GUIDELINE

Intubation on NETS Retrievals

Scope (Staff):	Nursing and Medical Staff
Scope (Area):	NETS WA

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this disclaimer

Aim

- Prepare NETS WA clinicians to perform endotracheal intubation on NETS retrievals through a standardized and structured approach whilst promoting good communication, teamwork and situational awareness.
- To reduce complications and adverse events during the intubation procedure.

Risk

Neonatal endotracheal intubation is a highly skilled procedure and can cause marked physiological changes in the neonate.

Key points

- **ALL** patients requiring intubation should be discussed with the on-call NETS WA Consultant prior to intubation unless in a clinical emergency.
- Preparation is paramount. Check equipment prior to the procedure and make sure it is present and working.
- There is a greater risk of clinical deterioration during transport. It is more difficult to intubate in a confined space in an emergency leading to a higher likelihood of intubation failure.
- Try to not get too task focussed. Remember the primary goal is oxygenation **NOT** intubation.
- Factors associated with intubation success and reduced adverse events are:
  - Provider experience

- The use of premedication (in non-emergency intubations)
- Teamwork, communication and preparation

Indications for Intubation

Indications and thresholds to intubate for transport may be different from within the neonatal unit. There may be a lower threshold to intubate due to the need for a stable airway during transport.

Nasal vs Oral Intubation

- Oral intubation is recommended and neonates can be safely transported with a secured oral ETT.
- Nasal intubation can be considered by clinicians experienced in nasal intubations.

Guide for Endotracheal Tube Size

In a resuscitation situation when a weight on a baby is not possible, gestational age may be used to help guide correct endotracheal tube size.

Gestational Age	Weight (g)	Uncuffed ETT (mm)	Length at the lips (cm)	Length at nares (cm)
< 28 weeks	< 1000	2.5	< 6.5 – 7.0	6.5 - 7.5
28 - 32 weeks	1000 - 2000	3.0	7.0 - 8.0	7.5 - 9.0
32 - 36 weeks	2000 - 3000	3.5	8.0 - 9.0	9.0 - 10.5
Term Neonate	3000 - 4000	3.5 – 4.0	9.0 – 10.0	10.5 - 12.0

Table 1: Guide for size of ETT

Oral ETT depth = weight (kg) + 6cm

Nasal ETT depth = (weight (kg) x 1.5) + 6cm

Intubation Procedure

Intubation checklist (Appendix 1) should be followed.

‘**Team Huddle**’

- Allocate team roles - utilise staff members from the referring hospital if possible – may need to allocate several roles to an individual due to staffing constraints

  - Team leader – Coordinates the team. Delegate roles and discusses preparations and plans. Maintains situational awareness. Team debriefer.
  - Airway lead (intubator) – Perform intubation and provides support to team leader by sharing cognitive load.
  - Airway assistant – Assist clinician with intubation and securing of ETT.
  - Medication nurse – Ensure IV access is patent, draw up and administer medications as required.
  - Circulation nurse – Prepare fluid boluses.
  - Scribe – document events.
- What is your intubation plan?
  - Plan A –Initial plan with goal to maximise likelihood of tracheal intubation success at 1st attempt.
  - Plan B – If intubation fails, what is your next plan? What am I going to change? Change one thing before next intubation attempt eg addition of stylet, different sized ETT, more senior staff/ anaesthetist.
  - Plan C – Can't intubate but CAN ventilate. Oxygenation of the baby is the priority.
- Do I anticipate a difficult airway?
  - History of difficult intubation
  - Micrognathia
  - Craniofacial abnormalities
  - Large tongue
  - Signs of respiratory obstruction

Premedication

Premedication reduces the time and number of attempts required for intubation whilst making the intubation procedure easier, safer and causes less physiological changes in the baby. Premedication should **ALWAYS** be used unless in a resuscitation situation. Premedication should include a sedative and muscle relaxant.

- Preferred medication is fentanyl (morphine if not available), suxamethonium +/- atropine.
- Atropine Optional. May give in situations where there may be cardiovascular instability or to treat bradycardia during the intubation. Atropine should be given prior to fentanyl
- Fentanyl - Given by SLOW IV push over 2-3 minutes (chest wall rigidity and impaired ventilation can occur with rapid administration). If fentanyl is not

available, Morphine can be used instead but onset of action is slower and takes at least 5-10 minutes to take effect.

- Suxamethonium - Do not use in cases of hyperkalaemia, neuromuscular disorders, raised intracranial pressure of family history of malignant hyperthermia. Use with caution if abnormal upper airway anatomy

See Neonatal Medication Protocols for all medication doses.

Equipment

To reduce the risk of Ventilator Acquired Pneumonia, all intubation equipment should be placed on a sterile towel on a clean trolley prior to use. No intubation equipment should be placed directly onto the infant's cot/ sheets unless it is still in the packaging. A new ETT should be used for each intubation attempt. An attempt is defined as when the laryngoscope passes the lips.

Consider using size 3.0mm cuffed ETT for surgical and cardiac babies if infant is >35 weeks and >2.7kg. This may avoid the need for reintubation in theatre by the anaesthetists, for whom a cuffed ETT is the preferred option.

Sterile towel to place equipment on	Stethoscope
Appropriate Endotracheal Tube (see table 1) with one size above and below	Pedi-Cap™ CO_2 detector and/or End Tidal CO_2 detector for ventilator circuit
Laryngoscope – size 00, 0 and 1	Securing Tapes
Video laryngoscope (CMAC) if available	Skin Preparation Wipes
Set ventilator and T-piece at appropriate pressures with consideration to size and clinical status of the neonate	PPE – surgical face mask (N95 if suspected COVID-19), protective eye wear
Laerdel bag	Magill Forceps (optional)
Appropriate sized face masks	Stylet/ Bougie (optional)
Suction	Supraglottic Airway – Laryngeal Mask (optional)

Patient preparation

- Ensure IV access patent and cardiorespiratory monitoring (ECG, SpO_2 and NIBP/IABP) in situ.
- Ensure neonate is supine, well positioned, comfortable and in as optimal physiological condition as possible before commencing intubation.
- Consider thermoregulation.
- Aspirate NGT if necessary.
- Assess airway patency with T-piece resuscitator or bag and mask before administration of muscle relaxant.

Guidelines for Securing Endotracheal Tubes

- Securing an endotracheal tube (Appendix 2) is a minimum 2-person procedure. Emergency intubation equipment needs to be prepared in the event of an unexpected extubation.

Clinical Deterioration after Initiation of Ventilation

Follow the acronym 'DOPE' to troubleshoot. Disconnect from ventilator and bag manually whilst trouble shooting.

'D' Displacement of ETT

Check ETT for displacement or dislodgement – assess air entry/ chest wall movement

Where is it taped at the lips? Does the $ETCO_2$ detector (Pedi-Cap™) change from purple to yellow?

'O' Obstruction

Is ETT patent? Does the neonate need suction? Is the ETT or any tubing kinked?

'P' Pneumothorax

Is air entry equal? Consider transillumination/ CXR

'E' Equipment failure

Is there adequate gas flow (minimum 6-8 l/min)

Has there been a disconnection in the ventilator circuit?

Are you achieving adequate pressure/ tidal volume? Are the ventilator settings correct?

Is the oxygen being delivered? Are your cylinders on?

Management and Monitoring of a Ventilated Baby During Transport

- Obtain a CXR to check and optimise ETT position prior to loading and departure from referring hospital.
- Take a blood gas prior to departure. Ensure you have blood gas equipment available to repeat blood gases enroute back to the receiving hospital if required particularly if you have a prolonged travel time.
- Monitor $ETCO_2$ trend which is more important than the absolute value. A portable $ETCO_2$ Monitor 'EMMA' (Figure 1) available if needed. Transcutaneous CO_2 monitoring is available also if required.

Figure 1. $ETCO_2$ Monitor 'EMMA'

Sedation

Sedation may be necessary (Morphine or Fentanyl infusion +/- midazolam). The need for sedation and choice of medication should be discussed with NETS Consultant on call.

Muscle relaxation (Vecuronium boluses or infusion) is usually reserved for critically unwell infants e.g. Meconium aspiration, diaphragmatic hernias with severe pulmonary hypertension. The use of muscle relaxants should **ALWAYS** be discussed with the on-call NETS Consultant prior to use.

Documentation

Document the intubation procedure on the NETS WA observation and history sheet MR400.01. Documentation should include the following information:

- Reason for intubation, premedication used and number of attempts.
- Oral or nasal intubation and size of ETT, and depth of insertion.
- Pedi-Cap™/ $ETCO_2$ confirmation of tube placement.
- Position of ETT on CXR and any alterations to ETT position
- Patient stability and any adverse events such as oesophageal intubation, pneumothorax, hypoxaemia, right main bronchus intubation, gum trauma, laryngospasm or vomiting.

Related CAHS internal policies, procedures and guidelines
Neonatology Clinical Guideline • CAHS Intubation Guideline: Difficult Airway Neonatal

References and related external legislation, policies, and guidelines

1. Hatch LD et al. Endotracheal intubation in neonates: a prospective study of adverse safety events in 162 infants. *J Pediatr*. 2016;168:62-6
2. Le CN et al. Impact of premedication on neonatal intubations by pediatric and neonatal trainees. *J Perinatol*. 2014;34:458–60
3. Foglia et al. Neonatal intubation practice and outcomes: An international registry study. *Pediatrics* 2019;143(1):e20180902
4. Foglia et al. Factors associated with adverse events during tracheal intubation in the NICU. *Neonatology* 2015;108:23-29
5. Dalrymple H et al. Improving intubation success in pediatric and neonatal transport using simulation. *Pediatric Emergency Care*. Dec 2020 Published ahead of print
6. Barrington KJ et al. Premedication for endotracheal intubation in the newborn infant. *Paediatr Child Health* 2011 Mar; 16(3):159-164

This document can be made available in alternative formats on request.

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Healthy kids, healthy communities

Compassion | Excellence | Collaboration | Accountability | Equity | Respect

Neonatology | Community Health | Mental Health | Perth Children's Hospital

Appendix 1: NETS WA Intubation Checklist

NETS WA INTUBATION CHECKLIST

PLAN	NETS Consultant on call informed of intubation unless emergency		☐
	'Team Huddle' • Assign team roles • Intubation plan with discussion of A, B, C plan *PTO • Medication (mandatory unless emergency) • Ventilation settings - volume guarantee if possible with consideration to size and clinical status of the neonate		☐
PREPARE DRUGS AND EQUIPMENT **Place equipment onto sterile towel**	IVI/DRUGS **check doses** on NETS Resus and Intubation medication chart	Flush IV and ensure patent and working **FENTANYL OR MORPHINE** **SUXAMETHONIUM** **+/- ATROPINE** Consider fluid bolus → 10mls/kg Normal Saline	☐
	LARYNGOSCOPE	Size ___ and light source working CMAC if available	☐
	SUCTION	Suction working	☐
	ET TUBES	Tube size _____with alternate sizes available Introducer/ Magills forceps available if required	☐
	T-Piece/BVM	T-piece set at correct pressures BVM available, connected to oxygen and working	☐
	CIRCUIT	Pedicap/ ETCO2 available Ventilator set up with appropriate settings	☐
	OTHER	Tapes to secure ETT, OGT Consider airway adjuncts – LMA, Guedel, Bougie	☐
PREPARE PATIENT	Optimise patient positioning and access to patient Ensure monitoring attached (ECG, SpO2, BP) and visible to team Baseline observations taken Optimise haemodynamics		☐
Pre intubation check is complete. **Commencing intubation at ____:____ Medication given at ____:____**			
INTUBATION and CONFIRM ETT PLACEMENT	Confirm sedation and muscle relaxation Intubation Pedicap positive/ ETCO2 trace on monitor Listen for air entry. Equal? Secure ETT in appropriate position CXR to confirm ETT position Document procedure on NETS observation chart		☐
PREPARE FOR TRANSPORT	Maintenance infusions/sedation/inotropes for retrieval? Blood gas prior to departure		☐
	Ensure ETT placement confirmed after every significant movement eg loading into cot / post CXR.		☐

NETS WA INTUBATION CHECKLIST

Patient sticker

What is your intubation plan?

If unsuccessful intubation, what are you going to change before moving to the next stage?

At all stages, maximum 2 attempts by the same operator
Is there anyone else who can help? eg more senior staff/ Anaesthetist?
What is your escalation pathway?
Do you anticipate a difficult airway?

- history of difficult intubation
- micrognathia
- craniofacial abnormalities
- big tongue
- signs of respiratory obstruction

Plan A:

- Initial plan with goal to maximise likelihood of tracheal intubation success at 1st attempt
- Optimise patient position and preparation

Plan B – secondary intubation plan

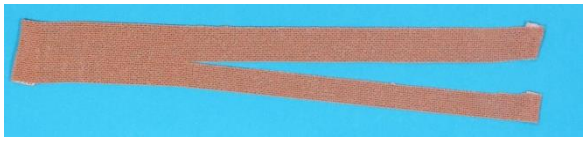
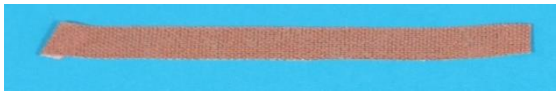
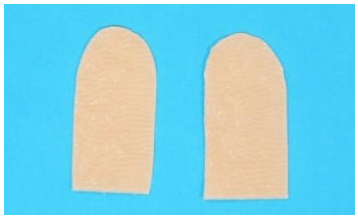
- Change patient position
- Different personnel?
- Different sized ETT?
- Use of stylet?
- Change modality – direct vs indirect laryngoscopy (CMAC)

Plan C – Can't intubate but **CAN** ventilate

- May consider use of laryngeal mask (LMA)

Appendix 2: Securing of Endotracheal Tube

Tapes Required

2 x Trouser Leg	
Anchor Tape	
2 x Comfeel Tape	
Black Silk Suture (NASAL only)	

Securing an Oral ETT Using Tape

Steps	Additional Information
Place hydrocolloid tape (Comfeel) to both cheeks from the edge of the mouth.	

Steps	Additional Information
Place the oral ETT to one corner of the mouth. Place anchor tape from the side of the ETT on the cheek and extend up the ETT.	
Place the first trouser leg tape with the non-split end on the cheek from the corner of the mouth where the ETT is. Place the upper leg across the top of the lip and then the lower leg is wrapped around the ETT in a spiral fashion.	
Place the second trouser leg tape on the opposite cheek from the corner of the mouth. The lower leg is placed across the lower lip and the upper leg is then wrapped around the ETT in a spiral fashion.	

Securing a Nasal Endotracheal Tube

Steps	Additional Information
Place hydrocolloid tape (Comfeel) to both cheeks from the edge of the mouth.	
Tie a double knot with a black silk suture around the base of the ETT at the depth it is to be secured, taking care not to occlude the tube. Hold both ends of the black silk across the cheeks.	
Place the anchor tape from the forehead, down the bridge of the nose and extend up the ETT.	

Steps	Additional Information
Place the first trouser leg tape with the non-split end to the cheek that is on the same side as the nostril with the ETT. Place the lower leg across the top of the lip, to the other cheek securing the knot in the tie and ensuring the black silk is covered. The upper leg is then wrapped around the ETT in a spiral fashion.	
Place the second trouser leg tape on the opposite cheek. The upper leg is taken across the bridge of the nose to the other cheek. The lower leg is taken under the ETT and is wrapped around the tube in a spiral fashion. The other nostril should not be occluded by any tape or silk tie.