HEALTH HOLDING

HAFER ALBATIN HEALTH CLUSTER
MATERNITY AND CHILDREN HOSPITAL

Department:	Neonatal Intensive Care Unit (NICU)		
Document:	Multidisciplinary Policy and Procedure		
Title:	Endotracheal Intubation of Neonates		
Applies To:	All NICU Staff, Respiratory Therapists and X-ray Technicians		
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1. PURPOSE:

1.1 Provide prolonged positive pressure ventilation when required.
1.2 To provide acute resuscitation of the newborn.
1.3 To relieve critical upper airway obstruction e.g. cystic hygroma.
1.4 To provide a route for surfactant/resuscitative medications.
1.5 To provide tracheal suctioning.
1.6 To assist in bronchial hygiene when secretions cannot otherwise be cleared.
1.7 Apnoea; central or obstructive.
1.8 Airway protection in cases of neuromuscular disorders or other neurologic injury.
1.9 When diaphragmatic hernia is suspected.
1.10 Elective for procedures or operative procedures.

2. DEFINITIONS:

2.1 **Endotracheal Intubation** is insertion of tube in the trachea to support and keep the airway patent.

3. POLICY:

3.1 Aseptic technique must be maintained throughout the procedure to minimize the risk of infection.
3.2 The assigned physician is assisted by assigned neonatal nurse.
3.3 To minimize hypoxia, each intubation attempt is limited to a maximum of 20 seconds or less if bradycardia or desaturation occurs. Interrupt an unsuccessful attempt to stabilize the infant with bag and mask ventilation.
3.4 Monitor heart rate, respiratory rate, oxygen saturations and patient status continuously throughout procedure.
3.5 Assistance should be requested from a senior physician if three attempts are unsuccessful.
3.6 Intubation premedication for pain is given to all neonates before non-emergency intubation. Fentanyl, ± short acting muscle relaxants are administered in addition to non-pharmacologic pain management
3.7 Use appropriate size tubes "Table 1"(appendices 7.1). The tube should not fit tightly between the vocal cords to minimize trauma and ensure proper depth of insertion "Table 2"(appendices 7.1).
3.8 Use proper size laryngoscope blades:
  3.8.1 Size 00 Miller for extreme preterm infants
  3.8.2 Size 0 Miller for infants < 3kg
  3.8.3 Size 1 Miller for infants > 3kg
3.9 Ensure proper depth of the tube in the trachea:
  3.9.1 Adding 6 to the babies' weight in kilograms and adding 5.5 cm to the weight of neonates < 750 gram is a rough estimate of the distance from the tube tip to the angle of the mouth. Gestational age is also an accurate predictor of the correct insertion depth (table 2), or measure the distance (cm) from the baby's nasal septum to the ear tragus.(appendices 7.2))
  3.9.2 During intubation, insert the ETT until the vocal cord guide is at the level of the cords. This will place the tube in the trachea approximately half way between the vocal cords and the carina.

3.9.3 Babies with certain syndromes e.g. DiGeorge syndrome, skeletal dysplasia may have short trachea.

3.9.4 Tip to lip distance is only an estimate of correct tube position. Tube position must be ascertained clinically and by auscultating the breath sounds in both axillae.

3.9.5 Confirm tube position by chest X-Ray. The tip should be located midway between vocal cords and carina. On X-Ray it will be visible at the level of the clavicle or slightly below (halfway between inferior portion of clavicle and carina around thoracic vertebra 2-3).

3.9.6 If the tube is too far, it generally will be down the right main bronchus, ventilating only the right lung and increasing the possibility of left side pneumothorax.

3.10 Precautions will be taken to prevent unplanned extubation:

3.10.1 Maintain correct lip to tip distance by regularly checking it every 4 hours.

3.10.2 Secure ETT tape and replace as necessary.

3.10.3 Support neck when moving or repositioning infant.

3.10.4 Avoid neck extension or traction on endotracheal tube.

3.10.5 Observe infant activity and secure his/her hands.

3.10.6 Increased secretions especially oral secretions can lead to loosening of tape and need more frequent suctioning.

4. PROCEDURE:

4.1 Needs written physician's order.

4.2 Identify patient and explain procedure to family if present. All patients must be clearly identified. Explaining the procedure to the family will help to gain trust and decrease anxiety.

4.3 Provide pharmacological and non-pharmacological interventions for pain for no-emergency intubation. Verify patent IV access for pre-medication and emergency drugs. Use appropriate pain assessment tool as necessary. Premedication with analgesic or a muscle relaxant leads to shorter time for intubation with fewer negative systemic effects.

4.4 Maintain neutral thermal environment by using warmer or warm blankets in incubator, etc. To ensure temperature stability during procedure.

4.5 Ensure the infant is attached to a cardio-respiratory an oxygen saturation monitor. To monitor heart rate, respiratory rate, oxygen saturations and patient status continuously throughout procedure.

4.6 Assemble all necessary intubation equipment. Select appropriate size endotracheal tube.

4.6.1 Attach laryngoscope blade to handle and check that light bulb is tightly attached and functional.

4.6.2 Suction is set up with suction level between 60-80 mmHg, with maximum suction used of 100 mmHg.

4.6.3 Resuscitation bag is connected to oxygen source.

4.6.4 Appropriate size mask for ventilating.

4.6.5 Appropriate size Stylet is optional for endotracheal intubation.

4.6.6 Appropriately size magill forceps if Nasotracheal intubation is indicated to advance ETT from the back of the throat.

4.7 Assistant nurse should prepare adhesive tapes for fixation of the tube. Restraint infant if necessary.

4.8 Don sterile gown, surgical mask and sterile gloves.

4.9 Insert oro/nasogastric tube and empty stomach contents. Keep it open and place it to drainage.

4.10 Clear oropharynx/nasopharynx with gentle suctioning.

4.11 Correctly position the infant for intubation with head in a midline position and neck slightly extended ("sniffing position").

4.12 Pre-oxygenate or ventilate with resuscitation bag as required.

4.13 Hold the laryngoscope in the left hand (for both right and left handed persons) between thumb and first 2 or 3 fingers with the blade pointing away from you.

4.14 Stabilize the head with your right hand in the sniffing position. Open the baby's mouth and slide the laryngoscope blade over the right side of the tongue and toward the midline pushing the tongue to the left side of the mouth, then advance the blade until the tip lies in the valecula, (the pouch formed by the base of the tongue and the epiglottis).

4.15 To further open the mouth, lift the entire laryngoscope blade by pulling up in the direction the handle is pointing. Simultaneously tilt the blade tip slightly to elevate the epiglottis and visualize the glottis.
Alert: Do not use a rocking motion If the tip of the blade is correctly positioned in the valecula, you should see the epiglottis at top and the glottis opening below. If not seen, advance or withdraw the blade slowly to see the glottis with the vocal cords on each side.

4.16 Suction oropharynx as necessary.

4.17 If needed, have assistant apply gentle downward pressure on the cricoid (the cartilage that covers the larynx). This may help bring the glottis into view.

4.18 Hold the ETT with the curve of the tube lying horizontal, so that the tube curves from left to right to prevent the tube from blocking your view of the glottis) and introduce it in the right side of the baby's mouth.
*When the tip of the ETT is in direct line with the glottis until the vocal cord are apart, insert the tip of the ETT until the vocal cord guide is at the level of the cords. This will place the tube in the trachea approximately half way between the vocal cords and the carina. If a Stylet was used (optional), remove it now.
Alert -Do not touch the closed cords with the tip of the tube because it may cause spasm of the cords. If the cords are not open within 30 seconds, stop and ventilate with a mask. After the heart rate and color improve, you can try again.

4.19 Stabilize the tube with your right hand against the hard palate and carefully remove the laryngoscope. Connect to ventilation bag or T-piece resuscitator. Attach a CO_2 detector to the tube and observe for color change, confirm correct position of the ETT by auscultation during positive pressure ventilation.

4.20 Use tape to secure the ETT or securing device. Note the centimetre markings at corner of the mouth before and after securing ETT. Document the ETT marking at the lip after taping the tube.

4.21 Connect ETT to appropriate ventilator settings and assess patient's respiratory status.
Cut off excess ETT length to leave around 3- 4 cm from the infant's lip to lessen dead space.

4.22 Obtain chest x-ray with head in neutral position to confirm appropriate ETT placement and reposition ETT as necessary.

- 4.22.1 Physician documents on the progress notes the indications of intubation, date, time, tolerance of the baby, site of tube on X-Ray and any complication.
- 4.22.2 The assisting nurse documents on the nurses progress notes:
  - 4.22.2.1 Date and time.
  - 4.22.2.2 Vital signs and oxygen saturation before, during and after the procedure
  - 4.22.2.3 Use of any medications
  - 4.22.2.4 Adverse effects if any
  - 4.22.2.5 Size of ETT and centimetre mark of ETT at corner of mouth
  - 4.22.2.6 Secretions- amount and characteristics.
  - 4.22.2.7 Patient response and toleration to procedure.

5. MATERIAL AND EQUIPMENT:

5.1 Resuscitation bag and appropriate size mask
5.2 Oxygen source and tubing
5.3 Suction equipment and catheters
5.4 Stethoscope
5.5 NICU medication trolley
5.6 IV access (if possible)
5.7 Laryngoscope with appropriately sized laryngoscope blades
5.8 Appropriately sized endotracheal tubes. (ETT)
5.9 Sterile gloves, none sterile gown and surgical mask.
5.10 Cardio-respiratory monitor, pulse oximeter.
5.11 Meconium aspirator (if necessary)
5.12 Tape or securing device (if available).
5.13 Stylet (optional).
5.14 CO_2 detector

5.15 Magill forceps (if nasal intubation is indicated).

6. RESPONSIBILITIES:

6.1 Physician
6.2 Nurse
6.3 Respiratory Therapist
6.4 X-ray Technician

7. APPENDICES:

7.1 Endotracheal tube sizes and depth of insertion
7.2 Measurement to determine depth of endotracheal tube insertion

8. REFERENCES:

8.1 Neonatal resuscitation textbook seventh edition. 2017.
8.2 Saudi Neonatology Society
8.3 Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI). Third edition 2015
8.4 Joint Commission of International Accreditation (JCI) standards for hospitals. Sixth edition.20l7.

9. APPROVALS:

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Appendices 7.1 Endotracheal tube sizes and depth of insertion

CRITERIA AND METHODS OF ENDOTRACHEAL INTUBATION OF NEONATES

Table 1: Endotracheal tube size for babies of various weights and gestational ages

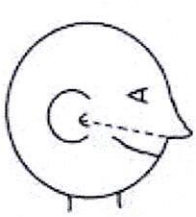
Birth Weight (Gm)	Gestational Age in weeks	Endotracheal Tube size (mm ID)
Below 1000	Below 28	2.5
1000-2000	28 – 34	3.0
Greater than 2000	Greater than 34	3.5

Table 2: Initial endotracheal tube insertion depth ("tip to lip") for orotracheal intubation

Gestation (Weeks)	Endotracheal Tube Insertion Depth at Lips (cm)	Body`s Weight (Gm)
23-24	5.5	500 - 600
25-26	6.0	700 - 800
27-29	6.5	900 - 1000
30-32	7.0	1,100 - 1,400
33-34	7.5	1,500 - 1,800
35-37	8.0	1,900 - 2,400
38-40	8.5	2,500 - 3,100
41-43	9.0	3,200 - 4,200

Appendices 7.2: Measurement of Nasal Tragus length NTL to determine depth of Endotracheal tube insertion

- Use a measuring tape and measure from the middle of the baby's nasal septum to the ear tragus (arrow) and add 1cm to the measurement.
- Place the endotracheal tube so that the marking on the tube corresponding to the estimated insertion depth is adjacent to the baby's lip.
- The NTL is a method that has been validated in both fullterm and preterm newborns



NTL - base of nasal septum to tip of tragus
Position at lips = NTL + 1cm