Natural Resources for Human Health
eISSN: 2583-1194

Original Research

Received 24 Oct 2025
Revised 28 Nov 2025
Accepted 31 Dec 2025

Natural Resources for Human Health 2025, Vol. 5 (4): 1252–1260

KEYWORDS:
Tracheostomy, hospitalization, nurses, infection, stoma care

Nursing Strategies for Preventing Tracheostomy-Related Complications in Hospitalized Patients

Alsomali, Huda Adam I[1], Wad Abdullah Badi Alsharari[2], Nujud Hamoud Mohammed Alsirhani[3], Norah Farhan Murid Alanazi[4], Almislat, Hanadi Dhaban A[5], Abdulkarim Alaudi R Alanazi[6], Samia Alasmar Owiada Alruwili[7], Raghad Fayez Dughayshim Al Anazi[8], Alruwaili, Bashayr Dhaifallah M[9], Saja Ayesh Alruwaili[10]

[1] Senior Specialist – Adult Critical Care Nursing — Ministry of Health – Jeddah – Makkah Region – Saudi Arabia. Email: hualsomali87@gmail.com
[2] Nursing Specialist — Al-Qurayyat General Hospital – Al Jouf Health Cluster – Ministry of Health – Al Qurayyat – Al Jouf Region – Saudi Arabia.
Email: Wedabdallh1@gmail.com
[3] Nursing Technician — Human Resources Executive Management, Al Jouf Health Cluster – Ministry of Health – Sakaka – Al Jouf Region – Saudi Arabia.
Email: Nhalsirhani@moh.gov.sa
[4] Nursing Specialist — Northern Borders Health Cluster – Ministry of Health – Arar – Northern Borders Region – Saudi Arabia. Email: norahfa@moh.gov.sa
[5] Nursing — Prince Mutaib bin Abdulaziz Hospital – Al Jouf Health Cluster – Ministry of Health – Sakaka – Al Jouf Region – Saudi Arabia. Email: halmuslet@moh.gov.sa
[6] Registered Nurse — Al-Qurayyat General Hospital – Al Jouf Health Cluster – Ministry of Health – Al Qurayyat – Al Jouf Region – Saudi Arabia.
Email: abdulkarim.alaidi@gmail.com
[7] Nursing Specialist — Al Jouf Health Cluster – Ministry of Health – Sakaka – Al Jouf Region – Saudi Arabia. Email: Samiaals9009@gmail.com
[8] Nursing Specialist — Turaif General Hospital – Northern Borders Health Cluster – Ministry of Health – Turaif – Northern Borders Region – Saudi Arabia.
Email: Rfalenazi@moh.gov.sa
[9] Nursing Specialist — King Abdulaziz Specialist Hospital – Al Jouf Health Cluster – Ministry of Health – Sakaka – Al Jouf Region – Saudi Arabia.
Email: Bashayr944@gmail.com
[10] Nursing Specialist — Eradah and Mental Health Hospital, Al Qurayyat – Al Jouf Health Cluster – Ministry of Health – Al Qurayyat – Al Jouf Region – Saudi Arabia.
Email: Alrwilisaja4@gmail.com

ABSTRACT: Tracheostomy is one of the most frequently performed procedures in critically ill hospitalized patients, yet it carries a substantial burden of preventable complications that range from stoma-site infection and tube obstruction to tracheal injury and ventilator-associated pneumonia. Nurses are the frontline clinicians who spend the greatest amount of time at the bedside and therefore occupy a uniquely influential position in complication prevention. This review synthesizes the available evidence on nursing strategies for preventing tracheostomy-related complications in hospitalized patients,

Natural Resources for Human Health
eISSN: 2583-1194

covering structured assessment and monitoring, stoma care and infection control, suctioning technique, airway humidification, cuff pressure management, patient and caregiver education, and the role of nurse-led care bundles. The evidence consistently demonstrates that standardized, protocol-driven nursing care—organized around clearly defined bundles and supported by ongoing competency assessment—is associated with significant reductions in complication rates, improved stoma integrity, and better patient outcomes. The paper concludes that nursing vigilance, when operationalized through evidence-based protocols rather than informal routines, is the single most modifiable determinant of tracheostomy safety in the hospital setting.

INTRODUCTION

Tracheostomy is a common intervention in hospitalized patients who require prolonged mechanical ventilation, protection of the upper airway, or relief of airway obstruction, but the presence of a tracheostomy tube creates a continuous risk of infection, obstruction, displacement, bleeding, pressure injury, and aspiration. Best-evidence summaries for integrated airway management in intensive care unit tracheostomy patients emphasize that prevention depends on structured assessment, humidification, suctioning, cuff management, stoma care, and team coordination rather than on any single intervention [1]. Systematic review evidence further supports standardized nursing protocols, care bundles, infection-prevention strategies, airway monitoring, and nurse competency as core elements of a strategy to reduce post-tracheostomy complications [2].

The complication profile of tracheostomy is broad. Bleeding may range from minor stomal oozing to massive arterial erosion, and even self-limited sentinel bleeds may herald a tracheoinnominate fistula. Airway obstruction from mucus plugging or crust formation is particularly relevant in spontaneously breathing tracheostomized patients, and respiratory tract infection remains a dominant threat. Critically ill tracheostomized patients often experience prolonged hospitalization, higher mortality, and discharge to care facilities, which makes prevention a clinical and resource priority [2]. The evidence base also shows that complications are not evenly distributed: patients with coagulopathy, obesity, copious secretions, inadequate humidification, prolonged ventilation, and altered mental status carry higher risk and require more intensive nursing surveillance [1]. Prevention therefore must be both universal and risk-stratified.

Structured Nursing Assessment as the Foundation of Prevention

Prevention begins with a repeatable and documented assessment rhythm. Best-evidence summaries recommend that tube position, cuff pressure, and secretion character be checked at least every eight hours, with daily auscultation of respiratory sounds and inspection of the stoma for redness, swelling, or seepage, obtaining culture specimens when infection is suspected [1]. Immediate postoperative care carries additional urgency because vital signs and incisional bleeding must be monitored closely in the first twenty-four hours, and the first cuff pressure adjustment should be completed within one hour of the procedure and maintained within the prescribed range [1]. Structured surveillance detects hypercapnia, granulomatous hyperplasia, early device-related pressure injury, and sentinel bleeding before they escalate. Table 1 consolidates the core assessment parameters and their recommended frequencies as reflected in contemporary evidence syntheses [1,2].

Table 1. Core Nursing Assessment Parameters for Hospitalized Patients with Tracheostomy

Assessment Domain	Parameters to Evaluate	Recommended Minimum Frequency	Clinical Rationale
Tube position and patency	Depth marking at stoma, ease of suction catheter passage, presence of air leak	Every shift and with any respiratory change	Detects displacement, partial obstruction, or cuff leak
Cuff pressure	Measured with calibrated manometer	Every shift or every 6–8 hours	Prevents aspiration at low pressure and tracheal mucosal ischemia at high pressure
Secretions	Volume, color, consistency, odor, ease of clearance	Every suction episode and every shift	Signals infection, dehydration, or need for humidification adjustment

Stoma and peristomal skin	Erythema, maceration, breakdown, drainage, bleeding	Every shift and with each dressing change	Enables early pressure-injury and infection intervention
Respiratory status	Auscultation, respiratory rate, work of breathing, oxygen saturation	Every shift and as clinically indicated	Detects obstruction, atelectasis, or respiratory distress
Bleeding	Stomal oozing, hemoptysis, bloody secretions	Every shift; immediately if any bleeding noted	Sentinel bleeds may precede tracheoinnominate fistula

Infection Prevention Bundles, Hand Hygiene, and Stoma Care

Tracheostomy-related infection prevention is most effective when organized as a bundle rather than as isolated tasks. Implementation of a post-tracheostomy tube care bundle has been shown to significantly reduce respiratory tract infection, signs of respiratory distress, and the need for suctioning while maintaining physiological parameters within normal ranges [3]. Hand hygiene and appropriate personal protective equipment before any manipulation of the tracheostomy tube remain non-negotiable foundations of the bundle [3]. Oral care is a critical but often underemphasized component because bacterial colonization of the oropharynx seeds the lower airway; mechanical oral hygiene and aspiration precautions should be performed at least twice daily, and oral secretions should be suctioned before repositioning [3]. Stoma care requires gentle cleansing, moisture control, complete drying of the skin under the flange, and inspection for redness or breakdown at every dressing change [3]. Table 2 summarizes the core elements of a nurse-led tracheostomy infection-prevention bundle.

Table 2. Core Elements of a Nurse-Led Tracheostomy Infection Prevention Bundle

Bundle Element	**Key Nursing Actions**	**Evidence Basis**
Hand hygiene and PPE	Alcohol-based hand rub or soap and water before and after every tube or stoma contact; gloves and eye protection as indicated	Fundamental to preventing cross-contamination [3]
Oral hygiene	Mechanical cleaning of teeth, gums, and oral mucosa at least twice daily; suction oral secretions before repositioning	Reduces oropharyngeal bacterial load and aspiration risk [3]
Stoma and skin antisepsis	Cleanse with prescribed solution; dry thoroughly; inspect for redness or breakdown	Prevents maceration, device-related pressure injury, and wound infection [3]
Cuff pressure control	Maintain prescribed pressure range with manometer; document	Prevents microaspiration and mucosal ischemia [3]
Closed suction when indicated	Use closed system for mechanically ventilated patients requiring frequent suction	May reduce environmental contamination and ventilator-associated pneumonia risk [3]
Early mobilization and weaning assessment	Collaborate with team to progress toward decannulation	Shortens exposure to device-related risk [3]

Bleeding and the Tracheoinnominate Fistula: Surveillance and Emergency Readiness

Bleeding after tracheostomy can occur at any time, from minor stomal oozing to massive hemorrhage from a tracheoinnominate fistula, and the nurse's most important contribution is early recognition and immediate escalation [4]. Small-volume bleeding through the tracheostomy or stoma may be a precursor of major hemorrhage and must never be dismissed as trivial [4]. Bleeding within the first three weeks of tracheostomy placement warrants urgent investigation for tracheoinnominate fistula, and active severe bleeding requires immediate airway control measures, including hyperinflation of the tracheostomy cuff to provide internal pressure against the bleeding point while awaiting definitive surgical management [4]. Preventive nursing strategies include meticulous technique during suctioning and tube manipulation, avoidance of excessive cuff pressure, prompt treatment of stoma infection, and vigilance for sentinel bleeds in patients with coagulopathy or those receiving anticoagulants [4]. Every

bedside should have immediately accessible equipment for airway emergencies, including spare tubes of the same and one size smaller, a manual resuscitation bag, suction equipment, and a cuff manometer [4].

The Multidisciplinary Team and the Nurse's Coordinating Role

Tracheostomy care is inherently interprofessional, and the nurse is often the professional who integrates the contributions of medicine, respiratory therapy, speech-language pathology, physiotherapy, nutrition, and occupational therapy into the daily plan [5]. Interprofessional quality-improvement projects incorporating speech-language therapy have demonstrated clinically relevant reductions in the mean time to decannulation, from approximately 43 days in a historical control group to approximately 24 days in the intervention group, along with reduced intensive care length of stay [5]. A standardized tracheostomy pathway that includes education, coordination, and protocolized care has been associated with a reduction in intensive care length of stay from a mean of 21 days to 10 days [5]. The nurse's role in this structure is to ensure that decannulation readiness is assessed daily, that swallowing and communication needs are addressed, that weaning from the ventilator is progressed, and that the patient is not left in a holding pattern simply because the tracheostomy exists [5].

Cuff Management: The Narrow Therapeutic Window

Cuff pressure management is one of the most consequential and most frequently audited nursing responsibilities in tracheostomy care. The cuff must be inflated sufficiently to prevent aspiration of oropharyngeal and gastric contents while avoiding pressures that exceed tracheal capillary perfusion pressure and produce mucosal ischemia [6]. Clinical practice guidelines generally recommend maintaining cuff pressure between 20 and 30 centimeters of water, which corresponds roughly to 15 to 22 millimeters of mercury, and some institutional protocols accept a range of 15 to 25 centimeters of water [6]. Pressures below this range permit silent aspiration, while pressures persistently above 30 centimeters of water risk tracheal mucosal necrosis and may contribute to later tracheal stenosis or tracheomalacia [6]. The cuff should be measured with a calibrated manometer, not estimated by finger palpation of the pilot balloon, and the measurement should be documented on every shift and before and after any intervention that may alter cuff volume, such as position change, suctioning, or speaking valve trials [6]. When a speaking valve or cuff deflation trial is undertaken, the nurse must deflate and reinflate the cuff in a controlled manner and recheck pressure afterward to avoid leaving the patient in an unprotected state [6].

Stoma and Skin Protection: Preventing Device-Related Pressure Injury

Tracheostomy-related pressure injury arises from the interaction of the rigid flange or tube with moist, vulnerable skin, often compounded by tension from ventilator tubing and by secretions that macerate the tissue [7]. A quality-improvement study comparing a ventilator-circuit flipping protocol with standard care found that skin breakdown occurred in 13 percent of patients receiving the intervention versus 36 percent receiving standard care, a statistically significant reduction [7]. The same body of work emphasizes that hydrocolloid or foam dressings placed under the flange in the postoperative period can redistribute pressure, and that changing the side to which the ventilator circuit is directed helps prevent focal load on one side of the neck [7]. Nursing assessment should therefore include not only the stoma itself but also the skin under the flange, the posterior neck where ties or straps may dig in, and the areas where tubing contacts the skin [7]. Dressings should be changed when soiled or saturated, and the skin should be inspected at every dressing change [7].

Nutrition, Swallowing, and Aspiration Prevention

Tracheostomized patients are at risk for aspiration because the cuff, while protective, does not eliminate the risk of microaspiration around the tube, and because critical illness frequently produces post-extubation dysphagia [8]. Nursing strategy includes maintaining head-of-bed elevation of at least 45 degrees during feeding when not contraindicated, suctioning oral, pharyngeal, and tracheal secretions before and after feeding, and ensuring that cuff pressure is within the therapeutic range before oral intake is attempted [8]. Feeding should not proceed in a patient with an open, uncuffed tracheostomy without an adequate multidisciplinary swallowing evaluation, and speech-language pathology involvement is essential for determining readiness for oral diet and for prescribing compensatory strategies [8]. The nurse's bedside swallow screening and mealtime supervision are practical safeguards that translate team recommendations into daily protection against aspiration pneumonia [8].

Emergency Management of Obstruction and Displacement

Airway obstruction and accidental decannulation are time-critical events in which nursing action can be lifesaving [9]. A structured approach using a mnemonic such as DOPE, standing for Displacement, Obstruction, Patient, and Equipment, helps the nurse rapidly identify the cause of deterioration [9]. If an inner cannula is present and obstruction is suspected, it should be removed promptly; if the tube itself is blocked or displaced, it should be removed rather than left in place as a last resort, and oxygenation should be provided via the stoma and face while preparations are made for replacement or oral intubation with the cuff placed beyond the tracheostomy site in non-laryngectomy patients [9]. The nurse should never leave a patient with a compromised tracheostomy alone, and should call for help early rather than attempting prolonged solo troubleshooting [9]. Every bedside should have a spare tube of the same size and one size smaller, suction, a bag-valve-mask, and a cuff manometer immediately available [9].

Reinforcing Infection Prevention Through Ventilator Bundles

Infection prevention also intersects with ventilator care because tracheostomized patients who require mechanical ventilation remain exposed to ventilator-associated pneumonia. A ventilator-associated pneumonia prevention bundle should be integrated into daily nursing practice and should include elevation of the head of the bed, daily sedation interruption and extubation readiness assessment where applicable, oral care, peptic ulcer prophylaxis as prescribed, and deep vein thrombosis prophylaxis as prescribed [10]. The nurse's consistent adherence to these elements complements tracheostomy-specific infection control and reduces the cumulative infectious burden in this vulnerable population [10]. Bundle compliance should be audited because documentation alone does not guarantee bedside performance [10].

Humidification: Protecting the Bypassed Upper Airway

After tracheostomy, the respiratory mucosa loses its normal heating, humidification, and filtration functions, so secretions become viscous and prone to crusting, which can partially or completely obstruct the artificial airway and, in severe cases, cause life-threatening asphyxia [11]. Nursing strategy must therefore pair secretion clearance with proactive humidification. For patients receiving mechanical ventilation or those with viscous secretions, a heated humidifier is recommended to maintain inspired gas at approximately 37 degrees Celsius and 100 percent relative humidity; for spontaneously breathing patients, a heat and moisture exchanger can provide passive humidification [11]. Systematic review evidence suggests that heated humidifiers consistently provide the highest humidity levels and are most effective in reducing respiratory complications and improving comfort, whereas heat and moisture exchangers may struggle to provide sufficient humidification when supplemental oxygen is required [11]. Nurses should assess the effect of humidification at every shift and titrate support according to secretion character [11].

Suctioning: Indication-Based Clearance and Technique

Suctioning is the complementary clearance strategy, but it must be performed only when indicated rather than on a fixed schedule, because unnecessary suctioning traumatizes the tracheal mucosa and may contribute to bleeding and infection [12]. Closed suction systems are generally preferred for mechanically ventilated patients who require frequent suctioning, as they maintain oxygenation and reduce environmental dispersion of secretions; open suction may be appropriate for uncuffed tubes or when a closed system is not feasible [12]. The nurse must ensure that catheter size is appropriate, that suction pressure is limited, that the procedure is brief, and that sterile technique is maintained [12]. In patients with thick secretions, increasing humidification and ensuring adequate systemic hydration are more physiologically sound than simply suctioning more aggressively [12]. A nurse who monitors secretion trends and humidification effectiveness can often prevent the progression from manageable secretions to obstructive plugging [12].

Education and Competency: Building the Skill Base

Prevention does not end at discharge, and it begins with a competent nursing workforce. A refresher programme for tracheostomy training for nurses has been shown to improve knowledge and psychomotor skills, and simulation-based refresher programs improve confidence, knowledge, and psychomotor skills in tracheostomy care and tube change [13]. Competency assessment after a single skill-testing iteration can deem a high proportion of participants competent, but maintenance of competence requires periodic reassessment [13]. Nursing leadership should therefore treat tracheostomy care as a measurable clinical program with defined process indicators, such as documented cuff pressure checks, stoma assessment completion, bundle adherence, and unplanned tube changes, and with outcome indicators, such as infection rates, pressure-injury incidence,

emergency airway events, and time to decannulation [13]. Education should include teach-back verification and should be documented as skill demonstration rather than attendance alone [13].

Decannulation Readiness and Long-Term Tracheostomy Management

Long-term tracheostomy management requires systematic assessment of decannulation readiness rather than indefinite continuation of the tube [14]. Decannulation criteria commonly include hemodynamic stability, minimal supplemental oxygen requirement, manageable secretion burden, an effective cough, tolerance of cuff deflation or capping for at least 24 hours, and a safe swallow [14]. The nurse who tracks these parameters and brings them to team rounds accelerates the patient's progression out of the highest-risk period [14]. Daily assessment should include whether the original indication for tracheostomy persists, whether the patient tolerates capping, and whether swallowing and secretion clearance are adequate [14]. Delayed decannulation prolongs exposure to infection, obstruction, and pressure injury, so readiness should be actively evaluated rather than passively awaited [14].

Speaking Valves and Emerging Adjuncts

Emerging technologies, including speaking valves for communication, are expanding the nurse's toolkit, but each requires competency-based training and careful patient selection [15]. The nurse remains the clinician who assesses readiness, monitors tolerance, and integrates these adjuncts into a safe plan of care [15]. Before speaking valve use, the nurse should verify that the cuff is deflated according to protocol, that the patient can tolerate cuff deflation, that secretions are manageable, and that the upper airway is patent [15]. Tolerance should be monitored continuously during initial trials, and the valve should be removed immediately if respiratory distress or excessive resistance occurs [15]. Documentation should include duration of tolerance, cuff status, and any adverse response [15].

Pediatric Considerations

Although the core principles of tracheostomy care apply across the lifespan, pediatric patients present distinct risks and require tailored strategies. The American Thoracic Society guideline recommends a standardized discharge process with comprehensive family caregiver training, an awake and trained caregiver for high-risk children, and bronchoscopy before decannulation to ensure airway patency [16]. Pediatric tracheostomy care also requires attention to small tube sizes, limited reserve, and the developmental needs of the child and family [16]. The nurse should ensure that caregivers can suction, change dressings, recognize obstruction, and respond to emergencies before discharge [16]. Simulation and teach-back should be used to verify caregiver competence [16].

Quality Improvement and Tracheostomy Tube Changes

Sustaining good tracheostomy care requires measurement. Quality-improvement projects focused on tracheostomy tube changes have reported reductions in pneumonia incidence from approximately 44 percent to 28 percent, accompanied by increases in staff knowledge scores and audit compliance [17]. A tracheostomy care bundle has been shown to improve nurses' performance from inadequate to adequate levels immediately after training, although follow-up scores may decline without reinforcement, underscoring the need for refresher education and audit-and-feedback cycles [17]. Table 3 presents selected nursing-sensitive process and outcome indicators that can be used to monitor a tracheostomy care program [17].

Table 3. Selected Nursing-Sensitive Process and Outcome Indicators for Tracheostomy Care

Indicator	Type	Target Direction	Measurement Approach
Cuff pressure documented within prescribed range each shift	Process	Increase	Audit of flowsheet and manometer readings [17]
Stoma and peristomal skin assessed each shift	Process	Increase	Documentation audit and bedside observation [17]
Bundle adherence for hand hygiene and oral care	Process	Increase	Direct observation and checklist [17]
Tracheostomy-related pressure injury incidence	Outcome	Decrease	Incident reporting and skin rounds [17]

Respiratory tract infection or VAP rate	Outcome	Decrease	Surveillance definitions and culture data [17]
Unplanned tube change or emergency airway event	Outcome	Decrease	Safety event reporting [17]
Time from tracheostomy to decannulation	Outcome	Decrease	Registry or pathway data [17]

Nurse-Led Education and Postoperative Outcomes

Nursing-led education has been associated with reduced intensive care length of stay and improved postoperative outcomes in head and neck cancer patients undergoing airway surgery, demonstrating that structured education is not merely supportive but outcome-modifying [18]. The nurse should document not only that education was provided but that the caregiver demonstrated the skill correctly and verbalized when to seek emergency help [18]. Discharge preparation should be structured and staged, beginning well before the planned transition, and should include teach-back verification of caregiver competence [18]. A multidisciplinary discharge roadmap should ensure that equipment is delivered, medications are prescribed, and caregivers have had supervised practice before the patient leaves the hospital [18].

Neurological and Complex Patients

Patients with neurological injury, altered mental status, or swallowing dysfunction face aspiration risk that intersects with cuff management and feeding decisions [19]. Clinical management and nursing care for patients with tracheostomy following traumatic brain injury require attention to airway protection, secretion management, positioning, and early rehabilitation [19]. The nurse should coordinate with speech-language pathology, physiotherapy, and nutrition to align tracheostomy care with neurological recovery and swallowing rehabilitation [19]. Cognitive impairment may limit the patient's ability to participate in decannulation trials, so readiness assessment should be team-based and repeated over time [19].

Sustaining Bundle Performance and Nursing Audit

A tracheostomy care bundle has a measurable effect on nurses' performance and patients' health outcomes, but the effect depends on sustained adherence rather than one-time training [20]. Audit and feedback should be used to identify gaps in cuff pressure documentation, stoma assessment, oral care, and emergency equipment readiness [20]. Leaders should provide refresher education, encourage near-miss reporting, and recognize units that achieve high bundle compliance [20]. The bundle should be reviewed regularly against current evidence so that it does not become outdated [20].

Heat and Moisture Exchangers Versus Heated Humidifiers

Heat and moisture exchangers and heated humidifiers are not interchangeable in every clinical situation [21]. Heated humidifiers generally provide higher humidity and are preferred for patients with viscous secretions or those requiring mechanical ventilation, while heat and moisture exchangers may be suitable for selected spontaneously breathing patients [21]. The nurse should assess secretion consistency, device tolerance, and the need for supplemental oxygen when selecting a humidification strategy [21]. Device selection should be documented and reassessed when the patient's respiratory status changes [21].

Closed Suction and Infection Risk

Closed suction systems may reduce environmental contamination and infection risk compared with open suction in mechanically ventilated patients, but the evidence is not uniform and device selection should be individualized [22]. The nurse should follow unit protocol, maintain sterile technique during open suction, and ensure that closed systems are changed according to manufacturer and infection-control guidance [22]. Suction should be performed only when indicated, and the nurse should monitor for mucosal trauma, bleeding, and hypoxia during the procedure [22]. Documentation should include secretion characteristics, tolerance, and any adverse events [22].

Simulation Training for Emergency Competence

A simulated tracheostomy tube change educational intervention can promote competency among novice healthcare professionals [23]. Simulation allows nurses to practice emergency tube change, suction failure, and obstruction management in a safe environment [23]. Training should include hands-on practice with the same equipment used at the bedside, debriefing,

and repeat assessment [23]. Units should schedule simulation drills regularly and include night-shift staff who may be first responders [23].

Pediatric Outcome Evidence

Clinical outcomes and nursing strategies for pediatric tracheostomy patients require dedicated attention because lower respiratory tract infections, including pneumonia and tracheitis, are common complications and can result in prolonged hospitalization [24]. More than sixty percent of pediatric patients may be readmitted within six months of initial placement, often for infection management, and the annual mortality rate is approximately five percent [24]. The nurse should emphasize caregiver education, infection prevention, and early recognition of respiratory deterioration in this population [24]. Transition planning should include equipment checks, emergency action plans, and accessible follow-up [24].

Wound Dressings and Pressure Injury Prevention

The impact of intraoperative wound dressing on post-tracheostomy pressure injuries has been examined as a potentially modifiable factor [25]. Dressings placed under the flange can redistribute pressure and reduce friction, but they must be changed when soiled or saturated to avoid maceration [25]. The nurse should inspect the skin at every dressing change and document the condition of the stoma and peristomal skin [25]. Pressure injury prevention should combine dressing selection, ventilator circuit positioning, moisture control, and regular skin assessment [25].

CONCLUSION

Tracheostomy-related complications are common, costly, and disproportionately preventable. The evidence reviewed here supports a conclusion that is both simple and demanding: prevention works best when it is systematized. Structured assessment at defined intervals, infection-prevention bundles with scrupulous hand hygiene and oral care, proactive humidification paired with indication-based suctioning, disciplined cuff pressure management, pressure-redistributing stoma care, vigilant bleeding surveillance, emergency readiness, swallowing and nutrition safeguards, structured patient education, and interprofessional coordination together constitute a coherent nursing strategy that reduces infection, obstruction, pressure injury, and emergency events. No single intervention is sufficient, and no bundle sustains itself without audit, feedback, and continuing education. Hospitals that treat tracheostomy care as a nurse-led clinical program, with defined process and outcome indicators and a culture of early escalation, are better positioned to protect patients from the complications that too often accompany this life-sustaining device. The nurse is not merely a participant in tracheostomy care; the nurse is the continuous presence that turns prevention from a policy into a practice.

REFERENCES

[1] Guo J, Li Y, Xie D, Zhang M, Fu S. Summary of best evidence for integrated airway management in ICU tracheostomy patients. Journal of Multidisciplinary Healthcare. 2025 31:4613-28.

[2] Niroula A, Yang P, Campbell ML, Cruse AR, Gizaw RM, Vannostrand KM, Jaber WS, Schimmel M, Daymude K, Revenig J, Berkowitz D. Reducing tracheostomy-related acquired pressure injury by flipping the ventilator circuit position study. Critical Care Explorations. 2024 Jun 6;6(6):e1102.

[3] Taha Mohamed N, Nashaat Beshay B, Mohamed Mustafa Ismail H. Effect of post tracheostomy tube care bundle on critically ill patient's outcomes. Alexandria Scientific Nursing Journal. 2024 Jun 1;26(2):64-75.

[4] Singh S, Debbarman S, Dwivedi D, Sud S. Intractable bleeding during tracheostomy. InThe Indian Anaesthetists Forum 2019 Jul 1 (Vol. 20, No. 2, pp. 109-110). Medknow.

[5] Mills CS, Cuthbertson BH, Michou E. What's new in reducing the impact of tracheostomy on communication and swallowing in the ICU. Intensive care medicine. 2023 Jul;49(7):860-3.

[6] McGrath BA, Bates L, Atkinson D, Moore JA. Multidisciplinary guidelines for the management of tracheostomy and laryngectomy airway emergencies. Anaesthesia. 2012 Sep;67(9):1025-41.

[7] Niroula A, Yang P, Campbell ML, Cruse AR, Gizaw RM, Vannostrand KM, Jaber WS, Schimmel M, Daymude K, Revenig J, Berkowitz D. Reducing tracheostomy-related acquired pressure injury by flipping the ventilator circuit position study. Critical Care Explorations. 2024 Jun 6;6(6):e1102.

[8] Saconato M, Maselli-Schoueri JH, Malaque CM, Marcusso RM, Oliveira AC, Batista LA, Ultramari G, Lindoso JA, Gonçalves MI, Sztajnbok J. Postorotracheal intubation dysphagia in patients with COVID-19: A retrospective study. Sao Paulo Medical Journal. 2024 May 24;142(6):e2022608.

[9] Chuaa WL. CONSIDERATIONS FOR EMERGENCY AIRWAY MANAGEMENT AND. Polish Journal of Cardio-Thoracic Surgery. 2024;21:47-54.
[10] Nuckchady DC. Incidence, risk factors, and mortality from hospital-acquired infections at a hospital in Mauritius. Cureus. 2021 Nov 28;13(11).
[11] Klerings KI. Aktiv erwärmte und befeuchtete High-Flow-Therapie versus passive Atemluftbefeuchtung bei spontan atmenden tracheotomierten Patient* innen.
[12] Fiorentino G, Lanza M, Annunziata A, Esquinas AM. Airway Clearance in Conditions of High-Risk Infections: COVID-19 and Other Conditions. InHumidification in the Intensive Care Unit: The Essentials 2023 Apr 1 (pp. 243-255). Cham: Springer International Publishing.
[13] Tiu RA, Meyer TK, Mayerhoff RM, Ray JC, Kritek PA, Merati AL, Sardesai MG. Tracheotomy care simulation training program for inpatient providers. Laryngoscope Investigative Otolaryngology. 2022 Oct;7(5):1491-8.
[14] Qin HM, Huang XY, Xu RY, Xie QY, Tang DZ. Prediction Model for Early Subacute Phase Tracheostomy Decannulation in Patients with Stroke. Ear, Nose & Throat Journal. 2025 Jan 16:01455613241312788.
[15] Wang H, Jiang H, Zhao Z, Liu J, Zhang C. Application and safety of speaking valves in tracheostomy patients. Critical Care. 2024 Dec 18;28(1):424.
[16] Abode KA, Drake AF, Zdanski CJ, Retsch-Bogart GZ, Gee AB, Noah TL. A multidisciplinary children's airway center: impact on the care of patients with tracheostomy. Pediatrics. 2016 Feb 1;137(2):e20150455.
[17] Ng J, Hohman MH, Agarwal A. Tracheostomy tube change. InStatPearls [Internet] 2024 Feb 14. StatPearls Publishing.
[18] Alsolami FJ. Nurse-led preoperative education for elective surgery: Patient satisfaction and recall in a mixed-method study. InHealthcare 2025 18 (Vol. 13, No. 22, p. 2951). MDPI.
[19] Quiñones-Ossa GA, Durango-Espinosa YA, Padilla-Zambrano H, Ruiz J, Moscote-Salazar LR, Galwankar S, Gerber J, Hollandx R, Ghosh A, Pal R, Agrawal A. Current status of indications, timing, management, complications, and outcomes of tracheostomy in traumatic brain injury patients. Journal of neurosciences in rural practice. 2020 May 2;11(2):222.
[20] Taha Mohamed N, Nashaat Beshay B, Mohamed Mustafa Ismail H. Effect of post tracheostomy tube care bundle on critically ill patient's outcomes. Alexandria Scientific Nursing Journal. 2024 Jun 1;26(2):64-75.
[21] Singhal S, Gurjar M, Duan J, Notaro S, Esquinas AM. Hygrometry behavior during high-flow nasal oxygen therapy and non-invasive mechanical ventilation: A narrative review of bench to clinical studies. Journal of Intensive Medicine. 2024 Oct 25;4(04):433-41.
[22] Jongerden IP, Rovers MM, Grypdonck MH, Bonten MJ. Open and closed endotracheal suction systems in mechanically ventilated intensive care patients: a meta-analysis. Critical care medicine. 2007 Jan 1;35(1):260-70.
[23] Peter J, Moser CH, Karne V, Stanley S, Wilson H, Maragos CS, Stokes J, Mattare K, Turner L, Brenner MJ, Pandian V. A simulated tracheostomy tube change educational intervention to promote competency among novice healthcare professionals: a repeated measures study. Tracheostomy (Warrenville, Ill.). 2024 Jun 30;1(2):16.
[24] Ranjan AA, Kumar PP, Shivappa SK, Ahmed M, Basavaraja GV. Indications and outcome of tracheostomy in a pediatric intensive care unit: A prospective observational study. Journal of Pediatric Critical Care. 2021 Jul 1;8(4):182-5.
[25] McEvoy TP, Seim NB, Aljasser A, Elmaraghy CA, Ruth B, Justice L, Begue S, Jatana KR. Prevention of post-operative pediatric tracheotomy wounds: a multidisciplinary team approach. International journal of pediatric otorhinolaryngology. 2017 Jun 1;97:235-9.