Standard Operating Procedure (SOP):		Procedure No:	Document replaced:	Version:
Standard operating procedure for Neonatal Difficult Airway Kit and Intubation Pathway		1	Version 1	2.0
Procedure Written By:	**Procedure Approved for Use By**:	**Date:**	**Next review date:**	**Pages**
Consultant Paediatrician	WCCSS Divisional Quality Meeting	May 2017	May 2020	**6**

1. This standard operating procedure relates to the description of the contents of the neonatal difficult airway kit and safe management of a baby needing airway support or intubation on the neonatal unit

2. This policy should be used in conjunction with Staffordshire, Shropshire and Black Country Maternity and Neonatal Network (SSBCMNN) guidelines (2015-2017) titled 'Intubation' and 'Intubation-difficult' which are accessible through the Children's and Family Services Care Group home page on the Trust Intranet and NLS and APLS guidelines on management of airway in neonates.

1.0 Purpose

The purpose of this standard operating procedure is to describe the different contents of the difficult airway kit and indications for their use and to provide a pathway for safe management of airway and intubation in neonates. This SOP should be used in conjunction with the neonatal network guidelines on neonatal intubation and difficult intubation available on the intranet.

2.0 Process

The Consultant Paediatrician on call must be informed of all babies requiring intubation before it is undertaken. In the rare situation of an emergency intubation required in the delivery room or during resuscitation, the consultant on call must be informed by any member of the team as soon as possible. A consultant must be present for delivery of all babies less than 28 weeks gestation unless it is a precipitate labour. For all other babies, the consultant will decide their attendance depending on the clinical condition of the baby and the experience of the registrar present.

Repeated failed attempts at intubation must be avoided at all costs; a neonate is unlikely to survive repeated attempts of intubation due to laryngeal trauma and blocked airway as well as development of PPHN (persistent pulmonary hypertension) from handling. It is definitely preferable to maintain adequate oxygenation even if it is with suboptimal ventilation, with airway adjuncts like oropharyngeal or laryngeal mask airway and T-piece mask ventilation or CPAP/BiPAP while awaiting more senior help rather than creating a "can't intubate, can't ventilate" situation.

There should only be a maximum of two attempts at intubation by any one operator (including a consultant), if not able to intubate in the first attempt the operator should identify the reason for the failure and correct it in the second attempt.

If the second attempt is also failed it is assumed that the operator has not correctly identified the reason for failure and hence it should be taken over by a more experienced clinician. In any case there should be a maximum of **3 attempts** before a Consultant Paediatrician and/or Anesthetist is called for help.

When calling for more senior help, this can be a senior registrar who is on the general Paediatric side or the Consultant on call. If asking for urgent help call extension 2222 and ask for the registrar to be crash bleeped or consultant on call/anaesthetist contacted.

3.0 Neonatal Difficult Airway Kit

This now forms part of the neonatal resuscitation trolley and consists of:

1) Oropharyngeal airways (3 sizes)
2) ET tubes of different sizes
3) Introducer
4) CO_2 detector
5) Laryngeal mask airway (size 1, Flexicare and i-Gel)
6) Magille's forceps
7) Robertshaw laryngoscope blade (size 0 and 1)
8) Storz video laryngoscope (this forms part of the difficult airway kit although it is physically situated in the clinical educator's office in the NNU)
9) Bougie

Each of the above will be described below with particular reference to their role in difficult airway scenario.

1) Oropharyngeal airways

Sick and unwell babies are usually hypotonic and tend to block their airway because of loss of tone of the pharyngeal muscles and the tongue falling back. They often need good jaw thrust with two handed technique. An appropriately sized oropharyngeal airway (according to NLS/APLS guidelines) can be used to ensure an open airway when giving T-piece mask ventilation while awaiting more senior help in floppy babies as well as in specific conditions like suspected choanal atresia.

2) ET tubes

In addition to the obvious use for endotracheal placement, ET tube cut to appropriate size can be used as nasopharyngeal airway (NPA) in specific conditions like Pierre Robin sequence. (Refer to NLS and APLS guidelines on sizing the NPA).

3) Introducer

Introducer helps to keep the small ET tubes stiff and direct the tip towards the laryngeal inlet. There is a risk of laryngeal and tracheal injury from its use; therefore it is important to make sure the tip of the introducer is not sticking out beyond the tip of the ET tube to reduce the risk of injury. In order to reduce the risk of accidental extubation when trying to remove an introducer, tightly wound around the hub of the ET tube, you must wind it around the flange of the ETT hub once.

4) CO_2 detector

This shows a change of colour from purple to yellow when there is CO_2 in the expired air and **must be used for every neonatal intubation**. The pack comes along with moisture absorber to keep the CO_2 detection panel dry. The colour change should be consistent with each expiration when the inspiratory breath is paused, beware of intermittent colour change you may see even with oesophageal intubation. Please note that bronchial intubation from an ETT inserted too long also gives a colour change, so correct position of the ETT must also be confirmed with equal air entry in the axillae by auscultation. Secretions deposited on the colour change panel may also give a false positive result. Please note CO_2 detection can be falsely negative if the baby is very small or if there is low or absent cardiac output.

5) Laryngeal mask airways (LMA)

Similarly to the oropharyngeal airways, laryngeal mask airway can be used in floppy babies as well as in babies with orofacial abnormalities like cleft lip/palate (which may make mask ventilation ineffective) whilst awaiting senior help. There are two brands available in the kit: Flexicare LMA can be used for babies >1.5 kg and i-Gel LMA can be used for >2 kg. LMA is inserted along the curvature of the tongue and the palate, similar to an oropharyngeal airway, until there is resistance to further advancement. The laryngeal mask should sit snugly at the laryngeal inlet providing an open albeit not perfectly secure airway until further help arrives.

6) Magille's forceps

These can be used to hold the tip of the ET tube and directing it towards the laryngeal inlet, especially with nasal intubation but cannot be used in small babies when there is not adequate room in the oropharynx for its use.

7) Robertshaw laryngoscope blades

These are wider and longer compared to Miller blades and can be used when an operator finds it difficult to move the tongue out of line of visualizing the larynx.

8) Storz video laryngoscope

It can be used for first attempt at intubation and must be used early in difficult intubation scenario i.e. after one or max two failed attempts at intubation with the standard laryngoscope. A video laryngoscope allows a more anterior and close up view of laryngeal inlet as the light source on the blade itself is not obscuring the view on the screen. In addition a second operator supervising or assisting can also make sure the tip of ETT has passed through the laryngeal inlet. It can be useful when there are lots of secretions obscuring the view, one can intubate while an assistant does the suctioning. It is an invaluable tool for training. The procedure can also be recorded as still pictures or a video for documentation.

However it comes only with size 0 and size 1 blades and hence may be difficult to use for small babies (<1kg). It must be cleaned with various wipes before use; therefore this must be requested as soon as a decision has been made to intubate a baby so that it is ready for use if needed. The blades should be cleaned after every use and placed in a clear sealed plastic bag so that in an emergency it can be used without a further round of cleaning. In order to be competent and confident in using Storz video

laryngoscope all middle grades and consultants should use it on routine non-emergency intubations before having to use it in an emergency.

9) Bougie

In extremely difficult situations a bougie can be used to access the laryngeal inlet and then rail track an ETT on to. However in neonates there is high risk of perforation of trachea with bougie and it **must only be used by an experienced neonatologist or an anesthetist**; it must be inserted no more than 2 cm into the trachea and an assistant must help to hold it to prevent it from going further in while threading the ETT over it.

4.0 Common problems with intubation

Senior help should be asked early for any such scenario

Problem	Action
Oesophageal intubation – Blade placed too deep, cords not visualised	Retry with shallow blade insertion and use cricoid pressure
Tongue obscures vision	• Sweep tongue to left side using blade • Use a more anterior lift • Use Robertshaw blade
Cannot see cords	• Ensure head not hyper-extended • Use small towel roll under baby's shoulders
Cannot intubate	• Do not panic • Call for senior help early • Calmly maintain chest excursions through bag or T piece/face or laryngeal mask ventilation until help arrives • Use Guedel oral airway if necessary

4.1 Can ventilate, cannot intubate (Good chest excursion and rising/good heart rate but baby still needs intubation)

- Call for senior help
- No more than 3 attempts at intubation (max 2 per individual resuscitator) by juniors before consultant or anaesthetist is called for help, to avoid laryngeal oedema and convert this into a 'cannot intubate, cannot ventilate' scenario
- Ventilate between attempts at intubation
- Maximum 30 seconds per attempt to limit hypoxia
- If intubation attempts fail, stop. Continue either bag and mask ventilation or laryngeal mask airway ventilation until senior help available
- It is safer to maintain ventilation with mask ventilation with adequate chest expansion until help arrives, as baby is less likely to survive repeated unsuccessful ETT attempts
- Two further attempts by consultant or anaesthetist

- Try indirect laryngoscopy using video laryngoscope if available. If this fails, call for ENT/anaesthetist for further help with difficult airways
- Use end tidal CO_2 detectors to confirm tracheal intubation

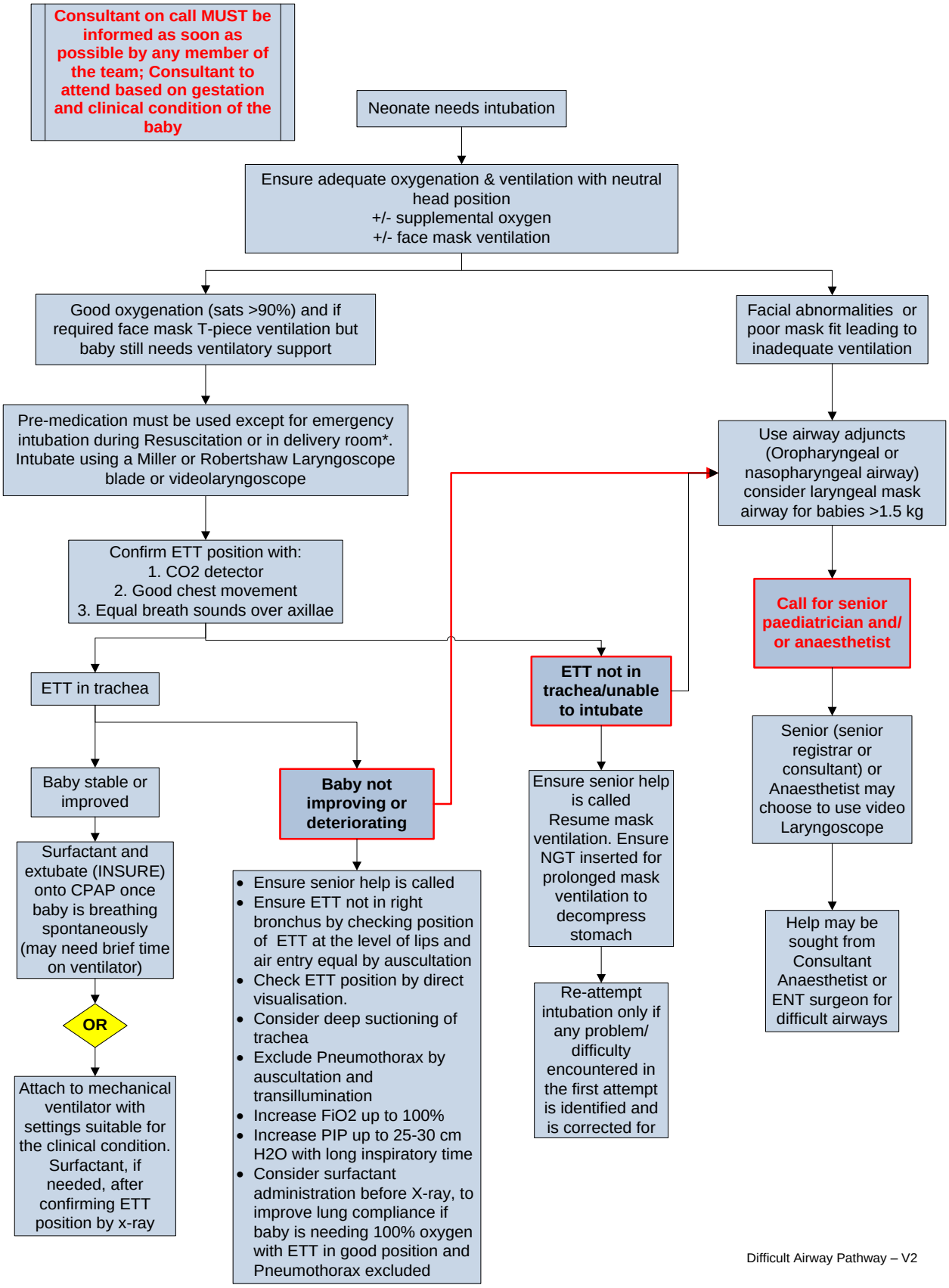
4.2 Cannot ventilate, cannot intubate

- Call for senior help and reconfirm the following
- Neutral head position (overextension can limit vision)
- Correct size face mask being used, create a tight seal
- Use two hand technique to perform the jaw thrust and ask a second person to squeeze the ventilation bag
- Use correct size oropharyngeal airway (Guedel airway): too big may cause laryngospasm and too small may worsen obstruction. (tip of the Guedel airway should reach the angle of the jaw when aligned with lip on side of face)
- For specific conditions (e.g. Pierre Robin sequence, micrognathia) nasopharyngeal airway may be useful. To make, take an ETT and shorten it by measuring distance between nasal tip and ear tragus. Choose a size that does not blanch the nares completely when inserted
- Laryngeal mask ventilation (smallest size = size 1, suitable for babies >1.5 kg)

When senior help arrives:

- Re-attempt intubation
- Use a small towel roll under baby's shoulder to improve vision
- Use video laryngoscope
- Call consultant anaesthetist for support
- Use end tidal CO_2 detector to confirm tracheal intubation
- May need to involve consultant ENT surgeon in certain specific situations

Appendix 1



Difficult Airway Pathway – V2