

Local Guideline



John Hunter
Children's Hospital
CHILDREN, YOUNG PEOPLE AND FAMILIES



Health
Hunter New England
Local Health District

Medication for elective/semi-elective endotracheal intubation of the neonate

Sites where Local Guideline applies	Neonatal Intensive Care Unit, JHCH
This Local Guideline applies to:	
1. Adults	No
2. Children up to 16 years	No
3. Neonates – less than 29 days	Yes
Target audience	Clinicians in NICU caring for term infants when elective/semi-elective intubation indicated
Description	Provides guidance for the rationale and procedure for administering medication for elective/semi-elective intubation for term infants
National Standard	Standard 4 Medication Safety

[Go to Guideline](#)

Keywords	Intubation, NICU, JHCH, Pain, Premedication, Suxamethonium Ventilation
Document registration number	JHCH_NICU_12.14
Replaces existing document?	No
Related Legislation, Australian Standard, NSW Ministry of Health Policy Directive or Guideline, National Safety and Quality Health Service Standard (NSQHSS) and/or other, HNE Health Document, Professional Guideline, Code of Practice or Ethics:	
<ul style="list-style-type: none"> • NSW Health Policy Directive PD2017_032 Clinical Procedure Safety • Medication Safety in HNE Health PD2013_043:PCP31 	
Prerequisites (if required)	Current prescription / medication order
Local Guideline note	This document reflects what is currently regarded as safe and appropriate practice. The guideline section does not replace the need for the application of clinical judgment in respect to each individual patient but the procedure/s require mandatory compliance . If staff believe that the procedure/s should not apply in a particular clinical situation they must seek advice from their unit manager/delegate and document the variance in the patients' health record.
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This document contains advice on therapeutics	Yes Approval gained from Local Quality Use of Medicines Committee on 10 th May 2018
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PURPOSE AND RISKS

This local clinical procedure has been developed to provide instruction to the health clinician and to ensure that the risks of harm to the infant associated with medication for elective/semi-elective endotracheal intubation are prevented, identified and managed.

The risks are:

- Discomfort during intubation
- Increased occurrence of physiological disturbances such as hypoxaemia, bradycardia, systemic hypertension, intracranial hypertension & pulmonary hypertension
- Failed attempts at intubation leading to multiple intubations
- Airway trauma

The risks are minimised by:

- *Clinicians having knowledge of medication for elective/semi-elective endotracheal intubation and management*
- *Clinicians seeking assistance if caring for infants is outside their scope of practice*
- *Following the instructions set out in the clinical procedure*
- *Recognition of the common clinical signs of the complications of endotracheal intubation*
- *Notification and management of the complications/ risks to the patient*

Risk Category: *Clinical Care & Patient Safety*

GLOSSARY

Acronym or Term	Definition
IV	Intravenous
ETT	Endotracheal Tube
NICU	Neonatal Intensive Care Unit
PEEP	Positive End Expiratory Pressure

GUIDELINE

This guideline does not replace the need for the application of clinical judgment in respect to each individual patient.

Background and Rationale

Endotracheal intubation is a common procedure in neonatal intensive care units (NICUs). Intubation in awake state is unpleasant and is frequently also associated with a series of physiological disturbances such as hypoxia, bradycardia, increase in intracranial pressure, blood pressure fluctuations and airway injury in neonates.^{1, 2, 3, 4} Therefore, endotracheal intubation should be performed expeditiously in as controlled an environment as possible to reduce complications. Several studies that evaluated the success rate of neonatal endotracheal intubations have reported that successful intubations frequently require more than 1 attempt and are rarely accomplished within the currently recommended time frame (NRP 2000 guide 20 sec).^{5, 6, 7} The failed and prolonged intubation attempts are considered to be secondary to suboptimal intubating conditions. Several trials have demonstrated that the use of premedication for intubation of the newborn significantly improves intubating conditions, decreases the time and number of attempts needed to complete the intubation procedure, and minimises the potential for intubation-related airway trauma and physiological disturbances.^{2, 3, 8, 9}

Elective/semi-elective intubation describes any situation in the neonatal intensive care setting where it is safe to prepare and administer medication before the intubation takes place. Majority of the intubations for surgical intervention and a number of intubations for medical management in the NICU are elective/ semi-elective. The most common indication for endotracheal intubation at JHCH neonatal unit is administration of surfactant using the INSURE method. However, due to the pharmacokinetic and pharmacodynamic limitations of the medications described here, this guideline is not applicable when intubation occurs for surfactant administration only. Similarly, this guideline is not applicable for emergency endotracheal intubation in neonates.

Outcomes

- Minimizing discomfort and perceived pain caused by the procedure.
- Optimisation of the intubation condition e.g. effective jaw relaxation, transient suppression of airway reflexes and opening of immobile vocal cords
- Minimising bradycardia, desaturations, blood pressure fluctuations and rise in intracranial pressure during the procedure.
- Intubation procedure expedited and a reduced number of intubation attempts undertaken.
- Pharyngeal/laryngeal reflexes will be suppressed with the absence of coughing or diaphragmatic movements.
- Non pharmacological strategies (i.e. swaddling and containment holds) will be practiced throughout the procedure.
- Safe administration of medications

Preparation for elective/semi-elective intubation

It is essential that all equipment for intubation and mechanical ventilation is prepared prior to commencement of the procedure or administration of medications.

Skill level of clinicians

Endotracheal intubation should only be performed by a clinician trained in advanced life support skills. Importantly, the person carrying out the procedure or supervising the procedure should be confident, competent and experienced in endotracheal intubation and use of medications.

Intubation in infants with difficult airway e.g. Pierre-Robin sequence should be discussed with neonatologist and appropriate airway management expertise should be available.

All staff involved should have clearly defined roles and it is important for there should be at least one and ideally 2 skilled assistants to help. If possible, the team will have introduced themselves to the family before commencing the procedure and parents will be informed and appropriately supported.

Procedure

It is important that equipment for intubation, resuscitation and positive pressure ventilation is close at hand and checked prior to administering the pre-medication. For a detailed list of equipment and the procedure for intubation refer to "[Resuscitation of the Newborn infant](#)" *JHCH NICU 01.03*, page 12 – 13, "Endotracheal Tube (ETT) Intubation".

The premedications and administration sequence should be charted on the STAT medication chart as per current drug guidelines. Refer to **Neomed Drug guidelines** for dosage, administration and adverse effects of medications.

Patient identification and drug checks must be completed prior to commencing procedure and administering medications. Follow the '5 rights' of Medication safety ¹⁸.

Continuously monitor the infant's heart rate and oxygen saturation levels (SaO₂) and provide respiratory support/ supplemental oxygen as appropriate. Infant should have a secure and patent intravenous access.

Equipment required

1. Suitable laryngoscope with an appropriately sized blade for the size of infant. Blades size 00, 0 and 1 are available. Check the light source is functioning
2. Appropriate size endotracheal tubes (ET) according to the weight (an introducer may be used if required)
Infants <1000 g → 2.5 mm
1000 g- 2500 → 3.0 mm
>2500 g → 3.5 mm

Keep **ET** of one size above and below ready in case unanticipated difficulties are encountered

3. **Check T-piece device** e.g. Neopuff is working and the pressure ranges are adequate
4. Oxygen and air flow
5. Ensure suction is working
6. **Pedicap** should be available to ascertain placement of ET in the airway.
7. **Neobar** and Tapes for fixing the endotracheal tube

Infants should receive intermittent positive pressure ventilation with adequate PEEP during the procedure if spontaneous respiratory efforts are ineffective.

Laryngoscopy should commence once adequate muscle relaxation is achieved, and heart rate and saturations are within normal range unless previously known to have a low resting heart rate or baseline saturations (e.g. congenital cyanotic heart disease). If the infant's heart rate and saturations drop significantly below the base line, discontinue the attempt and recommence positive pressure ventilation with mask until observations are back to baseline.

Confirm correct ETT position with a Pedicap CO₂ detector, improvement in oxygen saturations and heart rate, and with a chest x-ray. When infant is successfully intubated commence mechanical ventilator support.

Note: Timing and place for intubation for surgical intervention should be discussed between the neonatal team and the anaesthetic team pre surgery.

Selection of medications

There is no single medication which can provide analgesia, amnesia, adequate muscle relaxation with a quick onset and short duration of action with minimal side effects. Analgesics reduce the discomfort and perceived pain caused by the procedure. All three commonly used opioid analgesics, Morphine, Fentanyl and Remifentanyl, were found to be efficacious in clinical trials.^{2, 10,}

¹¹ Randomised controlled trials show that combination of premedications involving muscle relaxant makes intubation easier, quicker and less traumatic.^{2, 8, 9} Both the depolarising and non-depolarising group muscle relaxants improved intubation conditions in term and preterm infants.^{2, 8, 11} However, there are very limited studies which have compared one medication versus other for analgesia/sedation or muscle relaxation.

Laryngoscopy and insertion of endotracheal tube in the throat stimulate the vagal response and produce bradycardia. Analgesics and muscle relaxants commonly used for intubation also produce bradycardia. To reduce intubation related bradycardia, most of the clinical trials have used Atropine as a part of premedication combination.^{2, 10}

Based on the current evidence and pharmacokinetic profile, and majority consensus opinion of senior medical staff at JHCH, the following is the suggested **combination and sequence** of premedications for elective/semi-elective intubation.^{12, 13} If Atropine is not administered in the

beginning due to patient's disease pathophysiology and hemodynamic status, it should be kept ready for administration in case significant bradycardia develops during intubation.

Atropine (Dose: 10-20 microgram/kg/dose IV)

Atropine is a vagolytic and used for prevention of reflex or medication induced bradycardia during intubation. It has rapid onset of action over 1-2 min and effect lasts for 0.5-2 hours.

Fentanyl (Dose: 2-4 microgram/kg IV)

Fentanyl is a potent opioid analgesic. It has rapid onset (3-5 min) and short duration (30-60 min) of action compared to morphine when given as an IV bolus. In randomised control trials comparing Fentanyl to Morphine and Remifentanyl, Fentanyl was found to have comparable efficacy and better side effect profile.^{14, 15} Chest wall rigidity may occur with rapid administration which can be minimised by slow administration of the medication over 3-5 minutes.

Suxamethonium (Dose: 1-3 mg/kg/dose IV)

Suxamethonium is a depolarizing type of neuromuscular blocker. It is administered for muscle relaxation to facilitate intubation. It has a rapid onset and short duration of action. Complete muscle relaxation occurs within 30- 60 seconds and persist for only 3-5 minutes with gradual spontaneous recovery within 10 minutes. Therefore if Suxamethonium is given, a second dose should be drawn up and ready for administration in case the intubation takes longer than expected and the infant starts to move. Contra-indications to succinylcholine include significant hyperkalaemia, a family history of malignant hyperthermia and a suspicion of muscular dystrophy

Alternative medications

Following alternative medications may also be used for premedication in neonates at the discretion of the attending neonatologist.

Analgesia (as alternative to Fentanyl)

Morphine (Dose: 100 -200 micrograms/kg/dose IV; max 2 doses 15 min apart)

Morphine is one of the most commonly used analgesics in neonates. It has comparatively slower onset (5-15 min) and prolonged duration of action (3-5 hours). The variability in the time required for action may result in inadequate analgesic effect in some neonates. When morphine is used for premedication, the **sequence** of medications usually is **Morphine → Atropine → Suxamethonium**.

Documentation

The procedure and use of premedication should always be documented in the patient notes, medication chart and on the patient flow chart following procedure.

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18. [HNE QUM Committee Fact Sheet](#)

Feedback

Any feedback on this document should be sent to the Contact Officer listed on the front page.

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Staff Preparation

It is mandatory for staff to follow relevant: "Five moments of hand hygiene", infection control, moving safely/safe manual handling, documentation practices and to use HAIDET for patient/carer communication: **H**and hygiene **A**cknowledge, **I**ntroduce, **D**uration, **E**xplanation, **T**hank you or closing comment.

IMPLEMENTATION, MONITORING COMPLIANCE AND AUDIT

1. Approved clinical guideline will be uploaded to the PPG and communication of new 'Medication for elective/semi-elective endotracheal intubation of the neonate' guideline to NICU staff will be via email and message on the HUB.
2. Incident investigations associated with this Guideline and Procedure will include a review of process.
3. The Guideline and Procedure will be amended in line with the recommendations.
4. The person or leadership team who has approved the Guideline and Procedure is responsible for ensuring timely and effective review of the Guideline and Procedure.
5. Evaluation will include a review of the most current evidence as well as a consideration of the experience of Neonatal staff at JHCH in the implementation of the Guideline and Procedure.

Appendix

Premedications used for neonatal elective/semi-elective intubation

		Onset of action	Duration of action	Dose	Adverse effects	Comments
Analgesia	Fentanyl	3-5 min	30–60 min	2-4 mcg/kg IV	Chest wall rigidity Respiratory depression Bradycardia, Hypotension Urinary retention	Slow push over 3–5min Effects reversed by Naloxone
	Morphine	5-15 min	3–5 hours	100-200 mcg/kg IV	Respiratory depression Bradycardia, Hypotension Urinary retention Reduced GI motility	Slow push over 3-5 min Effects reversed by Naloxone
Vagolytic	Atropine	1–2 min	0.5-2h	0.01-0.02 mg/kg IV	Tachycardia, dry hot skin	Well studied and preferred agent
Muscle relaxation	Succinyl Choline	30–60 sec	4–6 min	1-2 mg/kg IV	Hypertension/hypotension, Bradycardia/ tachycardia, Bronchospasm, Hyperkalemia, Malignant hyperthermia	C/I Hyperkalemia Suspected muscular dystrophy F/H of Malignant hyperthermia