



Critical Care Therapy and Respiratory Care Section

Category:	Clinical
Section:	Airway Management
Title:	Airway Suctioning and the Use of the Ballard Closed Tracheal Suctioning System
Policy #:	01
Revised:	09/00

1.0. DESCRIPTION

1.1 Definitions:

- 1.1.1 Deep tracheal suctioning is a sterile procedure which is performed to mobilize secretions from the patient's airway. By aspiration through a suction catheter placed proximal to the secretions. Airway suctioning removes excess secretions and promotes the cough reflex to help in maintaining a clear airway.
- 1.1.2 The Ballard Closed Tracheal Suction System is a multiple use tracheal suction catheter which is incorporated into the ventilator circuit via a standard T-piece elbow or double swivel elbow (DSE) allowing for the continuation of mechanical ventilation during suctioning and reducing the potential for contamination.

1.2 Indications

- 1.2.1 Suctioning is indicated for:
 - 1.2.1.1 Patients with artificial airways
 - 1.2.1.2 Patients with copious, retained secretions who cannot cough well due to loss of muscle tone, loss of an adequate cough reflex, or severe pain
 - 1.2.1.3 The presence of adventitious breath sounds, i.e. Rhonchi
 - 1.2.1.4 A requirement for a sputum specimen for laboratory analysis from a patient who is unable to produce a specimen via his own cough mechanism or who has an artificial airway

The use of the closed tracheal suction system is indicated for intubated/tracheal patients who:

- 1.2.1.5 Are placed in Respiratory Isolation
- 1.2.1.6 Require frequent suctioning, ie, greater than three times per 12-hour shift
- 1.2.1.7 Require greater than 10 cm H₂O positive end expiratory pressure (PEEP) and/or an FiO₂ greater than 0.50
- 1.2.1.8 Have documented desaturations demonstrated on pulse oximetry during suctioning

1.3 Contraindications

- 1.3.1 Patients with known hypersensitivity or vasovagal response to suctioning
- 1.3.2 Nasotracheal suctioning of patients who are thrombocytopenic, on systemic anticoagulant therapy, or have recently sustained surgery or trauma to the pharynx
- 1.3.3 Patients with epiglottitis
- 1.3.4 The closed tracheal suction system is contraindicated for use with endotracheal or tracheostomy tube sizes less than 5.0 mm ID.

1.4 Complications

- 1.4.1 Hypoxemia
- 1.4.2 Dysrhythmias
- 1.4.3 Hypotension
- 1.4.4 Atelectasis
- 1.4.5 Infection
- 1.4.6 Tracheal mucosal damage
- 1.4.7 Vomiting and aspiration of stomach contents

1.5 Precautions

- 1.5.1 Acute hypoxemia during the suctioning process may precipitate heart rate abnormalities in the critically ill. Dysrhythmias resulting from myocardial hypoxia may compromise hemodynamic stability. Vagal stimulation secondary to tracheal irritation may lead to profound bradycardia.
- 1.5.2 Hypotension may occur from either prolonged bradycardia or prolonged coughing during suctioning.
- 1.5.3 Atelectasis may result from insertion of a large suction catheter into the small diameter of an artificial airway. The catheter should not occupy more than one-half of the internal diameter of the tube being suctioned. (See Section 2.1)
- 1.5.4 Sterile technique must always be followed to avoid contamination of the airway. The catheter must never be reused.
- 1.5.5 Airway mucosal trauma may occur when improper suctioning techniques are employed. Suction should only be applied while withdrawing the catheter, and excessive vacuum pressure and lengthy suction maneuvers should be avoided. It is advisable to pay particular attention to the depth of insertion in patients who may be particularly vulnerable to mucosal damage, i.e., very young patients. In these cases, follow the procedure for determining the proper insertion

depth of the suction catheter through an artificial airway as outlined in 3.8. Procedure.

- 1.5.6 The decision to suction patients on high levels of positive end expiratory pressure (PEEP) and/or in fulminant pulmonary edema must be weighed against the cardiopulmonary effects of the loss of PEEP to these patients.
- 1.5.7 Patients with artificial airways who are sedated should have gastric tubes in place with vacuum applied for the evacuation of stomach contents.
- 1.5.8 Patients with thrombocytopenia and/or on systemic anticoagulant therapy must be suctioned with care to avoid mucosal trauma and bleeding.
- 1.5.9 When using the closed tracheal suction system, the catheter must be withdrawn to the full extent, ie, the black line must be visible within the bag, to prevent obstruction of the airway.

1.6 Adverse Reactions and Interventions

- 1.6.1 If dysrhythmias occur or significantly increase during suctioning, abort the procedure and hyperoxygenate the patient. If a further attempt at suctioning promotes a dysrhythmia, notify the physician for further instruction.
- 1.6.2 If the patient fails to return to his/her baseline clinical status after suctioning, notify the physician.
- 1.6.3 Patients receiving PEEP levels of five cm H₂O and above should have the same level of PEEP maintained between suctioning passes. PEEP levels of 10 cm H₂O or greater warrant the use of bronchoscopy adapters, or, alternatively, the closed tracheal suction system (See 1.3. Indications). Suctioning through these systems eliminates the interruption in the mechanical ventilatory process, therefore PEEP may be maintained.
- 1.6.4 If vomiting occurs, maintain suction to the hypopharynx and oropharynx until the vomiting has stopped.

2.0 EQUIPMENT AND MATERIALS

2.1 Appropriately sized sterile suction catheter:

<u>ID Tube (Size)/patient</u>	<u>Catheter size</u>
8.0-9.5/avg. adult	14 French
5.0-7.5/child, sm. adult	10 French
4.0-4.5/ infant, sm. child	8 French
2.5-3.5/infant	6 French

OR

Appropriately sized in-line suction catheter (closed tracheal suction system):
ID Tube (Size)/patient Catheter size

6.0-6.5/lg. child
7.0-9.5/adult

12 French
14 French

- 2.2 Suction source that is capable of generating up to 300-600 mm Hg vacuum pressure with connecting tubing:
Vacuum pressure for: adults = 120-150 mm Hg
children = 100-120 mm Hg
infants = 60 -100 mm Hg
- 2.3 Sterile/nonsterile gloves, as appropriate
- 2.4 Manual resuscitator and mask (with PEEP valve, if appropriate) and oxygen source for intubated patients; supplemental blowby oxygen for nonintubated patients
- 2.5 Soluble lubricant for nasotracheal suctioning of the nonintubated patient
- 2.6 Sterile water for clearing clogged catheter
- 2.7 Universal precautions attire
- 2.8 Sterile specimen trap (if indicated)
- 2.9 0.9% NaCl for lavage, if indicated by inspissated secretions

3.0 PROCEDURE

- 3.1 Check order, gather equipment, and wash hands.
- 3.2 Assess the patient by inspection and auscultation.
- 3.3 Inform the patient of the procedure.
- 3.4 Don universal precautions attire.
- 3.5 Turn on the vacuum regulator and adjust the pressure as appropriate.
- 3.6 Preoxygenate the patient.

Routine nasotracheal suctioning or suctioning of artificial airways:

- 3.7 Open the catheter kit and don the gloves while maintaining sterility. Lubricate the catheter at this time, if appropriate. A nasopharyngeal airway may be used to facilitate passage of the catheter through the nasopharynx and thereby minimize trauma to the area. Connect the catheter to the vacuum tubing.
- 3.8 Suctioning the airway
 - 3.8.1 For intubated patients, insert the catheter into the airway until an obstruction is met, then withdraw about one cm. For very young patients, the catheter need only be withdrawn approximately 1/2 cm at this point.

3.8.2 For nasotracheal suctioning of nonintubated patients, blowing of the nose and use of an antiseptic mouthwash prior to the procedure may minimize the risk of tracheal infection. Position the head so that the neck is mildly hyperextended, and insert the lubricated catheter into one of the nares. Advance the catheter slowly during inspiration. Except in the most obtunded patient, vigorous coughing will result when the catheter passes into the trachea. Pass the catheter until resistance is met, and then pull back about one cm, or 1/2 cm in very young patients.

*** Alternatively, measure the depth of insertion by summing the length of the airway adaptor and the distance to the tip of the endotracheal or tracheostomy tube. Insert the suction catheter only to this depth.

- 3.9 Suction should not be applied for more than fifteen seconds, and ventilation and oxygenation should not be interrupted for more than twenty seconds in adults. For pediatric patients, suction should be applied for no more than five seconds, and the total interruption to ventilation and oxygenation should not exceed ten seconds.
- 3.10 Reoxygenate and hyperventilate the patient prior to performing another suction maneuver. Ensure stable vital signs prior to reinsertion of the catheter.
- 3.11 Repeat the suctioning procedure until secretions are cleared from the airway and breath sounds are improved. For nasotracheal suctioning, it may be helpful to withdraw the catheter into the airway above the epiglottis, without completely removing it, between suction passes.
- 3.12 If the patient has tenacious secretions, sterile 0.9% NaCl may be instilled prior to suctioning to facilitate loosening and removal of the secretions. Ventilation of the patient with a manual resuscitator immediately following instillation, and prior to suctioning, may aid in distribution of the diluent.

Use of the closed tracheal suction system:

- 3.13 Place the 24 hour change out sticker over the suction valve on the in-line suction catheter. **NOTE: Catheters must be changed every 24 hours or more frequently PRN.**
- 3.14 Attach wall suction tubing to the control valve.
- 3.15 Insert the T-piece between the endotracheal/tracheostomy tube and the ventilator circuit.
- 3.16 Open the irrigation port, and attach a 0.9% NaCl vial.
- 3.17 For sputum collection, connect specimen trap inline between the suction control valve and the suction tubing. Suction patient as described below. **Note:** Collection of sputum through closed catheters is only completely free of contaminants when first used.
- 3.18 Preoxygenate the patient.

- 3.19 Grasp the T-piece with one hand and advance the catheter using the thumb and forefinger of the opposite hand.
- 3.20 If opting to lavage: Advance the catheter approximately four inches for an endotracheal tube and two inches for a tracheostomy tube. Instill 3-5 ml of 0.9% NaCl from the vial during inspiration and immediately advance the catheter down the tube to the desired depth.
- 3.21 Withdraw the catheter slowly while depressing the suction control valve. Do not remove the catheter until the valve is fully depressed. Stabilize the T-piece with your non-dominant hand while withdrawing the catheter.
- 3.22 Withdraw the catheter to its full extent (black line must be visible within bag).
- 3.23 Reoxygenate the patient prior to performing another suction maneuver. Ensure stable vital signs prior to reinsertion of the catheter.
- 3.24 Repeat the suctioning procedure until secretions are cleared from the airway and breath sounds are improved.
- 3.25 When transferring the patient, disconnect the suction catheter from the suction tubing, and rotate and lock the suction control valve.

4.0 POST PROCEDURE

- 4.1 Rinse the suction tubing in water after the procedure to prevent clogging of the vacuum apparatus.
- 4.2 Assure that the patient is comfortable, and that vital signs are stable before leaving the bedside.
- 4.3 Immediately discard the dirty catheter and gloves.

For use of the closed tracheal suction system:

- 4.4 Instill at least 5 ml of 0.9% NaCl while applying continuous suction via the suction control valve to clean the catheter. Do not allow secretions to remain in the catheter or suction line after suctioning, since these may dry and harden, reducing line suction efficiency.
- 4.5 Cap the lavage port after removing the normal saline vial. Discard the empty vial.
- 4.6 Rotate and lock the suction control valve.

5.0 DOCUMENTATION

- 5.1 Chart the procedure by initialing the proper column on the patient's bedside flowsheet.
- 5.2 Chart any adverse reactions that may have occurred and the interventions required to correct these on the Notes side of the Continuous Ventilation Record. Report these to the patient's nurse and the responsible physician.

6.0 REFERENCES

- 6.1 AARC Clinical Practice Guideline “Nasotracheal Suctioning”
- 6.2 AARC Clinical Practice Guideline “Endotracheal Suctioning of Mechanically-Ventilated Adults and Children with Artificial Airways”.
- 6.3 Barnhart SL, Czervinske MP, eds. Perinatal and pediatric respiratory care. Philadelphia: WB Saunders Co., 1995.
- 6.4 Ballard Medical Products: Quality Assurance Manual
- 6.5 Whitaker K. Comprehensive perinatal and pediatric respiratory care. Delmar Publishers, Inc.: 1992; ppg. 209-214.

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