## SLHD: Royal Prince Alfred Hospital Guideline

**Women and Babies: Care of an infant requiring endotracheal intubation**

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<thead>
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<th><strong>TRIM Document No</strong></th>
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<tr>
<td><strong>Policy Reference</strong></td>
<td>RPAH_GL2016_040</td>
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<td>N/A</td>
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<td>Endotracheal intubation, Neonate</td>
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<td><strong>Applies to</strong></td>
<td>All nursing, midwifery, and medical staff in RPA Newborn Care</td>
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<td>Women’s Health, Neonatology</td>
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<tr>
<td><strong>Author</strong></td>
<td>Maria Daco, Clinical Nurse Specialist</td>
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<td>August 2021</td>
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<tr>
<td><strong>Replaces</strong></td>
<td>Intubation Procedure, September 2007 (Author M Daco)</td>
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**Version History V1**

| **Date** | 08/08/2016 |

Compliance with this Guideline is Recommended
Women and Babies: Care of an infant requiring endotracheal intubation

1. Introduction

In 2014, of the 843 babies admitted to RPA Newborn care, 104 babies required endotracheal intubation. Endotracheal intubation is performed by staff specialists, fellows, registrars and (transitional) nurse practitioners. Junior medical staff (registrars and residents, transitional nurse practitioners) may attempt intubations under the supervision of staff specialists, fellows, senior registrars and nurse practitioners.

The principal goals of endotracheal intubation are to:

- Treat airway obstruction
- Administer exogenous surfactant
- Treat respiratory failure

Infants may be orally or nasally intubated. Neither route has been found to be superior in terms of reducing tube malposition, accidental extubation, endotracheal obstruction, reintubation, infection or local trauma.

2. The Aims / Expected Outcome of this Guideline

- Provide brief background information for clinicians who may have limited prior content knowledge
- That appropriate, safe care and consistent practice is provided before, during and immediately after intubation procedure.
- This is an evidence based guideline. The aim is to ensure best and consistent practice within RPA Newborn Care

3. Risk Statement

SLHD Enterprise Risk Management System (ERMS) Risk # 484 - Governance for Safety and Quality in Health Service Organisations:

- Prevention of complications during and immediately post intubation procedure.

4. Guideline Statement

- To guide the clinician in successful endotracheal intubation in a safe and timely manner.

5. Scope

- This Policy applies to all services providing neonatal intubation at RPA

6. Resources

Allocated off-ward inservice sessions, clinical ward teaching by Newborn Care CNEs, NNPs, Perinatal Nursing CNC, CNSs and medical staff.

7. Implementation

- Staff education, support and supervision.

8. Key Performance Indicators and Service Measures

- Safe administration of intubation medications
- Correct ETT size selection and placement
- IIMS
9. Procedures

9.1 Indications

- To give prophylactic surfactant in the delivery room to preterm infants born <27 weeks gestation.3 (See guidelines for Surfactant - Preterm and Surfactant – Term)
- Failure to provide adequate ventilation with the Neopuff™ despite adequate attempts at obtaining an airway.3
- Preterm infants (≥27 weeks) with respiratory distress, with a chest x-ray consistent with respiratory distress syndrome, and despite adequate nCPAP require FiO2 ≥0.35 in the first 24 hours, or a FiO2 ≥0.4 to 0.6 after first 24 hours.5
- Infants in respiratory failure despite nCPAP or intermittent positive ventilation (nIPPV).
- Prolonged and frequent apnoeas not resolved with Caffeine or nCPAP.5
- Tracheal suctioning for meconium of infants born through thick meconium who are non-vigorous (no respiratory effort).4 (See guideline for Meconium Stained Amniotic Fluid and Meconium Aspiration Syndrome).
- Congenital abnormalities or anatomic airway obstruction.4
- Infants needing deep sedation for a medical procedure (eg. laser therapy for retinopathy of prematurity).

9.2 Description of Procedure

*The use of standard precautions throughout procedure is mandatory*

9.3 Equipment

- Neopuff™ with appropriate sized mask. This should be connected to the O₂ / air blender.
- Suction catheters 6Fg, 8Fg or 10Fg
- Laryngoscope with appropriately sized blade
- Neonatal endotracheal tubes (See guidelines for Resuscitation Policy for tube size and lengths)
- Magill neonatal forceps
- Pedi-Cap® CO₂ detector (Nellcor™)
- Lubrication jelly
- Supplies for securing endotracheal tube:
  - Scissors
  - Comfeel® (Coloplast)
  - Skin Preparation- Cavilon® (3M)
  - Leukoplast® tape (BSN Medical)
- Neonatal stethoscope
- Dräger VN500 Ventilation Unit
- Use of an intubation stylet for oral intubation is not routine but should be available on resuscitation trolley.

9.4 Preparation

- Two registered nurses to assist with the procedure.
- Ensure intravenous cannula in situ and patent.
- Premedication should be given prior to intubation where feasible.6
- Prepare pre-intubation medications as per protocol (See guideline on Pre-medication for intubation and drugs for sedation/analgesia during).
- Check that the intubation equipment is ready for use on the resuscitation trolley.
- Confirm that the ventilator settings are appropriate to support the infant - discuss with senior clinician.
Recommended initial settings:

- PC-AC +VG (4mL/kg)
- PIP 20 cm H2O; PEEP 5 cm H2O
- Backup rate 40
- FiO2 - 21% or current inspired oxygen
- Inspiratory time 0.3 seconds
- Slope 0.1

- Have Neopuff™ ready with appropriate sized mask.
- Dial Neopuff™ flow up to 8L/min and adjust the O2/air blender to deliver the desired gas concentration.
- Attach appropriate sized suction catheter and set the suction at -100mmHg.
- Cut Comfeel® strips approximately the length of infants cheek. Cut Leukoplast® strips a little shorter than the ear to ear length of the infant.
- Cut the Leukoplast® tape into two ‘trouser leg’ strips (Figure 1). Fold the ends back over the adhesive side to facilitate easy removal.

![Figure 1](image)

- Ensure appropriate monitoring (cardiorespiratory and SpO2%) are in situ.

9.5 Method

- Position the infant on his or her back. Turn the infant so his or her head is perpendicular and close to the clinician performing the procedure.
- Ensure the infant is protected from excessive heat loss.
- Aspirate intragastric tube to prevent vomiting or aspiration during procedure. Remove if requested by proceduralist.
- Two registered nurses to check and administer intubation medications as per RPAH Policy Directive on Ward Accountable Drug Management and Safe Administration in Clinical Areas and unit protocol (See guideline on Pre-medication for intubation and drugs for sedation/analgésia during ventilation).
- Suction and Neopuff™ as appropriate.
- Apply cricoid pressure (Figure 2) as requested. This may assist the intubating clinician visualise the glottis and intubate successfully.
Table 1: Recommended ETT length to the nearest 0.5 cm by corrected gestation (gestation at birth plus postnatal age) and weight at time of orotracheal intubation and nasotracheal intubation.$^{7,8,9}$

<table>
<thead>
<tr>
<th>Corrected gestation (weeks)</th>
<th>Actual weight (kg)</th>
<th>ETT size</th>
<th>Oral ETT mark at lip (cm)</th>
<th>Nasal ETT mark at nares (cm)</th>
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</thead>
<tbody>
<tr>
<td>23–24</td>
<td>0.5–0.6</td>
<td>2.5</td>
<td>5.5</td>
<td>6.5</td>
</tr>
<tr>
<td>25–26</td>
<td>0.7–0.8</td>
<td></td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>27–29</td>
<td>0.9–1.0</td>
<td>6.5</td>
<td>7.5</td>
<td></td>
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<tr>
<td>30–32</td>
<td>1.1–1.4</td>
<td>7</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>33–34</td>
<td>1.5–1.8</td>
<td>2.5 - 3.0</td>
<td>7.5</td>
<td>8.5</td>
</tr>
<tr>
<td>35–37</td>
<td>1.9–2.4</td>
<td>2.5</td>
<td>8</td>
<td>9</td>
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<tr>
<td>38–40</td>
<td>2.5–3.1</td>
<td>3.5</td>
<td>8.5</td>
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<tr>
<td>41–43</td>
<td>3.2–4.2</td>
<td></td>
<td>9</td>
<td>11</td>
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</table>

- Monitor the infant’s cardiorespiratory and oxygenation status during procedure. Consider suspending the procedure if there is fall in heart rate and/or SpO₂% to unsatisfactory levels.
- Administer O₂ via Neopuff™ until the infant recovers.
- Pre-oxygenate prior to further attempts and permit adequate recovery.$^{7}$
- The clinician must insert the endotracheal tube the appropriate distance below the cords. Secure the orotracheal tube against the palate with a finger, or a nasotracheal tube at the nares, and then check the distance at the lips or the nares (see table 1). **Do not go until secure with taping.**
- Junior clinicians have a maximum of two attempts at intubation- then a more experienced clinician should perform the procedure.
- Administer additional intubation medications if necessary.
- Intubation for laser treatment MUST be performed by a fellow or consultant.
9.6 Verify correct endotracheal tube placement

- Confirm correct endotracheal tube placement with a Pedi-Cap® and auscultate equal air entry in axilla and auscultate over the stomach. The gold standard for correct endotracheal placement is by x-ray, which will be done once ETT is secure and lines have been inserted.
- After six positive pressure inflations using the Neopuff™ assess the Pedi-Cap® window for colour change. Successful endotracheal intubation is confirmed if the window changes from purple (during inspiration) to gold/yellow (during expiration).

(N.B. Extremely low birthweight infants may not have sufficient flow to generate CO₂ response even when ETT is correctly placed.)

- Once correct endotracheal intubation is confirmed, attach the ventilator to the endotracheal tube and observe the chest for adequate and symmetric movement.
- Examine the flow/volume loops or the waveform on the Dräger monitor to determine that the ETT is through the vocal cords and in the trachea.
- Note tidal volume (target 4mL/kg).
- Note measurement of the endotracheal tube at the lips or nares and ensure position is maintained during taping.

9.7 Secure the ETT

- There is no data available about the most effective method of securing endotracheal tubes in neonates. The current practice at RPA Newborn care is to maintain skin integrity with Comfeel®, and secure the endotracheal tube using two or three strips of Leukoplast® tape cut in ‘trouser legs’ – see diagrams below.
Goals of taping the ETT

- Safely secure the ETT to maintain adequate airway.
- Prevent pressure areas (eg. skin pinching) and loss of skin integrity.
- Keep tape away from eyes, lips, ears and opposite nostril.

Taping of nasal endotracheal tubes

- Apply Cavilon® skin prep (use in babies over 27 weeks only) on the infant’s cheeks with caution. 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® avoiding the ear. Secure the lower trouser leg under the nose and on to the other cheek. (Figure 7). Secure the endotracheal tube by winding the upper trouser leg up and around the tube achieving maximum surface area coverage (Figure 8). Do not reduce ETT lumen by winding too tightly.

- 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 and on to the other cheek (Figure 9). Secure the endotracheal tube by winding the lower trouser leg up and around the tube (Figure 10).
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 lower cheeks. Starting from the cheek proximal to the endotracheal tube, tape the trouser legs on the infant’s cheek, over the Comfeel® avoiding the ear. Secure the upper trouser leg above the infant’s top lip and on to the other cheek (Figure 12). Secure the endotracheal tube by winding the lower trouser leg up and around the tube (Figure 13).

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 (Figure 11).

The third set of trouser legs can be taped to the bridge of nose. The endotracheal tube is then secured by winding both trouser legs individually up and around endotracheal tube.

The second set of trouser legs can be taped on the same cheek. But this time, secure the lower trouser leg on the infant’s chin to the other cheek. Then tape the upper trouser leg up and around the tube (Figure 14).
• If taping on the opposite cheek, secure the lower trouser leg on the infant’s chin to the other cheek (Figure 15). Secure the endotracheal tube by winding the upper trouser leg up and around the tube (Figure 16). N.B. trouser leg length will need to be longer for this method.

9.8 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 and pressure/volume graphs on the Dräger Infinity C500 monitor. Ensure tidal volume set as ordered.

General assessment:
• Assess the infant’s colour, perfusion, tone, activity, pain/comfort and general appearance. Obtain a set of vital signs.

Nursing care:
• Two nurses or medical officer and nurse to reposition infant carefully.
• Ensure the infant’s head is in a neutral position and the endotracheal tube is in alignment with the nose and not kinked.
• If needed, two registered nurses 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 of complications, a senior clinician able to intubate must be informed of the procedure and remain in the unit until the procedure is completed.
• Ensure ventilation parameters are appropriate. Confirm desired ventilator settings with orders.
• Ensure alarm limits on the ventilator, cardiorespiratory, SpO₂% monitors are set correctly.
• Insert an intragastric tube if not in situ, aspirate and leave on free drainage.
• Obtain an arterial blood gas/capillary blood gas 30 minutes after intubation, or when appropriate to determine if ventilation is adequate.
• Assist in positioning the infant (supine with head in neutral position) for the x-ray to confirm exact tube placement. The tip of the endotracheal tube should be between T1-T2 on x-ray.
Communication

- Ensure that the procedure has been discussed with parents and their questions answered.

9.9 Documentation of procedure

This is done by the clinician who performed, or attempted the intubation. The green Neonatal Intubation Procedural Record sticker should be completed and stuck in the infant’s Progress/Clinical notes.

The following information needs to be documented by the registered nurse in the infant’s Progress/Clinical notes:

- Medications administered to the infant during intubation.
- 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 arterial blood gas/capillary blood gas onto the infant’s Intensive care chart and in the Progress/Clinical notes. If ventilation changes are ordered, document the clinician who ordered the change, the change made, and the time this was done in the infant’s Progress/Clinical 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.
- It is also useful to document significant events (such as time intubation medications were given, time of intubation, etc.) at the bottom of the infant’s Intensive care chart for easy reference.
- Update Respiratory support, Medications and other relevant sections in the infant’s Powerchart and in NICUS.

9.10 Risks and complications

- Incorrect endotracheal tube placement – (esophageal, bronchial intubation).  
- Airway trauma (laceration or bleeding of the vocal cords, perforation of the airway.  
- Vomiting and aspiration of gastric contents.  
- Hypertension, tachycardia, bradycardia, arrhythmia.  
- 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.  
- Endotracheal tube obstruction (eg. tenacious secretions) – observe for increased respiratory effort / obstructive pattern in volume graphs.  
- Accidental extubation.  

9.11 Risk minimisation

- Equipment required for intubation should be ready and checked to ensure it is functional.  
- All staff members involved with the intubation procedure should be trained in basic neonatal resuscitation skills, and at least one staff member trained at advanced neonatal resuscitation. One staff member should be responsible for the care of the infant and take the lead in the intubation procedure.  
- Nurse infant to prevent excessive heat loss, which can increase oxygen consumption.  
- Safely administer pre-intubation medications as per unit guideline.
• Promptly verify correct endotracheal tube placement with a Pedi-Cap®, chest auscultation, flow loops, and chest x-ray.
• Tape endotracheal tube securely to avoid accidental extubation, or other complications that may result from an unstable endotracheal tube.
• If ETT requires repositioning or retaping, two registered should be present and a clinician capable or reintubation available.

9.12 Key points

| Intubation may be by either nasal or oral route | Level of evidence: II  
Grade of randomisation: C |
|------------------------------------------------|---------------------------------------------------------------|
| Premedication should be given prior to intubation where feasible | Level of evidence: II  
Grade of randomisation: B |
| Recommended ETT insertion lengths | Level of evidence: IV  
Grade of recommendation: C |
| Confirm correct ETT placement with a CO₂ detector, flow-loops and auscultate equal breath sounds | Level of evidence: IV  
Grade of recommendation: B |
| Minimise risk of failed intubation, hypothermia and accidental extubation through appropriate measures (see 3.4) | Level of evidence: Opinion  
Grade of recommendation: C |

10. Definitions

<table>
<thead>
<tr>
<th>nCPAP</th>
<th>nasal continuous positive airway pressure</th>
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<tbody>
<tr>
<td>ETT</td>
<td>endotracheal tube</td>
</tr>
<tr>
<td>IGT</td>
<td>intragastric tube</td>
</tr>
<tr>
<td>NICU</td>
<td>neonatal intensive care unit</td>
</tr>
<tr>
<td>PC-AC +VG</td>
<td>pressure control-assist control + volume guarantee</td>
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<tr>
<td>PEEP</td>
<td>positive end expiratory pressure</td>
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<tr>
<td>PIP</td>
<td>peak inspiratory pressure</td>
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11. Consultation

RPA Newborn Care Research Committee
12. **Links and Tools**


12.1 **Resuscitation**


12.2 **Ventilation**


RPA Women and Babies Premedication for (neonatal) Intubation


13. **References**


3. Stevens TP, Harrington EW, Blenow M, Soll RF. Early surfactant administration with brief ventilation vs. selective surfactant and continued mechanical ventilation for preterm infants with or at risk for respiratory distress syndrome. The Cochrane Database of Systematic Reviews. 200:CD003063.


13.1 National Standards

National Standard 1: Safety and Quality in Health Service Organisations
National Standard 3: Preventing and Controlling Healthcare Associated Infections
National Standard 4: Medication Safety

Last reviewed: May 2016 Maria Daco