for patient-targeted resources by the NIH. CONCLUSION: While ChatGPT-generated tracheostomy care responses may exhibit acceptable appropriateness, incomplete or misleading information may have dire clinical consequences. Further, inappropriately high reading levels may limit patient comprehension and accessibility. At this point in its technological infancy, AI-generated information should not be solely relied upon as a direct patient care resource.

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Conflict of interest statement: None.

Laryngoscope. 2024 Oct 8. doi: 10.1002/lary.31826. Online ahead of print.

Incidence of Pediatric to Adult Transition Among Tracheotomy Patients.

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OBJECTIVE: To estimate the incidence and identify predictors of pediatric tracheostomy patients who transition into adulthood with a tracheostomy. METHODS: We conducted a retrospective analysis of pediatric tracheostomy patients treated at a single tertiary care pediatric hospital between 2009 and 2022. Patient demographics, comorbidities, tracheostomy outcomes, including decannulation and mortality rates, and the status of those alive with a tracheostomy at adulthood were compared. RESULTS: Of the 663 children who underwent a tracheostomy, 103 (15.5%) would have surpassed 18 years by September 1, 2023. Detailed breakdown: 26 (25%) were alive with a tracheostomy, 35 (34%) had been decannulated, 25 (24%) had passed away, and 17 (16.5%) were lost to follow-up. Patients who retained their tracheostomies into adulthood were more likely to be older at tracheostomy placement (mean age 14.3 vs. 1.7 years, $p < 0.001$), Hispanic (43.7% vs. 30.5%, $p = 0.003$), not ventilated at initial discharge (41% vs. 24%, $p < 0.001$), and have severe neurocognitive disabilities (72% vs. 53%, $p < 0.001$). Logistic regression identified older age at tracheostomy placement (OR = 1.35, 95% CI [1.24-1.48]) and severe neurocognitive disability (OR = 6.20, 95% CI [2.13-18.09]) as significant predictors of maintaining a tracheostomy into adulthood. CONCLUSIONS: Older age at tracheostomy placement and severe neurocognitive disabilities significantly predict the transition of pediatric tracheostomy patients to adult care with their tracheostomies. These findings highlight the need for specialized transition programs tailored to the needs of this unique population. LEVEL OF EVIDENCE: IV Laryngoscope, 2024.

DOI: 10.1002/lary.31826 PMID: 39377191

NTSP Podcast Series

Indian J Otolaryngol Head Neck Surg. 2024 Oct;76(5):3871-3875. doi: 10.1007/s12070-024-04733-5. Epub 2024 May 2.

Tracheostomy - A Comparative Study of Decannulation with Gradual Blocking of the Tube vs. Reduction of the Size of Tube - A Prospective Study.

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BACKGROUND: Tracheostomy is one of the most common procedures done in intensive care unit (ICU) patients. Decannulation is the weaning off from tracheostomy to maintain spontaneous respiration and/or airway protection. However, this step needs a near perfect coordination of brain, swallowing, coughing, phonation, and respiratory muscles. However, despite its perceived importance, there is no universally accepted protocol for this vital transition. In this systematic review of decannulation we focus attention to this important aspect of tracheostomy care. AIM: To compare the two methods of decannulation, with gradual blocking of the tube and reducing the size of the tube and also study and compare the incidental complications associated with both methods. METHODOLOGY: This longitudinal, open label, randomized, observational study of 50 patients who were tracheostomized for more than 7 days was carried out in a tertiary health care Centre in central India. Over the course of 2 years demographic data, clinical information was collected and patients divided into 2 groups according to the method of decannulation done by a simple randomization method. The outcomes and the complications associated with the two techniques in the study groups were also be noted down and then compared. RESULTS: Maximum number of patients in both the study groups were males (56% in group with tube blocking, and 52% in group with tube size reduction). 48% cases in group with tube blocking, and 60% in group with tube size reduction were noted to be between 51 and 70 years' age group. The mean duration between tracheostomy and decannulation in group with tube blocking was 16.63 + 8.44 days, and while it was 16.71 + 8.79 days in group with tube size reduction. 36% patients in group with tube blocking had tracheostomy tube number 7.5, while 32% had tube number 8. 36% in group with tube size reduction had tube number 7.5 while 32% had tube size 7. 4 patients in group with tube blocking, and 3 patients in group with tube size reduction required reinsertion of tube. 40% patients in group with tube blocking, and 44% in group with tube size reduction underwent tracheostomy following prolonged intubation. 4 patients in group with tube blocking, and 3 patients in group with tube size reduction required reinsertion of tube. 1 patient in group with tube blocking had trachea-esophageal fistula as post decannulation complication. 1 patient each in group with tube size reduction had granule formation over stoma and tracheal stenosis as complications.CONCLUSION: The two decannulation methods, viz., gradual blocking of tube and reduction of tube size, showed comparable outcomes in terms of tube reinsertion rate, mechanical ventilation rate after decannulation, successful decannulation, and complications.

DOI: 10.1007/s12070-024-04733-5 PMCID: PMC11456123 PMID: 39376335

Conflict of interest statement: Conflict of InterestThe authors declare that they have no competing interests.