Intubation

Introduction
Intubation in RPA Newborn Care is performed by staff specialists, fellows, experienced registrars or RNs in an extended role. Junior medical staff (registrars and residents) may attempt intubations under the supervision of staff specialists or fellows.

Neonates may be orally or nasally intubated. Neither route has been found more superior in terms of reducing tube malposition, accidental extubation, endotracheal obstruction, re-intubation, infection or local trauma (Spence & Barr 2000).

In our experience, a nasal endotracheal tube is more secure than oral placement and is therefore the preferred method for intubation. However, in an emergency or when nasal intubation has been unsuccessful the oral route can be used (Spence & Barr 1999).

Indications for intubation and mechanical ventilation
- Prolonged and frequent apnoea not resolved with nCPAP or Caffeine (Nabi 2005)
- Inadequate PaO2 and/or PaCO2 levels (Nabi 2005)
- Administration of surfactant (Nabi 2005)
- Chest X ray consistent with respiratory distress syndrome, despite adequate nCPAP with FiO2 >0.35 in the first 24 hours, or an FiO2 >0.4 to 0.6 after first 24 hours (RPA Newborn Care 2003)
- Infants that are <30 weeks gestation with a CXR consistent with RDS and increasing O2 requirement (RPA Newborn Care 2003)
- Functional or anatomic airway obstruction (Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care 2000)
- Infants needing sedation for a medical procedure for example laser therapy for retinopathy of prematurity (Nabi 2005)
- Infants with neurological sequelae who are unable to breath adequately (Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care 2000)

Goals of mechanical ventilation (Donn & Sinha 2003)
- Achieve sufficient pulmonary gas exchange.
- Reduce risk of lung injury.
- Minimise work of breathing.

Equipment
1. Anaesthetic bag with manometer & an appropriately sized mask. This should be connected to the O2 / air blender.
2. Suction catheters 8/10Fg
3. Laryngoscope with appropriately sized blade
4. Endotracheal tube (see Resuscitation Policy for tube size and lengths)
5. Magills forceps
6. Pedi-Cap® CO2 detector (Nellcor)
7. Lubrication jelly
8. Scissors
9. Comfeel® (Coloplast)
10. Skin Preparation- Cavilon® (3M)
11. Leukoplast® tape (BSN Medical)
12. Stethoscope
13. Ventilator
(Use of an intubation stylet for oral intubation is not routine but should be available on resuscitation trolley)

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Preparation

- Two RNs assist with the procedure.
- Prepare pre-intubation medications as per protocol - see Policy - Intubation/Sedation drugs
- Check that the intubation equipment is ready for use & the resuscitation trolley is available
- Confirm the ventilator settings are appropriate to support the infant (standard settings: IPPV 20/5; IT 0.3sec; I:E ratio 1:2; backup rate 60/min; check FiO₂ concentration; sensitivity =1) - discuss with registrar
- Clinical nurse specialist to check circuit & humidity settings
- Ready the anaesthetic bag with appropriately-sized mask
- Turn the flow up to 8L/min and adjust the O₂ / air blender to deliver the desired gas concentration
- Attach a size 8Fg or 10Fg suction catheter & set the suction at -100mmHg
- Cut Comfeel® & Leukoplast® strips
- Cut the Leukoplast® tape into two strips - trouser legs & fold the ends back over to the adhesive side

- Ensure appropriate monitoring (cardio respiratory & SpO₂%) is in situ
- When using transcutaneous monitoring, ensure that the readings have stabilised and the probe is secured
Procedure

- Position the infant for intubation
- Ensure the infant is protected from excessive heat loss
- Aspirate stomach contents to prevent vomiting or aspiration during procedure
- Two RNs to check and administer intubation medications as per protocol
- Assist in suctioning and bagging as appropriate
- Apply Cricoid pressure as required
- Monitor the infant’s cardio respiratory & oxygenation status during procedure
- Suspend procedure if there is fall in heart rate and / or SpO₂% to unsatisfactory levels
- Administer O₂ via bag & mask until the infant recovers
- Permit adequate recovery between attempts at elective intubation
- Pre-oxygenate prior to further attempts when appropriate
- Registrars routinely to have no more than two attempts at intubation – consider a more experienced MO take over the intubation procedure
- Administer additional intubation medications if necessary.

Following intubation

- Confirm correct endotracheal tube placement
- Consider use of a CO₂ detector to confirm correct placement of endotracheal tube (Attach the CO₂ detector to the end of the endotracheal tube & connect to the ventilator. This will provide prompt confirmation of tracheal placement (International Liaison Committee on Resuscitation. 2005)
- Attach the ventilator to the endotracheal tube and observe the chest for adequate and symmetric movement. Auscultate breath sounds (International Liaison Committee on Resuscitation. 2005)
- Note tidal volume (target 4mls/kg)
- Once position is confirmed, note measurement of the endotracheal tube at the lips or nares and ensure position is maintained during taping
- There is no data available about the most effective method of securing endotracheal tubes in neonates. The current practice is to maintain skin integrity with Comfeel®, and secure the endotracheal tube using two strips of Leukoplast® tape cut in trouser legs – see diagrams below.
1. **Taping of nasal endotracheal tubes**

- Apply Cavilon® skin prep (use in babies over 27 weeks only) on the infant’s cheeks. Once dry, tape the Comfeel® strips on the cheeks.

- Starting from the intubated nostril, tape the *trouser legs* to the infant’s cheek, over the Comfeel®. Secure the *lower trouser leg* under the nose. Secure the endotracheal tube by winding the *upper trouser leg* up and around the tube.

- Tape the second set of *trouser legs* on the infant’s opposite cheek and secure the *upper trouser leg* over the top of the nose. Secure the endotracheal tube by winding the *lower trouser leg* up and around the tube.
• For larger and/or more active babies a third set of trouser legs is used to secure the endotracheal tube to the bridge of the nose and glabella.

• The third 3rd set of trouser legs can be taped to the bridge of nose. The endotracheal tube is then secured by winding both trouser legs down the endotracheal tube.

2. Taping of oral endotracheal tubes

• Apply Cavilon® skin prep (use in babies over 27 weeks only) on the infant’s lower cheeks. Once dry, tape the Comfeel® strips on the cheeks.

• Starting from the cheek proximal to the endotracheal tube, tape the trouser legs on the infant’s cheek, over the Comfeel®. Secure the lower trouser leg across the chin. Secure the endotracheal tube by winding the upper trouser leg up and around the tube.
• Tape the second set of trouser legs on the infant’s opposite cheek and secure the upper trouser leg above the lips. Secure the endotracheal tube by winding the lower trouser leg up and around the tube.

Nursing care post-procedure

- **Respiratory assessment:**
  - Observe adequacy and symmetry of chest expansion, auscultate breath sounds and count the infant’s respirations. Note and document if there is a significant tube leak.
  - Examine the flow / volume trends and pressure / volume graphs on the BabyView® (Dräger) or Stephanie® (InVitro) for gas movement and compliance, note tidal volume (target 4mls/kg) & minute volume (target 200-300mls/kg)

- **General assessment:**
  - Assess the infant’s colour, perfusion, tone, activity, pain/comfort and general appearance. Take the infant’s vital signs.
  - Ensure the infant’s head is in a neutral position and the endotracheal tube is in alignment with the nose.
  - If needed, two RNs may cut the endotracheal tube to an appropriate length. The tube length should be kept short to prevent mechanical dead space, but long enough to allow the ventilator tubing to be positioned adequately without applying pressure on the lips or nares. *The tube should be cut on the diagonal to facilitate re insertion of the blue connector.* In case complications arise, a senior medical officer must be informed of the procedure and remain in the unit until the procedure is completed. Measure the length of the endotracheal tube from the lips or nares to the suction port and document.
  - Ensure ventilation parameters are appropriate. Confirm desired ventilator settings with orders.
  - Ensure alarm limits on the ventilator, cardio respiratory, SaO₂% and transcutaneous monitors are set correctly.
  - Obtain an ABG (or capillary gas) 30 minutes after intubation, or when appropriate to determine if ventilation is sufficient.
  - Assist in positioning the infant (supine with head in neutral position) for the X-ray - *see X-ray Protocol.* This is to verify proper endotracheal placement. The tip of the endotracheal tube should be between T2-T3.

- **Communication**
  - Ensure that the parents are updated about the procedure.
**Documentation of procedure**

Documentation of the intubation procedure is done by the medical officer who performed or attempted the intubation. This should include the date and time, the size of the endotracheal tube and measurement at the cords, lips or nares. This information should be boxed in the infant’s progress notes for quick reference.

The following information also needs to be documented by the RN:

- Medications administered to the infant during intubation (medication charts & progress notes)
- Time and route of intubation, size of endotracheal tube, measurement of endotracheal tube at the lips or nares and stability of tube.
- Initial ventilator settings post intubation and assessment of infant after intubation.
- Any changes to ventilator settings, or to infant’s condition to time of report.
- Results of ABGs (or capillary blood gases) onto the flow chart and in progress notes. If ventilation changes are ordered, document the medical officer requesting the change, the change made, and the time in the infant’s progress notes. If no changes are ordered, this must also be documented.
- Whether the parents have been notified of the procedure and updated on their infant’s condition.
- Update Respiratory support, Medications and other relevant sections in the infant’s Powerchart.

**Possible complications**

- Airway trauma (laceration or bleeding of the vocal cords, perforation of the airway) (Page et al 1998, Divatia & Bhowmick 2005)
- Loss of skin integrity. This can result from excessive oral/nasal secretions, pulling of tape with movement, or pressure from a poorly positioned and/ or taped endotracheal tube (Page et al 1998)
- Incorrect endotracheal tube with excessive leak (too small) / trauma (too big) (Divatia & Bhowmick 2005)
- Nosocomial infection including ventilation acquired pneumonia & atelectasis—see policy suction of endotracheal tube
- Endotracheal tube obstruction with tenacious secretions – observe for increased respiratory effort / obstructive pattern in volume graphs
- Accidental extubation
References


Tracy, M, Downe, L, Holberton, J. How safe is intermittent positive pressure ventilation in preterm babies ventilated from delivery to newborn intensive care unit. Archives of Diseases in Childhood. Fetal Neonatal Ed 2004 89: 84-87