

**Best Evidence Statement (BESt)** 

Date: April 1, 2013

Title: Tracheal Cuff Pressure Management

# **Clinical Question:**

L

- P (*Population/Problem*) In pediatric patients with cuffed endotracheal or tracheostomy tubes,
  - *(Intervention)* is minimal leak technique (MLT)\*/minimal occlusive volume (MOV) technique\*
- C (Comparison) compared to using a cuff manometer
- O (Outcome) a more effective way to measure cuff pressures\*?

**Definitions** for terms marked with \* may be found in the Supporting Information section.

# **Target Population for the Recommendation:**

Inclusion: Neonatal and pediatric patients with a cuffed endotracheal tube or cuffed tracheostomy tube Exclusion: None

# **Recommendations:**

It is recommended that cuff pressure be measured in the neonatal and pediatric population.

Note 1: There are no studies that compare any one of these measurement approaches to another in neonates and pediatrics therefore one approach over another cannot be recommended. Research among the neonatal and pediatric populations would prove beneficial.

Note 2: At CCHMC, current policy is to utilize MOV and measure pressures with a cuff manometer, at least once per shift (RESP-PR-123).

# Discussion/Synthesis of Evidence related to the recommendation:

It is known that proper management of cuff pressure is very important to the patient's airway, especially in the pediatric patient. If the cuff is overinflated the pressure can cause damage to the tracheal wall. If the cuff is underinflated the patient could be underventilated and is at increased risk for aspiration (Sole 2009 [4a]). One cross-sectional study performed among the pediatric population recommended that cuff pressures be set and monitored with a pressure manometer (Sengupta 2004 [4a]). This is also recommended in adult studies (Karnes, 2004 [5a]; Sole 2009 [4a]). Another adult study stated that while MOV is adequate for obtaining a seal, there is a greater risk to the tracheal wall when this technique is used alone (Ganner 2001 [5a]). Continuous monitoring of cuff pressures using a transducer are also recommended, but is not frequently used (Sole 2009 [4a]). Of the eight studies found, only three of them directly related to the pediatric population. This is of concern because the pediatric airway is smaller and more fragile than the adult airway (Infosino 2002).

# **Reference List:**

- Devys, J.M., Schauvliege, F., Taylor, G., Plaud, B. (2004). Cuff compliance of pediatric and adult cuffed tracheal tubes: an experimental study. *Paediatric Anasthesia*, *14*, 676-80, [4a].
- Dullenkopf, A., Bernet, V., Maino, P., & Weiss, M. (2006). Performance of a novel pressure release valve for cuff pressure control in pediatric tracheal tubes. *Paediatric Anaesthesia, 16,* 19-24, [4b].
- Felten, M., et al. (2003). Endotracheal tube cuff pressure is unpredictable in children. Anesthesia & Analgesia, [4a].
- Ganner, C. (2001). The accurate measurement of endotracheal tube cuff pressures. *British Journal of Nursing, 10*(17), 1127-1134, [5a].
- Infosino, A. (2002). Pediatric upper airways and congenital anomalies. *Anesthesiology Clinics of North America, 20,* 747-766.
- Karnes, J., Stewart, S., Secrest, J., Norwood, B., Zachary, R.A. (2004). Comparison of endotracheal tube cuff pressures using estimation techniques and direct intracuff measurement. *AANA Journal [serial online]*, *72*(2), 97, [5a].

- Rose, L., & Redl, L. (2008). Survey of cuff management practices in intensive care units in Australia and New Zealand. *American Journal of Critical Care, 17(5),* 428-435, [4a].
- Sengupta, P., Sessler, D.I., Maglinger, P., Wells, S., Vogt, A., Durrani, J., et al. (2004). Endotracheal tube cuff pressure in three hospitals, and the volume required to produce an appropriate cuff pressure. *BMC Anesthesiology*, 4(8), [4a].
- Sole, M.L., Penoyer, D.A., Su, X., Jimenez, E., Kalita, S.J., Poalillo, E., et al. (2009). Assessment of endotracheal cuff pressure by continuous monitoring: A pilot study. *American Journal of Critical Care*, *18*(2), 133-143, [4a].

Wilkins, R. L., Stoller, J. K., Scanlan, C.L. (2003). Egan's Fundamentals of Respiratory Care, 8<sup>th</sup> ed., 683

## **I**MPLEMENTATION

#### **Applicability Issues:**

No current applicability issues as current procedure is to use MOV and measure pressure with a cuff manometer since no other recommendation is made.

#### **Relevant CCHMC Tools for Implementation:**

Policies, Procedures, Knowing Notes, or Health Topics CCHMC Respiratory Care Procedure: Therapeutics and Diagnostics: Monitoring and Documentation of Intratracheal Cuff Inflation Pressure. Procedure Number: RESP-PR-123. Effective Date: 3/15/2010.

#### **Outcome or Process Measures:**

The current procedure will continue to be performed.

# **SUPPORTING INFORMATION**

## Background/Purpose of BESt Development:

This BESt was developed based on a referral made to the Respiratory Inquiry Council from the respiratory clinical staff. Since cuffs are frequently used in the mechanically ventilated population and there are known risks of an overinflated and underinflated cuff, the staff wanted to know what the best technique was for measuring cuff pressures. The Respiratory Inquiry Council then performed a literature search, which lead to development of this BESt.

#### **Definitions:**

Minimal Occlusive Volume technique: Cuff is slowly inflated until the airflow heard escaping around the cuff during a positive-pressure breath ceases (Wilkins 2003).

Minimal Leak Technique: Air is slowly injected into the cuff until no leak is heard then once seal is obtained; a small amount of air is removed allowing a slight leak (Wilkins 2003).

Cuff Pressures: pressure (air) required to seal off the lower airway to protect from aspiration or to provide positive pressure ventilation (Wilkins 2003).

#### Search Strategy:

Databases: Medline, CINAHL, Google Scholar Search Terms: Cuff pressures, endotracheal tubes, tracheostomy tubes, minimal leak technique, minimal occlusive volume Limits, Filters, Search Dates: Neonatal, Pediatric; 2001-2009

Date Search Done: April 2012-August 2012

# **Relevant CCHMC Evidence-Based Documents:**

None were found.

#### Group/Team Members:

*Team Leader/Author:* Jessica Sexton, BHS, RRT-NPS, Transitional Care Center & Neonatal Intensive Care Unit *Team Members/Co-Authors:* Tonie Perez, BHS, RRT-NPS, Neonatal Intensive Care Unit; Amy Wolf, BS, RRT-NPS, Transport

Support/Consultant: Cyndi White, MSc, RRT-NPS, FAARC, Research Respiratory Therapist

# Respiratory Care/Tracheostomy Tubes/Tracheal Cuff Pressures/BESt 159

# Conflicts of Interest were declared for each team member:

No financial or intellectual conflicts of interest were found.

No external funding was received for development of this BESt.

The following conflicts of interest were disclosed:

**Note:** Full tables of the <u>LEGEND evidence evaluation system</u> are available in separate documents:

- 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 (dimensions table below)

#### Table of Evidence Levels (see note above):

Quality level	Definition
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
5a or 5b	General review, expert opinion, case report, consensus report, or guideline
5	Local Consensus

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

#### Table of Language and Definitions for Recommendation Strength (see note above):

Language for Strength	Definition			
It is strongly recommended that	When the dimens	sions for judging the strength of the evidence are applied,		
It is strongly recommended that not	there is high supp	port that the benefits clearly outweigh risks and burdens.		
	(or visa-versa for	negative recommendations)		
It is recommended that	When the dimens	sions for judging the strength of the evidence are applied,		
It is recommended that not	there is moderate	e support that benefits are closely balanced with risks and burdens.		
There is insufficient evidence and a lack of consensus to make a recommendation				
Given the dimensions below and that more answers to the left of the scales indicate support for a stronger recommendation, the				
recommendation statement above reflects the strength of the recommendation as judged by the development group.				
(Note that for negative recommendations, the left/right logic may be reversed for one or more dimensions.)				
Rationale for judgment and selection of each dimension:				
1. Grade of the Body of Evidence		High 🔄 Moderate 🛛 🖾 Low		
Rationale: All evidence is Level 4a or lower				
2. Safety/Harm (Side Effects and Risks	)	Minimal Moderate Serious		
Rationale: If cuff is over distended tracheal damage can occur and if cuff is underinflated inadequate ventilation can occur and/or				
aspiration.				
3. Health benefit to patient		Significant 🗌 Moderate 🗌 Minimal		
Rationale: Decreased risk of tracheal wall damage, de-compensation due to inadequate ventilation, and/or aspiration				
4. Burden on patient to adhere to rec	ommendation	Low Unable to determine High		
Rationale: Healthcare provider to manage cuff				
5. Cost-effectiveness to healthcare sy	stem	Cost-effective Inconclusive Not cost-effect	ive	
Rationale: Evidence does not discuss				
6. Directness of the evidence for this	target	Directly relates Some concern of Indirectly related	es	
population		directness		
Rationale: Evidence relates to adult population				
7. Impact on morbidity/mortality or o	uality of life	High Medium Low		
Rationale: Evidence does not discuss, but may be able to infer there could be negative repercussions of tracheal damage and aspiration				

Copies of this Best Evidence Statement (BESt) and related tools (if applicable, e.g., screening tools, algorithms, etc.) 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/service/j/anderson-center/evidence-based-care/bests/

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 EBDMinfo@cchmc.org for any BESt adopted, adapted, implemented, or hyperlinked by the organization is appreciated.

Please cite as: Sexton, J., Cincinnati Children's Hospital Medical Center: Best Evidence Statement Tracheal Cuff Pressure Management, http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/best.htm, BESt 159, pages 1-4, 4/1/13.

This Best Evidence Statement has been reviewed against quality criteria by two independent reviewers from the CCHMC Evidence Collaboration. Conflict of interest declaration forms are filed with the CCHMC EBDM group.

Once the BESt has been in place for five years, the development team reconvenes to explore the continued validity of the guideline. This phase can be initiated at any point that evidence indicates a critical change is needed. CCHMC EBDM staff performs a quarterly search for new evidence in an horizon scanning process. If new evidence arises related to this BESt, authors are contacted to evaluate and revise, if necessary.

# For more information about CCHMC Best Evidence Statements and the development process, contact the Evidence Collaboration at <u>EBDMinfo@cchmc.orq</u>.

#### 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.