



CLINICAL PRACTICE GUIDELINE

Practice Guideline:

Adult Mechanically Ventilated Endotracheal/Tracheostomy Tube: Open and Closed System Suctioning and Specimen Collection

Approval Date:

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Supersedes:
N/A

[PART A: ENDOTRACHEAL TUBE \(ETT\)/TRACHEOSTOMY TUBE CLOSED SYSTEM SUCTIONING](#)

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1.0 PURPOSE AND INTENT

- 1.1 To provide a systematic approach to suctioning mechanically ventilated patients with an artificial airway (i.e. Endotracheal Tube (ETT) or Tracheostomy Tube) using either a closed or open suctioning method, thereby:
 - Minimizing the introduction of pathogens to patients.
 - Minimizing aerosol generation of secretions & microorganisms
 - Reducing the risk of desaturation or lung de-recruitment.
- 1.2 To provide a systematic approach to specimen collection via an artificial airway.

2.0 DEFINITIONS

- 2.0 **Closed System (i.e. In-line) Suctioning:** Suctioning technique that involves attaching a sterile, closed, in-line suctioning catheter to a ventilatory circuit, allowing passage of the suction catheter through the artificial airway without disconnecting the patient from the ventilator.
- 2.1 **Open System Suctioning:** A suctioning technique that involves inserting a regular suction catheter into a patient’s open artificial airway.
- 2.2 **Deep Suctioning:** A suctioning technique involving the insertion of the suction catheter until resistance is met and/or patient coughs, followed by withdrawal of the catheter by 1-2 centimeter (cm) before the application of negative pressure.
- 2.3 **Shallow Suctioning:** A suctioning technique involving the insertion of the suction catheter to the distal end of the ETT, using the cm marking on the closed or open system catheter. Indicated but not limited to patients at high-risk for suction related complications e.g. high risk for bleeding, significant physiological response affecting hemodynamics and bronchospasm.

3.0 GUIDELINES

- 3.1 The following skills may be performed by health care providers involved in patient’s care whose scope of practice qualifies them to suction an artificial airway using the closed system or open system methods.
- 3.2 The closed system suctioning technique is the preferred method for suctioning as it allows for continuous oxygenation and ventilation throughout procedure. If using open system suctioning, inform Registered Respiratory Therapist (RRT) as required by your site specific practice.

3.3 Perform artificial airway suctioning only when clinically indicated.

3.3.1 Indications include, but are not limited to:

- Assessment of presence of cough reflex, strength, and quality.
- Presence of airway secretions. Assessment findings related to secretions can include, but are not limited to:
 - Auscultation of adventitious breath sounds, including wheezes, rhonchi, or crackles.
 - Sudden increased or gradual increase in peak inspiratory pressure or increased resistance on ventilator
- Cough (e.g. weak cough/effort, frequent coughing, inability to initiate cough etc.)
- Tachypnea
- Sudden onset of increased work of breathing, or respiratory distress
- Gradual or sudden decrease in oxygen saturation
- Secretions in the airway that are unable to be cleared with coughing efforts
- Suspected aspiration of gastric or upper airway secretions
- Obtaining specimen collection if unable to collect with cough.

3.4 If using closed system suction for specimen collection, an in-line suction can be used if it has been in situ less than 24 hours.

3.4.1 **If greater than 24 hours, consider replacing in-line suction system prior to specimen collection.**

Rationale: If a sample is taken from an in-line suction system that has been in situ for longer than 24 hours, there is a high risk the sample will be contaminated.

3.5 Using the teeth or gum line as a landmark for ETT depth is recommended as it provides a consistent measurement. Landmarking of ETT depth may be described as: at the teeth or at the gum-line and varies by site.

3.6 Perform hand hygiene before direct patient contact and subsequently as clinically indicated. Follow routine practices and use appropriate PPE as per point of care risk assessment (PCRA).

4.0 DOCUMENTATION

4.1 Document on site/unit specific documentation records, such as Adult Intensive Care Flow Sheet, Adult Ventilator Flowsheet, Adult PACU Patient Record/Electronic Patient Record; and/or intake and output records, and IPN identifying:

- Type of suctioning performed.
- Amount, color and consistency of obtained secretions.
- Collection of specimens along with clinical rationale.
- Tolerance of procedure and complications encountered during suctioning.

5.0 PART A: ENDOTRACHEAL TUBE (ETT)/TRACHEOSTOMY TUBE CLOSED SYSTEM SUCTIONING

5.1 Equipment

- In-line suction catheter
- Prefilled 0.9% Normal Saline (NS) syringe/nebule
- Clean gloves
- Oxygen saturation monitor

- Calibrated suction source (either wall or portable) with regulator
- Suction tubing

5.2 Procedure

5.2.1 Perform hand hygiene before direct patient contact and subsequently as clinically indicated. Follow routine practices and use appropriate PPE as per point of care risk assessment (PCRA).

5.2.2 Monitor patient's cardiopulmonary status before, during, and after suctioning.

5.2.2.1 Adverse reactions include but are not limited to: decreased oxygenation, bronchospasms, respiratory distress, cardiac arrhythmia, agitation, pain, change of level of consciousness or increased Intracranial Pressure (ICP).

5.2.3 Turn on the suction source and set suction regulator to less than or equal to 150 mmHg of negative pressure unless otherwise clinically indicated (e.g. thickened secretions).

Rationale: Negative pressure settings greater than 150 mmHg may increase risk of tracheal mucosal damage. An effort to use the least amount of suction pressure necessary to clear secretions should be made. If mucosal damage is present, consider decreasing suction pressure.

5.2.4 Test suction prior to use by either pinching the suction tubing or by occluding suction tubing using thumb covered with clean glove. Negative pressure applied while occluding/pinching should not exceed 150 mmHg.

5.2.5 Ensure in-line suction catheter is attached to suction tubing.

5.2.6 For ETT suctioning, note ETT depth placement at patient's teeth or gum-line.

Rationale: Landmarking ETT depth placement allows for early identification of artificial airway migration. Using the teeth or gum-line as a landmark for ETT depth is preferred as it provides a more consistent measurement. Landmarking of ETT depth may be described as: at the teeth or at the gum-line and varies by site.

5.2.7 Pre-oxygenate patient on ventilator for a minimum of 30-60 seconds.

5.2.8 Silence ventilator alarms as required by your site specific practice.

5.2.9 While stabilizing airway with non-dominant hand, insert the in-line suction catheter with the dominant hand, using one of the following methods:

- Deep Suctioning:** Insert suction catheter into the artificial airway until resistance is met and/or patient coughs, then pull catheter back 1-2 cm.
- Shallow Suctioning:** Insert suction catheter and align cm markings on both in-line suction catheter and ETT, where able to visualize (e.g. align 25 cm on in-line suction catheter to 25 cm markings on ETT).

NOTE: Do not apply suction during insertion of the catheter into the airway.

5.2.10 Using dominant hand and thumb, activate the thumb-control valve on the suction catheter to apply continuous suction while withdrawing the in-line suction catheter and stabilizing airway/ETT with non-dominant hand.

NOTE: Each suction pass should not exceed more than 15 seconds to decrease risk of oxygen desaturation.

- 5.2.11 Ensure tip in-line suction catheter is completely out of airway and visible outside ventilator T-piece once suctioning is complete. See image below:



- 5.2.12 Doff gloves if required. Perform hand hygiene.
- 5.2.13 Ensure alarms have been re-enabled on ventilator if previously silenced.
- 5.2.14 Assess effectiveness of suctioning. This includes but is not limited to assessment of patient's: respiratory rate, auscultation of lung fields, assessment of cough, ventilator response and oxygen saturation.
- 5.2.15 While applying continuous suction, flush the prefilled Normal Saline (NS) syringe solution into the in-line suction irrigation port to clear the catheter of secretions.

Rationale: Applying continuous suction prior to flushing the in-line catheter prevents airway lavage.

- 5.2.16 If additional suction is needed, repeat steps 5.2.6 to 5.2.15.

NOTE: Allow adequate time between suctioning for the patient to recover. Minimize oxygen desaturation and cardiopulmonary complications by not exceeding 4 consecutive suctioning attempts. If patient does not recover to baseline, notify RT/medical team.

6.0 PART B: ENDOTRACHEAL TUBE (ETT)/TRACHEOSTOMY TUBE OPEN SYSTEM SUCTIONING USING A REGULAR SUCTION CATHETER

6.1 Equipment

- Regular suction catheter (for single use)
- Clean gloves
- Sterile 0.9% NS solution or sterile water
- Calibrated suction source (either wall or portable) with regulator
- Suction tubing
- Oxygen saturation monitor
- Disposable pad

6.2 Procedure

- 6.2.1 Perform hand hygiene before direct patient contact and subsequently as clinically indicated. Follow routine practices and use appropriate PPE as per point of care risk assessment (PCRA).

- 6.2.2 Monitor patient's cardiopulmonary status before, during and after suctioning.
- 6.2.2.1 Adverse reactions include but are not limited to: decreased oxygenation, bronchospasms, respiratory distress, cardiac arrhythmia, agitations, pain, change of level of consciousness or increased ICP.
- 6.2.3 Turn on the suction source and set suction to less than or equal to 150 mmHg unless otherwise clinically indicated (e.g. thickened secretions).
- Rationale:** Negative pressure settings greater than 150 mmHg may increase risk of tracheal mucosal damage. An effort to use the least amount of suction pressure necessary to clear secretions should be made. If mucosal damage is present, consider decreasing set suction pressure.
- 6.2.4 Test suction prior to use by either pinching the suction tubing or by occluding suction tubing using thumb covered with clean glove. Negative pressure applied while occluding/pinching should not exceed 150 mmHg.
- 6.2.5 Place disposable pad on patient's chest.
- Rationale:** This prevents contamination of ventilator circuit connection, and accidental spillage of secretions and condensation on patient's chest.
- 6.2.6 For ETT suctioning, note ETT depth placement at patient's teeth or gum-line.
- Rationale:** Landmarking ETT depth placement allows for early identification of artificial airway migration. Using the teeth or gum line as a landmark for ETT depth is preferred as it provides a more consistent measurement. Landmarking of ETT depth may be described as: at the teeth or at gum-line and varies by site.
- 6.2.7 Using aseptic technique and a clean surface, open sterile suction catheter packaging to expose the connecting end and connect to the suction tubing.
- 6.2.8 Pre-oxygenate patient on ventilator for a minimum of 30-60 seconds.
- 6.2.9 Silence ventilator alarms as required by your site specific practice.
- 6.2.10 Perform hand hygiene and don clean gloves.
- 6.2.11 Disconnect the ventilator circuit with non-dominant hand from the artificial airway and place on disposable pad.
- 6.2.12 While stabilizing airway with non-dominant hand, pick up suction catheter with the clean, gloved dominant hand. Avoid contamination of suction catheter on any non-sterile surfaces.
- 6.2.13 With dominant hand, insert suction catheter into artificial airway.
- NOTE:** Do not apply suction during insertion of catheter into airway.
- 6.2.14 Gently insert catheter into artificial airway until resistance is met. Once resistance is met, pull back 1-2 cm.
- 6.2.15 Use clean, gloved dominant hand to apply suction by occluding the control vent on suction catheter while withdrawing catheter from artificial airway.
- NOTE:** Suctioning process should not exceed more than 15 seconds to decrease risk of oxygen desaturation.
- 6.2.16 Once suction is completed, re-attach the ventilator circuit and/or oxygen source to the artificial airway and ensure system is intact while confirming airway depth.

- 6.2.17 Disconnect the catheter from the suction tubing. Wrap the catheter around the gloved hand. Pull the glove off inside out, keeping the catheter in the glove. Discard and perform hand hygiene.
- 6.2.18 Ensure alarms have been re-enabled on ventilator if previously silenced.
- 6.2.19 Rinse the suction system with sterile 0.9 % NS or sterile water solution until tubing clear.
- 6.2.20 If additional suctioning is repeat 6.2.6 to 6.2.19.

NOTE: Allow adequate time between suctioning for the patient to recover. Minimize oxygen desaturation and cardiopulmonary complications by not exceeding 4 consecutive suctioning attempts. Use new standard suction catheter with each suctioning attempt. If patient does not recover to baseline, notify RT/medical team.

7.0 PART C: SPECIMEN COLLECTION USING REGULAR SUCTION CATHETER OR CLOSED SYSTEM SUCTION CATHETER

7.1 Equipment

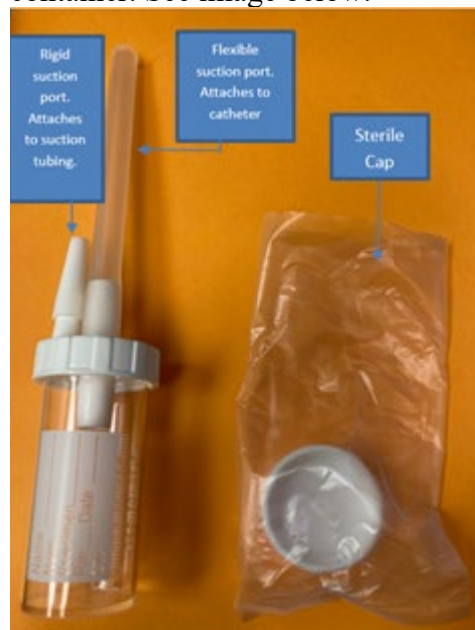
- Regular suction catheter (for single use)/In-line suction catheter
- Suction tubing
- Specimen collection container with sterile cap
- Clean gloves
- Calibrated suction source (either wall or portable) with regulator
- Sterile 0.9% Normal Saline (if using open system method)
- Sterile 0.9% Normal Saline syringe/nebule (if using closed system method)

7.2 Procedure

- 7.2.1 Perform hand hygiene before direct patient contact and subsequently as clinically indicated. Follow routine practices and use appropriate PPE as per point of care risk assessment (PCRA).
- 7.2.2 Monitor patient's cardiopulmonary status before, during, and after suctioning.
- 7.2.2.1 Adverse reactions include but are not limited to: decreased oxygenation, bronchospasms, respiratory distress, cardiac arrhythmia, agitations, pain, change of level of consciousness or increased ICP.
- 7.2.3 Turn on the suction source and set suction to less than or equal to 150 mmHg unless otherwise clinically indicated (e.g. thickened secretions).
- Rationale:** Negative pressure settings greater than 150 mmHg may increase risk of tracheal mucosal damage. An effort to use the least amount of suction necessary to clear secretions should be made. If mucosal damage is present, consider decreasing set suctioning pressure.
- 7.2.4 Test suction prior to use by either pinching the suction tubing or by occluding suction tubing using thumb covered with clean glove. Negative pressure applied while occluding/pinching should not exceed 150 mmHg.
- 7.2.5 For ETT specimen collection, note ETT depth placement at patient's teeth or gum-line.

Rationale: Landmarking ETT depth placement allows for early identification of artificial airway migration. Using the teeth or gum-line as a landmark for ETT depth is recommended as it provides a consistent measurement. Landmarking of ETT depth may be described as: at the teeth or at the gum-line and varies by site.

- 7.2.6 Aseptically remove the specimen collection container from the package, maintain sterility of the inside of the package.
- 7.2.7 Attach specimen collection container to the suction catheter:
- If using an in-line suction catheter:** attach distal end to the flexible port on the specimen collection container.
 - If using a regular suction catheter:** open sterile suction catheter packaging to expose the connecting end and connect suction catheter to flexible port on the specimen collection container.
- 7.2.8 Connect suction tubing to rigid suction port connector on the specimen collection container. See image below.



- 7.2.9 **If using open system method with regular suction catheter:** pour small amount of sterile 0.9% Normal Saline into sterile package.
- 7.2.10 Perform hand hygiene and don clean gloves.
- 7.2.11 Suction patient, keeping the specimen collection container in an upright position to ensure sample collected is maintained within container.
- If using an in-line suction catheter:** follow 5.2.5 to 5.2.11.
 - If using a regular suction catheter:** follow 6.2.7 to 6.2.15
- 7.2.12 Flush the suction catheter with sterile 0.9% NS
- If using in-line suction catheter:** flush the suction catheter with sterile 0.9% NS syringe/nebule while activating the suction apparatus to clear catheter secretions from the suction catheter into the specimen collection container.
 - If using regular suction catheter:**

- Re-attach the ventilator circuit and/or oxygen source to the artificial airway and ensure system is intact while confirming airway depth.
- Flush the suction catheter using sterile 0.9% Normal Saline previously poured into sterile package.

7.2.13 Remove specimen collection container cap with suction ports and aseptically apply sterile cap to specimen collection bottle.

7.2.14 Discard supplies, doff gloves, and perform hand hygiene.

7.2.15 Ensure alarms have been re-enabled on ventilator if previously silenced.

7.2.16 Label specimen collection bottle with appropriate patient identifiers and complete appropriate lab requisitions as per facility Lab Information Manual.

8.0 REFERENCES:

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