Endotracheal suctioning

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ABSTRACT –

Endo tracheal suctioning is a critical procedure performed to maintain airway patency and remove secretions from the trachea, particularly in patients who are unable to clear their own airway due to mechanical ventilation, respiratory compromise, or altered consciousness. This procedure is essential in preventing complications such as atelectasis, hypoxemia, and respiratory infections, thereby optimizing pulmonary function and improving patient outcomes.

The process involves the insertion of a suction catheter through the endotracheal tube (ETT) to aspirate mucus, secretions, or other obstructing materials from the lower airways. While it is a standard practice in intensive care units (ICUs) and emergency settings, it requires careful technique and monitoring to minimize risks, including hypoxia, tissue damage, infection, and arrhythmias. Various guidelines emphasize the importance of assessing the patient's respiratory status, evaluating the need for suctioning, and ensuring that suctioning is performed in a sterile manner to reduce the risk of nosocomial infections.

Factors such as suction pressure, duration, and catheter size should be tailored to the individual patient's condition, with frequent monitoring of vital signs and oxygen saturation levels. Research has shown that appropriate endotracheal suctioning techniques, when combined with timely interventions, contribute to better patient outcomes, particularly in those with chronic respiratory conditions, postoperative recovery, or acute respiratory distress.

In conclusion, endotracheal suctioning plays a vital role in respiratory care, and understanding the best practices surrounding this procedure is essential to minimize adverse effects and enhance patient recovery. Further research is needed to refine techniques, optimize patient safety, and establish evidence-based protocols for this critical intervention.

BACKGROUND:

Endotracheal suctioning is a vital component of respiratory care in critically ill patients, especially those who are mechanically ventilated or unable to manage their own airway clearance. The buildup of secretions in the trachea can obstruct airflow, leading to respiratory distress, reduced gas exchange, and potential life-threatening complications such as aspiration pneumonia or atelectasis. In these situations, the use of endotracheal suctioning is employed to clear the airway and restore normal respiratory function.

Over time, research in this area has explored different suctioning techniques, frequency of suctioning, and the impact of suctioning on patient outcomes. While routine suctioning has been a common practice, current evidence suggests that it should be done based on clinical need rather than routinely, to avoid unnecessary trauma to the airways. Studies have also looked at pre-oxygenation, the use of closed suction systems, and the importance of monitoring vital signs during the procedure to mitigate risks such as oxygen desaturation.

The ongoing challenge in endotracheal suctioning research is to determine the most effective methods to balance the need for airway clearance with the risks of complications, particularly in patients with underlying respiratory conditions, those

in critical care, and those with a prolonged need for mechanical ventilation. Future research should focus on refining suctioning protocols, examining patient-specific variables, and investigating the long-term impact of repeated suctioning on lung health and recovery

INTRODUCTION-

Endotracheal tube is used to maintain the patent airway and to facilitate mechanical ventilation. Presence of artificial airway **prevents the effective coughing and secretion removal**, necessitating periodic removal of pulmonary secretions with suctioning.

In Health care settings, suctioning always performed as a sterile procedure to prevent the hospital-acquired infections (VAP).

DEFINITION –

Suctioning is the removal of secretions from tracheobronchial tree through an endotracheal and tracheostomy tube with help of mechanical suction device.

- Brunner and Suddarth's, 2018

Suctioning is defined as the procedure to remove pulmonary secretion mechanically from the patient's airway passages.

PURPOSES -

- Maintain a patent airway by removing accumulation tracheobronchial secretions
- Improve the oxygenation
- Prevent infection from the retained secretion
- Improve the effective ventilation

INDICATION

1. Therapeutic -

- Noisy breathing
- Visible Secretions in the airways
- Decreased SpO2 in the pulse oximeter
- Deterioration of arterial blood gas values
- Inability to generate the effective spontaneous cough reflex
- Presence of pulmonary atelectasis or consolidation, presumed to be secretion retention
- During special procedure like Bronchoscopy and Endoscopy

2. Diagnostic –

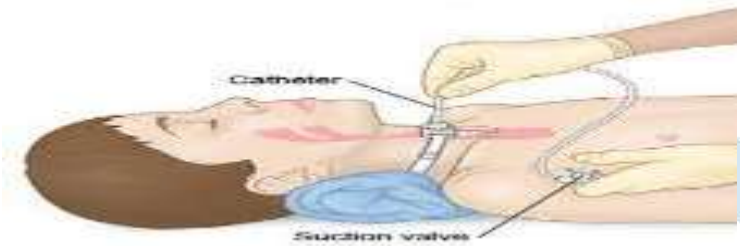
- The need to obtain a sputum specimen/ Endotracheal Aspiration for investigation**.**

3. Mechanical ventilation indication -

- Increase in Peak Airway Pressures

TYPES OF SUCTION SYSTEM

1. **Open suction system**
    - Involves disconnecting the ETT from the oxygen source and then suctioning with sterile suction catheter.



2. Closed suction system

- Involves using an enclosed suction catheter with a sleeve that facilitate continuous mechanical ventilation and oxygenation during the suctioning

***** Special Consideration before Suctioning**

✓ Ensure emergency resuscitation equipment is readily available
i.e. Bag-Valve- device connected to oxygen flow meter and set at 15L/Min

✓ Correct Suctioning depth (insert until detect resistance then retract 1 cm back before applying pressure) is essential to minimize tracheal mucosal damage

✓ Frequency of Suction based on auscultation or as per need of patients

✓ To reduce the risk of hypoxia – ***Do not exceed four passes per suctioning & no longer than***

- 10 seconds for paediatrics & adults

- 5 to 10 seconds for neonates and infants

✓ Pre-oxygenate patients at least 30 seconds by activating hyper-oxygenation on ventilator or using BVM

✓ Ensure the recommended suctioning pressure applied

- 100 – 120 mmHg for Adults

- 80 – 100 mmHg for Children

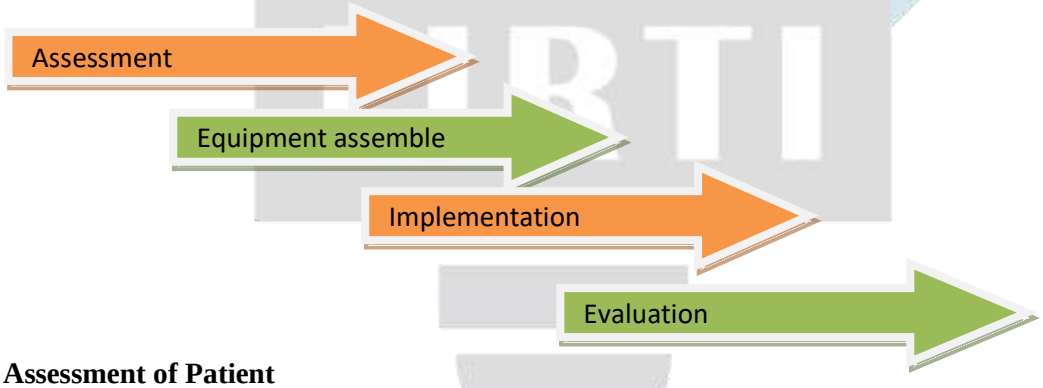
- 60 – 80 mmHg for Infants

✓ **At least 30 minutes Before Ryle's tube feeding**

❖ **Suction pressure greater than recommended may cause mucosal damage and Haemorrhage**

Articles	Purpose
• Suction tray containing suction catheters	• To suction the secretion
• Sterile water	• To loosen the secretion
• Normal saline	• To loosen the secretion
• Ambu bag	• To oxygenate patient
• Sterile gloves, mask	• To prevent cross infection
• Stethoscope	• To auscultate the sounds
• Sterile towel	• To protect the linen
• Gauze pieces	• To wipe secretion
• Kidney tray	• To discard the waste
• Suction apparatus	• To apply suction

Procedure



1. **Assessment of Patient**

Before starting the suctioning procedure, monitor the following parameters:

- **Breath sounds**
- **Oxygen saturation** (SpO_2)
- **Respiratory rate** and **pattern**
- **Heart rate** and **blood pressure**
- **Cough effort** and **ventilator parameters** (e.g., PIP, tidal volume, FiO_2)
- **Intracranial pressure (ICP)** if relevant

2. Equipment Preparation:

Prepare and check all necessary equipment:

- Ensure suction pressure is set to 120–150 mmHg

- Gather the appropriate size suction catheter
- Verify that all suction devices and accessories are sterile

3. Positioning the Patient:

Place the patient in a semi-Fowler's or Fowler's position by raising the head of the bed to facilitate easy access to the airway.

4. Sterile Technique:

- Wash your hands thoroughly before starting.
- Wear a sterile mask and gloves.
- Keep the suction catheter sterile by holding it only by its outer edges.

5. Suctioning Procedure:

A. Open Suctioning:

1. Open the sterile suction tray and prepare sterile saline or water for lubrication.
2. Use your non-dominant hand to connect the suction catheter to the suction apparatus, keeping the catheter sterile with your dominant hand.
3. Disconnect the patient from the ventilator or CPAP machine, placing the connector on the sterile towel.
4. Use an Ambu bag to oxygenate the patient by delivering 100% oxygen, if necessary.
5. Insert the suction catheter gently into the endotracheal tube, advancing it up to 12.5 cm (for adults).
6. Apply suction by releasing the "Y" port, and rotate the catheter gently while withdrawing it to clear secretions.
7. Limit suctioning to 10 seconds per pass to avoid hypoxia.
8. After each suction attempt, provide additional oxygen through the Ambu bag or via the ventilator.
9. Rinse the catheter with sterile water between suction attempts.
10. Repeat the procedure until the airway is cleared or the patient can no longer tolerate it (typically 4 passes).

ETT Size (mm) X 2 = Catheter size (Fr)

Eg – 4 mm ET X 2 = 8 Fr catheter

$$\frac{\text{Tracheostomy Size}}{2} \times 3 = \text{Catheter size}$$

B. Closed Suctioning:

1. Open the closed suction system and follow the manufacturer's instructions.
2. Attach the suction catheter to the ventilator circuit, ensuring proper connection.
3. Stabilize the endotracheal tube (ETT) with one hand and advance the suction catheter gently into the tube.
4. Once the catheter reaches the end of the ETT, apply suction by pressing the thumb valve and withdraw the catheter carefully.
5. Irrigate the catheter with saline as necessary and repeat the suctioning process.
6. Disconnect and clean the catheter after the procedure.

Post-suctioning care

After completing the suctioning procedure, the following steps should be taken to ensure the patient's safety and comfort:

1. **Reposition the Patient:**
   - Return the patient to a comfortable and safe position, preferably in a semi-Fowler's or Fowler's position, depending on the patient's condition.
2. **Auscultate Lung Sounds:**
   - Carefully auscultate the patient's lung fields to ensure that the airway is clear and no further secretions remain.
   - Check for signs of wheezing, crackles, or other abnormal lung sounds that may indicate retained secretions.
3. **Oxygenation:**
   - Ensure that the patient is receiving adequate oxygenation, either via mechanical ventilation or other oxygen delivery methods.
   - Adjust the oxygen levels to the previous settings or as required by the patient's condition.
4. **Suction Catheter Disposal and Cleaning:**
   - Properly dispose of the suction catheter according to hospital policy.
5. **Oral Hygiene:**
   - If appropriate, perform oral hygiene as per hospital protocol to reduce the risk of infection and maintain patient comfort.
6. **Monitor and Assess the Patient:**
   - Continue to monitor vital signs, including oxygen saturation, heart rate, and blood pressure, to assess the patient's recovery post-suctioning.
   - Reassess the need for further suctioning if the patient's condition changes or secretions are not adequately cleared.

Documentation

Accurate and thorough documentation is critical for patient safety and continuity of care. After performing the suctioning procedure, ensure the following information is documented in the patient's medical record:

- **Patient Positioning:**
  - Record the position of the patient during the procedure (e.g., semi-Fowler's or Fowler's position).
- **Breath Sounds:**
  - Note any findings from auscultating the patient's lungs before and after suctioning (e.g., crackles, wheezing, or clear).
- **Secretions:**
  - Document the amount, color, consistency, and odor of any secretions cleared during the procedure.
  - Include details such as whether the secretion was thick, mucopurulent, or watery.
- **Oxygen Administration:**
  - Record the amount of oxygen provided during the procedure, including any adjustments made to the ventilator or oxygen flow.
- **Ventilator/CPAP Use:**
  - Note whether the patient was on a ventilator or CPAP, and specify if the tube was changed or replaced during the procedure.
- **Post-Suctioning Auscultation:**
  - Document findings after the suctioning, including whether lung sounds were clearer and if any additional suctioning was needed.
- **Patient Response:**
  - Record the patient's overall condition following suctioning, including any changes in heart rate, oxygen saturation, or blood pressure.
- **Complications:**
  - If any complications arose during or after suctioning (e.g., desaturation, arrhythmias, or mucosal injury), they must be carefully noted, along with any interventions provided.

Complications

Endotracheal suctioning, though necessary, can result in various complications if not performed with care. Some potential complications include:

- **Dislodgement of Tubes and Accidental Decannulation:**
  - Suctioning may cause accidental removal or displacement of the endotracheal or tracheostomy tube, which could compromise the airway.
- **Airway Blockage:**
  - Accumulation of secretions or other material can lead to a blockage of the artificial airway, necessitating prompt intervention.
- **Subcutaneous Emphysema:**
  - Air can enter the subcutaneous tissues, leading to swelling, usually in the neck and face.
- **Pneumothorax:**
  - Air may enter the pleural space, causing a collapsed lung, particularly if suctioning is not performed carefully.
- **Infection:**
  - The risk of infection, including ventilator-associated pneumonia (VAP) and respiratory tract infections, increases with improper technique or contamination during suctioning.
- **Hemorrhage:**
  - Trauma to the mucosal lining or blood vessels during suctioning could result in bleeding.

- **Tracheal Stenosis:**
  - Repeated trauma to the tracheal wall can cause narrowing, potentially leading to long-term airway obstruction.
- **Communication Difficulties:**
  - Patients with endotracheal tubes may have difficulty communicating, making assessment of their comfort and needs challenging.
- **Tracheoesophageal Fistula:**
  - Suctioning can, in rare cases, cause the formation of an abnormal connection between the trachea and esophagus, leading to serious complications.
- **Cuff Herniation or Tracheal Necrosis:**
  - Prolonged or inappropriate suctioning can damage the cuff of the endotracheal tube, causing airway leaks or necrosis of the tracheal tissue.

Conclusion

Endotracheal suctioning is an essential procedure in managing patients with mechanical ventilation or those unable to clear their airways independently. However, it carries certain risks that must be minimized through proper technique and careful patient monitoring. Adhering to established protocols for pre-procedure preparation, suctioning techniques, and post-procedure care can significantly reduce the potential for complications. Further research and continuous practice refinement will continue to improve patient safety and outcomes in respiratory care.

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