Endotracheal Suctioning in Newborn Intensive Care Unit (NICU)

Procedure Responsibilities and Authorisation

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Target Audience	Nurses and Medical Staff in NICU
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Procedure Review History

Version	Updated by	Date Updated	Description of Changes
1	Jenni Richards	Sept 2018	Previous version of this procedure was merged with Lippincott Procedures. This is re-developed as a new procedure with NICU specific equipment and practice.
2	Richard Pagdanganan	October 2020	Added the information on in-line suction changing.
3	Vanessa Agustin & Kimmy Fulgencio	September 2022	Update in changing in-line suction

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Contents

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1. Overview

1.1 Purpose

To outline the procedure to ensure suctioning of secretions through the endotracheal tube is performed safely and to maintain airway patency and facilitate ventilation and oxygenation.

1.2 Scope

Te Whatu Ora Waikato staff working in the NICU.

1.3 Patient / client group

Neonates and infants in NICU

1.4 Definitions

ET tube (ETT)	An endotracheal tube (ETT) is a tube that is inserted into the trachea through the nose, mouth, or an opening in the neck. It must be kept clear of secretions, including mucus, blood, and other debris, to permit respiration and ventilation
Endotracheal suctioning	ET suctioning is an invasive procedure that requires the insertion of a suction catheter into the ETT, applying suction, and withdrawing secretions. The procedure facilitates oxygenation and ventilation by maintaining a patent airway. Endotracheal suctioning can be done using an open- or closed-suction system.
In-line (closed-suction) system (CSS)	The in-line suction system is a multiple-use system. The ventilator remains connected to the patient during use of CSS. The CSS system can be used for multiple procedures and changed daily. This is the preferred method of suctioning neonate: CSS allows ventilation to continue during procedure, smaller changes in blood flow, and reduce risk of infection.
Open-suction system	The open-suction system is a single-use system which requires the patient be temporarily disconnected from the ventilator. The catheter is discarded after use

1.5 Frequency of ET suctioning

- Suctioning is not a routine practice; the need to suction should be assessed on an individual basis.
- No routine suctioning for infants born ≤ 1000g and/or ≤ 28 weeks gestation for the first 5 days, if suctioning is clinically indicated, provide comfort measures before, during and after the procedure.

- Ventilated babies with Respiratory Distress Syndrome (RDS) have minimal secretions. In the first 72hrs, the need for suctioning should be minimal.
- Delay ETT suction for 12 hours post administration of Poractant Alfa (Curosurf™), if possible (Poractant alfa (Curosurf) for neonates Ref 0444)

1.6 Indications

Endotracheal suctioning should be performed only when indicated by the following conditions:

- Increase in oxygen requirement
- Increase in CO_2
- Apnoea and/or bradycardia
- Decreased air entry / increased work of breathing
- Audible crepitation
- Visible secretions
- Irritable agitated baby
- Radiological changes: consolidation, collapse
- Decreased minute volumes
- Diminished chest wall vibration with high-frequency ventilation
- Decreased chest movement with mechanical ventilation
- Suctioning may be performed to obtain a secretion specimen for laboratory tests, e.g. to identify organisms in pneumonia

2. Clinical Management

2.1 Competency required

Registered nurse who has completed NICU ventilation orientation

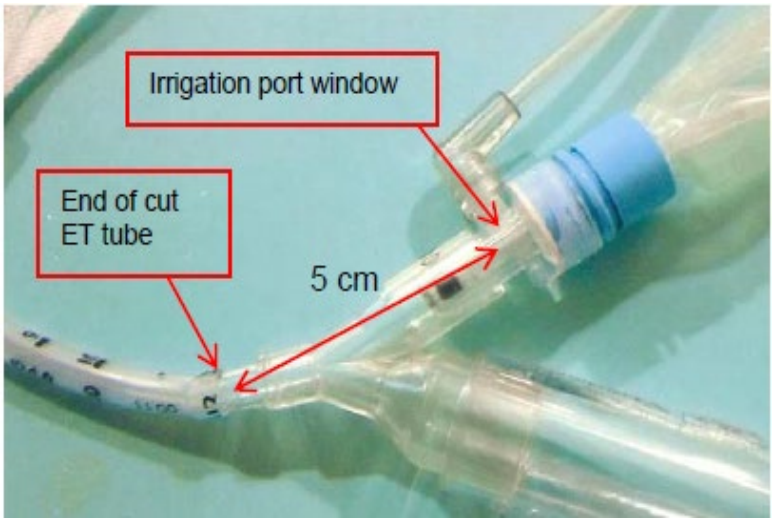
2.2 Equipment

- NICU intubation chart
- Neopuff™ with an appropriate sized mask.
- Some babies may have an additional anaesthetic bag if needed
- Suction catheters – range of sizes – (see below)
- Suction unit
- Oral suctioning device
- Gloves, non-sterile/sterile as required
- Sterile sodium chloride 0.9%
- 1ml syringe
- Stethoscope
- Antiseptic pad
- Containers for specimen, e.g. mucus trap, if required

2.3 Procedure

2.3.1 In-line system (close-suction system)

- Preparation
  - NICU Intubation Chart: correct ETT size, and determine correct depth of suctioning for the specific closed-system suction catheter, e.g. end of cut ETT+5cm.
  - Obtain correct catheter for in-line suction circuit and attached to the end of the ET tube (removing the end piece and attaching the appropriate size adapter, which comes in the package).



ET Tube Size	Suction Catheter Size
2.5	5 Fr or 6 Fr
≥3.0	7 Fr

  - Check wall suction is functioning and tubing is connected at shift commencement.
  - Check suction pressure prior to suction by occluding the suction tubing: set at 80-100 mm Hg.
  - Check Neopuff™ is set at correct parameters according to baby's needs at shift commencement.

- Assessment for open & close-suctioning
  - Perform hand hygiene.
  - Explain procedure to parents to allay their fear and anxiety.
  - Determine the need for suctioning and the neonate's need.
  - Auscultate chest before and after suctioning
  - Turn continuous/compressed feed off temporarily before commencing suction to prevent aspiration.
  - Recommence the feed after suctioning when neonate's condition is normalised.
  - **NOTE:** The procedure should be done by at least two people to minimise complications.

- Performing suctioning
  - Use personal protective equipment, as needed.
  - Position the neonate appropriately for secretion clearance and stress reduction.
  - Assess the neonate's vital signs, respiratory effort, and oxygen saturation level and note his ventilator settings.
  - Ensure that the neonate is adequately oxygenated prior to commencing the procedure; increase supplemental oxygen as needed to prevent massive desaturation.
  - Ensure target oxygen saturations are maintained during endotracheal suctioning.
  - Discuss with medical team re: saline instillation (0.9% sodium chloride) if secretions are thick/tenacious.

Rationale:

Saline instillation is not a routine practice as it increases the risk of cardiac arrhythmia, hypoxemia, atelectasis, bronchospasm, infection, mucosal and respiratory tract cilia trauma, raised intracranial pressure and can adversely affect oxygenation.

- Insert the suction catheter to the predetermined depth of insertion. Stabilise the Y adaptor with one hand and advance the catheter until calculated length (note the number with corresponding coloured band) is visible in the irrigation port window. The catheter tip will be within 0.5 -1 cm at the end of the ETT.
  - Apply suction by pressing the suction control valve steadily then gradually withdraw catheter at a consistent speed , until the black mark on catheter appears in the viewing window
  - To avoid hypoxia, suctioning should not exceed more than 5 seconds.
  - Make sure the suction catheter is completely withdrawn from the neonate's airway because allowing the catheter to remain in the airway increases airway resistance.
  - Repeat suction if only necessary.
  - Allow the neonate to recover until SpO_2 has returned to baseline. If the neonate did not recover and occlusion of ET tube is suspected, suction the neonate immediately.
  - Assess the characteristics of the secretions. Document if there is change in colour, consistency, or amount of secretions and report to medical staff.
  - Gently suction the oropharynx using an appropriate sized suction catheter. Consider using a Yankauer suction tip if there are large amounts of thick/tenacious oral secretions.
  - On completion, clean the suction catheter and tubing by depressing suction before slowly instilling 1-2ml of sodium chloride 0.9%. Aspirate remaining saline solution in irrigation port to decrease risk of microbial growth. Remove syringe and close lavage port.
  - Turn the suction control valve to 'Off' position.

2.3.2 Change in-line catheters and ventilator

- Change the in-line suction catheter every 24 hours or more often if becomes heavily soiled. Put the provided sticker to indicate the next change.

- Change ventilator circuit tubing every two weeks to avoid frequent disruptions in the closed circuit, which increase the risk of ventilator-associated pneumonia. Change more often as required.

If infant is unstable on HFOV or Nitric Oxide Therapy, consider delaying or withholding suction catheter changes and discuss with medical team.

2.3.3 Open-suction system

- Indication
  - Open suctioning of ET tube is initiated when the closed suction system does not effectively clear the airway due to copious amount of tenacious secretions or if closed suction is not available.
- Preparation
  - Gather sterile suction catheters of appropriate size and gloves
  - Choose the correct size suction catheter (the smaller the better). The suction catheter should occlude less than 50% of the inner lumen of the ET tube.

ETT Size (mm)	Suction Catheter Size
2.5	5-6 Fr
≥3.0	5-8 Fr

  - This is a two person procedure at all times: one person performs suction while the second assists and supports the baby during the procedure.
  - Ensure the Neopuff™ is functioning properly so it is ready to use if the baby becomes apnoeic or bradycardic during the procedure.
  - Refer to the baby's NICU Intubation Chart and measure length required (just beyond tip of ET tube) to avoid the carina during insertion of the suction catheter and prevent mucosal damage.
  - Length of suction = measurement from ET tube to the outside edge of the adaptor (blue/clear end piece) plus 1cm.
- Performing open-system suctioning
  - Perform hand hygiene
  - Put on gloves as required.
  - Ensure suction unit is set appropriately at 80-100mmHg.
  - Position the baby appropriately for secretion clearance and stress reduction.
  - Assess the baby's vital signs, respiratory effort, and oxygen saturation level and note the ventilator settings.
  - Ensure that the neonate is adequately oxygenated prior to commencing the procedure; increase supplemental oxygen as needed to prevent massive desaturation.
  - Ensure target oxygen saturations are maintained during endotracheal suctioning.
  - Assistant will open the packet containing the suction catheter.
  - Attach the catheter to the suction tubing using your dominant hand. Avoid touching the catheter to maintain its sterility. Assistant to disconnect the ET tube from the ventilator.

- Stabilise the connector of the ET tube while gently insert the suction catheter into the ET tube to predetermined depth.
- Apply suction for no longer than 5 seconds.
- Assistant will continue stabilizing the connector of the ET tube during the withdrawal of suction catheter to prevent accidental extubation.
- Only one suction attempt should be made before reconnecting the ET tube to the ventilator and start the ventilation again. Repeat the procedure only if necessary.
- Allow the baby to recover until SpO2 has returned to normal baseline. If the baby is not recovering and an occluded ET tube is suspected, suction the baby immediately.
- On completion, clean the suction tubing with saline/sterile water. Discard the suction catheters.
- Assess the ET tube position and condition to make sure that the tube has not been displaced or kinked during the procedure.
- Ensure the ventilation is back to pre-suction settings.

2.3.4 Obtain specimen

- If a respiratory specimen is needed, attach to the open port of a specimen catcher, e.g. mucus trap, to the suction catheter.
- Follow the previously described procedures for suctioning (closed or open suction system as appropriate).
- Collect secretions in the specimen container and label the specimen.

2.3.5 After Care

- Remove and discard gloves and personal protective equipment according to Te Whatu Ora Waikato procedure.
- Perform hand hygiene.
- Assess the baby's vital signs, respiratory status and activity level to evaluate the effectiveness of the procedure and the baby's response.
- Wait for a minimum of 20 minutes before performing blood gas analysis, only if blood gas is required.
- Use facilitated tucking, or another containment intervention, to comfort the baby and improve oxygenation after suctioning.
- Reposition the baby regularly from side to side, supine and prone.
- After the procedure, provide an adequate rest period for the baby before providing other aspects of care, e.g. feeding, because ET tube suctioning compromises the baby's physiologic homeostasis.
- Recommence continuous/compressed feeding after suctioning when baby's condition is normalised
- Clean and disinfect the stethoscope using an antiseptic pad.
- Perform hand hygiene again.
- Document the procedure and baby's response.

2.4 Potential Complications

- Hypoxia.
- Bradycardias/arrhythmias
- Increased cerebral blood flow and intracranial pressure
- Mucosal trauma and injury
- Destruction of mucociliary transport
- Pneumothorax/perforation
- Infection
- Atelectasis
- Decrease in lung compliance

3. Audit

3.1 Indicators

- There is documented evidence of the procedure within the clinical notes including the baby's response.
- All adverse incidents in association with ETT suctioning are fully investigated and actions taken to prevent a reoccurrence.

4. Evidence Base

4.1 References

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4.2 Associated Te Whatu Ora Waikato documents

- Care of Ventilated Infant in Newborn Intensive Care Unit (Ref. 0432)
- High frequency ventilation: Nursing care of infant (Ref. 0396)
- Nitric Oxide-Inhaled (iNO) - Nursing Management in Newborn Intensive Care Unit (NICU) (Ref. 4938)
- High Frequency Ventilation of Neonates (Ref. 2625)
- Nitric Oxide Usage in NICU (Ref. 1553)