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## **Basic Pediatric Tracheostomy Care**

### **Clinical Questions**

#### ***Outcome: Maintaining skin integrity***

1. In children with tracheostomies with intact skin (chronic/healthy tracheostomy), is soap and water cleansing once a day and as needed, compared to ½ strength hydrogen peroxide cleansing with the same frequency, more effective in maintaining skin integrity?
2. In children with tracheostomies with non-intact skin, does increasing the frequency of cleansing, compared to the use of a dressing (any type), decrease the time to return to baseline skin integrity?
3. In children with tracheostomies, does the method of securing the tracheostomy tube influence skin integrity? (Consider: tension, twill tape, self-fastening ties, or metal bead chain.)

#### ***Outcome: Preventing accidental decannulation***

4. In children with tracheostomies, does the method of securing the tracheostomy tube influence the incidence of accidental decannulation?

#### ***Outcome: Maintaining tracheostomy tube patency***

5. In children with tracheostomies, does the frequency of suctioning influence tracheostomy tube patency?
6. In children with tracheostomies, does suctioning technique influence the rate of mucous plugs?
7. In children with tracheostomies, does the frequency of tracheostomy tube changes influence tracheostomy tube patency?
8. In children with tracheostomies, does heated humidification compared to cool humidification influence the frequency of mucous plugging?

### **Target Population**

Children birth to 18 years old with tracheostomies

### **Recommendations**

#### ***Outcome: Maintaining skin integrity***

1. It is recommended that skin care of the stoma and under the tracheostomy ties be provided at least daily, and more often if indicated, to prevent pressure necrosis and to maintain intact, clean and dry skin. (Local Consensus [5]).

**Note 1:** Skin care includes:

- inspection of peristomal and neck skin.
- gentle cleansing of these areas with soap and water. If encrusted secretions are present, they can be removed with 0.5% hydrogen peroxide. Rinse skin with water, and dry.
- dressings (if indicated for excess secretions or to prevent pressure ulcers) to promote movement of moisture away from the skin and prevention of pressure necrosis.

- ointments/creams appropriate for specific indications.

(Local Consensus [5])

**Note 2:** Consultations with wound care specialists are available for children who have significant issues with skin integrity or skin care issues (Local Consensus [5]).

2. There is insufficient evidence and a lack of consensus to make a recommendation on the frequency of cleansing tracheostomies which have non-intact skin.
3. It is recommended, in order to preserve skin integrity, that decisions regarding securing the tracheostomy tube be individualized based on the needs of the child and caregiver resources, skills and preferences and include:
  - the tension of tracheostomy tube ties: adequate to prevent pressure necrosis without causing accidental decannulation
  - the materials used for securing tracheostomy tubes: consider twill, self-fastening, or metal bead chain
 (ATS, 2000 [5], Local Consensus [5]).

***Outcome: Preventing accidental decannulation***

4. It is recommended, in order to prevent accidental decannulation, that decisions regarding securing tracheostomy tube be individualized based on the needs of the child and caregiver resources, skills and preferences and include:
  - the tension of tracheostomy tube ties: adequate to prevent accidental decannulation without causing pressure necrosis
  - the materials used for securing tracheostomy tubes: consider twill, self-fastening, or metal bead chain
 (ATS, 2000 [5], Local Consensus [5]).

***Outcome: Maintaining tracheostomy tube patency***

5. It is recommended that tracheostomy tube suctioning be performed at least twice daily and as needed based on clinical assessment to assure tracheostomy tube patency (NHS (2008) [5], ATS (2000 [5], Local Consensus [5]).
6. It is recommended that suctioning technique includes:
  - a premeasured depth technique (NHS (2008) [5], ATS (2000) [5], Local Consensus [5])
  - a rapid (< 5 seconds) catheter pass (NHS (2008) [5], ATS (2000) [5], Local Consensus [5])
  - suctioning only while withdrawing the suction catheter
 

**Note:** Suctioning while inserting and removing the catheter may be appropriate based on clinical assessment (for example in a patient with secretions bubbling from the tracheostomy tube and who needs hyperventilation or preoxygenation) (NHS (2008) [5], ATS (2000) [5], Local Consensus [5]).
  - choice of suction catheter size based on clinical assessment
 

**Note:** Recommendations in the literature vary between half the diameter of the tracheostomy tube to one that can be easily passed through the tracheostomy tube and effectively removes secretions (NHS (2008) [5], ATS (2000) [5], Local Consensus [5]).
  - selection of lowest effective pressure using equipment with an adjustable and measurable dial:
    - 60-80 mm Hg for neonates
    - 80-100 mm Hg for children
    - 80-120 mm Hg for adolescents

- **Note:** In the case of highly viscous secretions, the above stated suction pressure ranges may be adjusted upwards.  
(NHS (2008) [5], Local Consensus [5])
  - consideration of the need for pre-oxygenation or pre-ventilation based on clinical assessment (NHS 2008) [5], ATS (2000) [5], Local Consensus. [5])
  - that normal saline instillation **NOT** be used routinely (NHS (2008) [5], ATS (2000) [5], Local Consensus [5])  
**Note:** Saline use may be appropriate based on clinical assessment as a means to stimulate a cough or loosen encrusted secretions (Local Consensus [5]).
7. It is recommended that tracheostomy tube changes are performed routinely by institutional standards to maintain airway patency. (Local Consensus [5])  
**Note 1:** Tracheostomy tubes are routinely changed at CCHMC every 2-4 weeks. (Local Consensus [5])  
**Note 2:** At CCHMC consultation with complex airway management resource personnel may be called upon for children who have significant issues with mucous plugging (Local Consensus [5]).
  8. There is insufficient evidence and a lack of consensus to make a recommendation on the use of heated versus cool humidification in prevention of mucous plugging (ATS (2000) [5]).

**Research agenda:** Due to the current low level evidence available on the topic of basic tracheostomy care, further research is needed including but not limited to:

- frequency of tracheostomy tube change
- suctioning techniques
- use of humidity (cool or warm) in mucous plug prevention
- frequency of cleansing non-intact skin
- optimal material for tracheostomy tube ties.

#### **Relevant CCHMC policies/procedures:**

I-207 Tracheostomy Care

I-137 Monitoring of Patient with Stable Artificial Airways

CCHMC Best Evidence Statement: Technique for Suctioning Pediatric Tracheostomies, posted August 2008.

#### **Discussion/summary of evidence**

The literature search identified seventeen articles that discussed tracheostomy care. Upon review of those articles, three were found to help answer the clinical questions. The American Thoracic Society (ATS, 2000 [5]) published a consensus statement on the care of the child with a chronic tracheostomy. Carr, et al. (2001 [4a]) conducted a retrospective study to identify outcomes of pediatric patients with tracheostomies at a tertiary children's medical center in New England. The National Health Service Quality Improvement Scotland Best Practice Statement (NHS, 2008 [5]) published a consensus statement on the care of the child/young person with a tracheostomy.

Outcome: Maintaining skin integrity. There is little or no research evidence available regarding care to maintain skin integrity near a tracheostomy tube. No care frequency, specific cleaning products or barriers, or types of tracheostomy tube ties were discussed in the articles reviewed in relationship to skin care.

Outcome: Preventing accidental decannulation. There is little or no research evidence available regarding preventing accidental decannulation. Carr's study (2001 [4a]) reported 20% of their population had complications of accidental decannulation; however, preventative techniques were not discussed. The ATS

(2000 [5]) consensus group and the NHS Best Practice Statement (2008 [5]) described the security of the tracheostomy tube ties as most important when choosing a tie; however the specific product or frequency was not addressed. Other aspects of care (positioning, products to prevent torque on the tube, developmental issues) were not addressed.

**Outcome: Maintaining tracheostomy tube patency.** There is little or no research evidence available regarding the care to maintain tracheostomy tube patency. Carr's study (2001 [4a]) reported one third of their population had complications with tube occlusions; however preventative techniques were not addressed. The published literature was inconsistent on suctioning technique and frequency, and the use of saline. There was published consensus that tracheostomy tube changes should be done, but frequency was not described (NHS 2008) [5], ATS (2000) [5], Local Consensus [5]). There was no evidence in the area of humidification in its role with maintaining tracheostomy tube patency.

The addendum lists the other published literature that addressed pediatric tracheostomy care and was reviewed by this group. However, that literature lacked evidence based research, or made recommendations that were based solely on expert opinion that was inconsistent with CCHMC local consensus.

### **Health Benefits, Side Effects and Risks**

Health benefits include healthy skin, airway patency and security, or appropriate humidity for mobile/active patients, and "in-line" with some ventilator dependent patients (The theoretical advantage is to provide 32 to 34 C° at 100% relative humidity of 33 to 37 mg H<sub>2</sub>O/L matching normal airway physiology). There are minimal benefits that include infection reduction, granuloma reduction, and improved caregiver experience.

Side effects include skin redness, cutaneous or allergic reaction to cleaning product or dressing, potential skin breakdown if tracheostomy tube ties are too tight, potential suction trauma, increased "dead space" and airway resistance, or potential increased tracheal secretions.

Infections, accidental decannulation, and mucus plugging are risks that cannot be completely eliminated in this medically fragile patient population.

### **References/citations**

1. American Thoracic Society. (2000). Care of the child with a chronic tracheostomy. American Journal of Respiratory & Critical Care Medicine, 1, 297-308. [Expert consensus, 5].
2. Carr MM, et. al. (2001). Complications in pediatric tracheostomies. Laryngoscope, 111, 1925-8. [Descriptive study, 4a].
3. National Health Service Quality Improvement Scotland. (2008) "Best Practice Statement: Caring for the child/ young person with a tracheostomy." (ISBN Publication No. 1-84404-522-6). Retrieved from [http://www.nhshealthquality.org/nhsqis/files/CHILDTRACHEO\\_BPS\\_SEP08.pdf](http://www.nhshealthquality.org/nhsqis/files/CHILDTRACHEO_BPS_SEP08.pdf). October 13, 2009. [Expert consensus, 5].

Note: Full tables of evidence grading system available in separate document:

- Table of Evidence Levels of Individual Studies by Domain, Study Design, & Quality (abbreviated table below)
- Grading a Body of Evidence to Answer a Clinical Question
- Judging the Strength of a Recommendation (abbreviated table below)

**Table of Evidence Levels** (see note above)

<i>Quality level</i>	<i>Definition</i>
1a† or 1b†	Systematic review, meta-analysis, or meta-synthesis of multiple studies
2a or 2b	Best study design for domain
3a or 3b	Fair study design for domain
4a or 4b	Weak study design for domain
5	Other: General review, expert opinion, case report, consensus report, or guideline

†a = good quality study; b = lesser quality study

**Table of Recommendation Strength** (see note above)

<i>Strength</i>	<i>Definition</i>
“Strongly recommended”	There is consensus that benefits clearly outweigh risks and burdens (or visa-versa for negative recommendations).
“Recommended”	There is consensus that benefits are closely balanced with risks and burdens.
No recommendation made	There is lack of consensus to direct development of a recommendation.

**Dimensions:** In determining the strength of a recommendation, the development group makes a considered judgment in a consensus process that incorporates critically appraised evidence, clinical experience, and other dimensions as listed below.

1. Grade of the Body of Evidence (see note above)
2. Safety / Harm
3. Health benefit to patient (*direct benefit*)
4. Burden to patient of adherence to recommendation (*cost, hassle, discomfort, pain, motivation, ability to adhere, time*)
5. Cost-effectiveness to healthcare system (*balance of cost / savings of resources, staff time, and supplies based on published studies or onsite analysis*)
6. Directness (*the extent to which the body of evidence directly answers the clinical question [population/problem, intervention, comparison, outcome]*)
7. Impact on morbidity/mortality or quality of life

## Supporting information

### Introductory/background information

Evidence review of pediatric tracheostomy care was undertaken in order to provide recommendations for practice, staff and parent education. This information was shared with and mentorship provided to several groups of stakeholders within the medical center who were also developing pediatric tracheostomy care resources for CCHMC patients/ families.

### Group/team members

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### **Search strategy**

1. DATABASES

CINAHL

2. SEARCH TERMS

Tracheostomy care  
Tracheotomy care

3. LIMITS AND FILTERS

English  
Humans

Age Range: all child (0-18 years)

Publication Date Range: 1999-2010

### **Applicability issues**

Prevention of skin breakdown is a key safety/quality indicator with outcomes measurement already in place. Currently, pressure ulcer prevalence and occurrence data is collected and trended over time and analyzed using the pediatric pressure ulcer prevention bundle (PPUPB).

When skin breakdown occurs, CCHMC has resources in place for consultation and individualized treatment that includes interventions that are outlined in this PPUPB: positioning, moisture, surface, nutrition, and family involvement.

Copies of this Best Evidence Statement (BEST) are available online and may be distributed by any organization for the global purpose of improving child health outcomes. Website address: <http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/ev-based/default.htm>  
Examples of approved uses of the BEST include the following:

- copies may be provided to anyone involved in the organization's process for developing and implementing evidence based care;
- hyperlinks to the CCHMC website may be placed on the organization's website;
- the BEST may be adopted or adapted for use within the organization, provided that CCHMC receives appropriate attribution on all written or electronic documents; and
- copies may be provided to patients and the clinicians who manage their care.

Notification of CCHMC at [HPCEInfo@cchmc.org](mailto:HPCEInfo@cchmc.org) for any BEST adopted, adapted, implemented or hyperlinked by the organization is appreciated.

*Additionally for more information about CCHMC Best Evidence Statements and the development process, contact Center for Professional Excellence/Research and Evidence-based Practice office at [CPE-EBP-Group@cchmc.org](mailto:CPE-EBP-Group@cchmc.org).*

### **Note**

**This Best Evidence Statement addresses only key points of care for the target population; it is not intended to be a comprehensive practice guideline. These recommendations result from review of literature and practices current at the time of their formulation. This Best Evidence Statement does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the recommendations to meet the specific and unique requirements of individual patients. Adherence to this Statement is voluntary. The clinician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.**

**Reviewed against quality criteria by 2 independent reviewers**

### Addendum

#### Additional references reviewed

1. Akgul, Sevum; Akyolcu, Neriman. (2002) Effects of normal saline on endotracheal suctioning. *Journal of Clinical Nursing*. 11(6), 826-830. [Longitudinal study; content \not applicable to this BEST statement as it was a study of critically ill, intubated adults.]
2. Bahng, SC, et. al. (1998) Parental report of pediatric tracheostomy care. *Archives of Physical Medicine & Rehabilitation*. 79(11), 1367-9. [Descriptive study of home care techniques; content not applicable to this BEST statement]
3. Day T, et. al. (2002) Tracheal suctioning: an exploration of nurses' knowledge and competence in acute and high dependency ward areas. *Journal of Advanced Nursing*, 39(1), 35-45. [Descriptive study about nursing knowledge and competence; content not applicable to this BEST statement. References are dated. (1978-2001). It is unclear if references used in discussion are evidenced based or expert opinion.]
4. Dennis-Rouse MD; Davidson JE. (2008) An evidence-based evaluation of tracheostomy care practices. *Critical Care Nursing Quarterly*. 31(2), 150-60. [Guideline; not reliable or applicable to this BEST statement due to lack of evidence based research, local consensus based on limited experience]
5. Dougherty JM, et. al. (2003) Continuing education – CE 131C. Pediatric tracheostomy and ventilator care. *Nursing Spectrum (Midwest)*. 4(6), 24-9. [Continuing education article; not applicable to this BEST statement].
6. Fiske E; Gracey K. (2004) Effective strategies to prepare infants and families for home tracheostomy care. *Advances in Neonatal Care*. 4(1), 42-53. [Article on preparing for home care, not applicable to this BEST statement.]
7. Gray S, et. al. (2006) A creative solution for standardizing the care of a patient with a new tracheostomy in the ICU and the transition to the inpatient unit. *Journal of Pediatric Nursing*, 2(4), 129 [Abstract about standardizing care, not about technical aspects of care, not applicable to this BEST statement]
8. Kang, JM. (2002) Using a self-learning module to teach nurses about caring for hospitalized children with tracheostomies. *Journal for Nurses in Staff Development*. 18(1), 28-35. [Article about nursing education methodology; not applicable to this BEST statement.]
9. Lewis, T; Oliver G. (2005) Improving tracheostomy care for ward patients. *Nursing Standard*. 19(1), 33-7. [Article about nursing education and need for evidence based guidelines; not applicable to this BEST statement.]
10. McKillop, A. (2004) Evaluation of the implementation of a best practice information sheet: tracheal suctioning of adults with an artificial airway. *JBIR Reports*. 2(9), 293-308. [Article about the development and implementation of evidence based guidelines; not applicable to this BEST statement]
11. Russell, C. (2005) High-dependency nursing. Providing the nurse with a guide to tracheostomy care and management. *British Journal of Nursing*. 14(8), 428-33. [Expert opinion, 5b]

12. Veator R, et. al. (2006) Pediatric patients with new tracheotomies – innovative solutions for safe patient care. Critical Care Nurse. 26,(2), S31. [Abstract about developing patient guidelines; not applicable to the BESSt statement]
13. Wilson M. (2005) Tracheostomy management. Paediatric Nursing, 17(3), 38-43. [Nursing education article lacking evidence based research or guidelines; not applicable to this BESSt statement]