NHS SCOTLAND

National Neonatal Network

Guideline

Difficult Airway Management

Scottish Perinatal Network NEONATAL

Document Control Sheet

Title:	Difficult Airway Management
Lead Author(s)	Tom Marriage, Consultant Neonatologist, NHS Greater Glasgow & Clyde Andrew MacLaren, Consultant Neonatologist, NHS Greater Glasgow & Clyde
Date Published/ Issued:	12.04.2023
Date Effective From:	12.04.2023
Version/Issue Number:	1.0
Document Type:	Guideline
Document Status:	Final
Owner:	National Neonatal Network (NNN)
Approver:	NNN Guideline Oversight Group
Approval Date:	14.03.2023
Contact:	nss.perinatalnetwork@nhs.scot
File Location:	\\freddy\DEPT\NSDBCS\09 PCF\NSD\Strategic Networks\Perinatal\SPN Guidance

Revision History:

Version:	Date:	Summary of Changes:	Name:	Changes Marked:
1.0	Jan 2023	None - original version		

National Neonatal Network Guideline:

Difficult Airway Management

Aim

The aim of this guideline is to help neonatal teams in Scotland apply the *BAPM Framework for Practice: Managing the Difficult Airway in the Neonate* locally and establish clear referral pathways in the event of a neonatal difficult airway.

Summary

1. Every centre caring for the neonate in Scotland should have an approach to management of the difficult airway.
2. This should be in line with the *BAPM Framework for Practice: Managing the Difficult Airway in the Neonate* (https://www.bapm.org/resources/199-managing-the-difficult-airway-in-the-neonate).
3. Every centre should have a designated Airway Lead who is responsible for ensuring effective implementation of the Framework in their centre.

Disclaimer

The National Neonatal Network endorses the *BAPM Framework for Practice: Managing the Difficult Airway in the Neonate*. Many of the concepts from this framework are summarised in this document. For further detail please refer to the BAPM framework.

There are aspects in this guideline that have been developed for the National Neonatal Network and are not included in the BAPM framework (e.g. the referral process) and minor aspects of the BAPM algorithm have been modified; however the core concepts remain the same.

The recommendations in this guideline represent the view of the National Neonatal Network Guideline Development Group, arrived at after careful consideration of the evidence available. When exercising their clinical judgement, healthcare professionals are expected to take this guidance fully into account, alongside the individual needs, preferences and values of their patients or the people using their service. It is not mandatory to follow the guideline recommendations and it remains the responsibility of the healthcare professional to make decisions appropriate to the circumstances of the individual, in consultation with them and their families and carers or guardian.

The Unexpected Difficult Airway Algorithm is located at the beginning of this document for ease of access. Explanatory notes follow later in the guidance.

Unexpected Difficult Airway

Read all text in **BOLD** aloud to the team:

VERBALISE AS CHALLENGE AND RESPONSE.

Yes/No responses required from team leader

Immediate actions**: We have a difficult airway situation.**

1) Has someone called for expert help?

- Send a specific team member to call for help (numbers below).
- Tell them to state: 'We have a difficult airway situation in (state your location). Please attend immediately'.

  1) .....

  2) .....

  3) .....

2) Has the Difficult Airway Equipment been located and retrieved?

If Not: Retrieve and Open the Difficult Airway Box located at

.....

NOW TURN OVER THIS SHEET AND READ FROM 'PLAN A'

Other information:

Medication for sedation/muscle relaxation: Type/dose.....

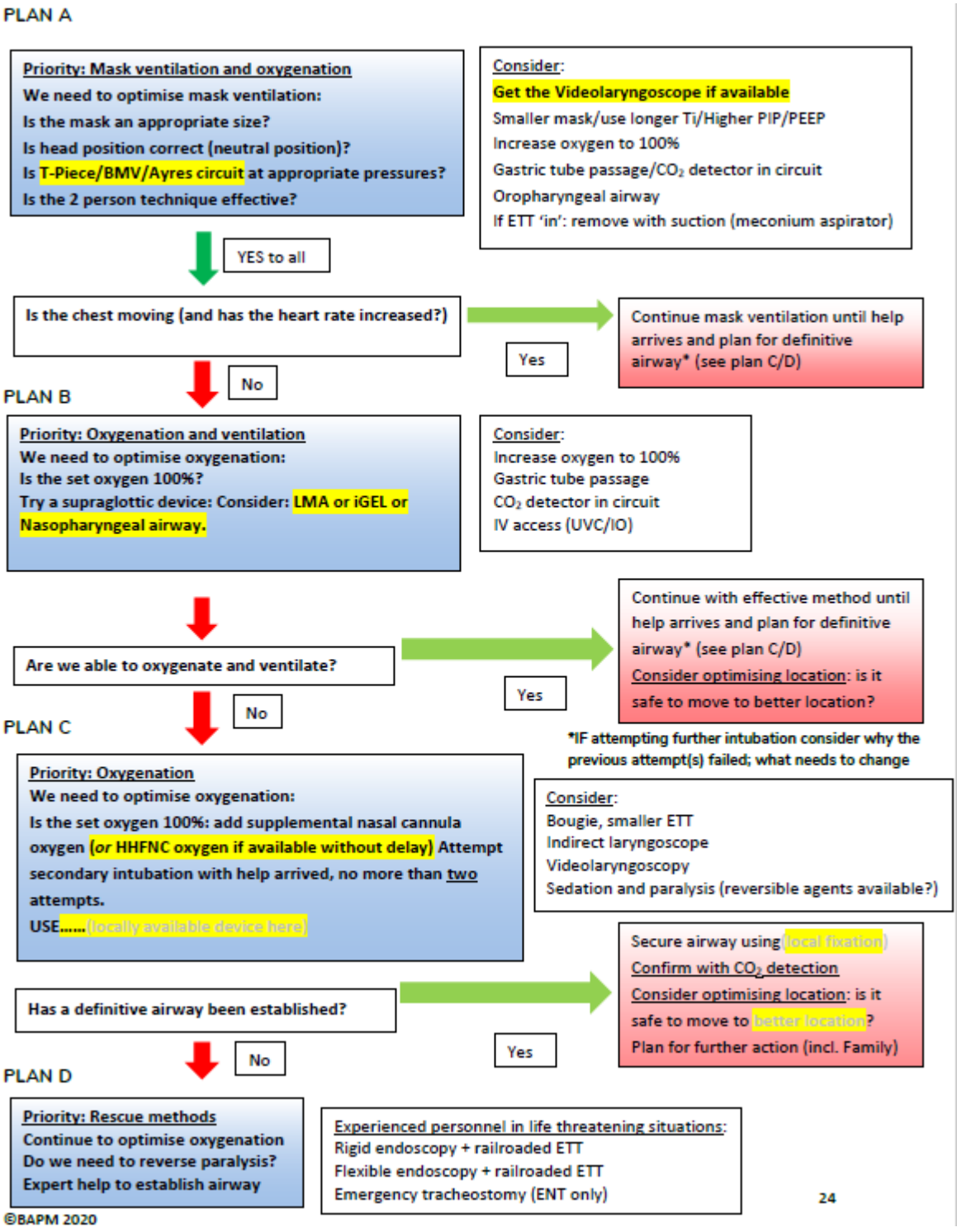
Medication for reversal of sedation/paralysis: Type/dose.....

Location of specific equipment (e.g. ENT scopes, tracheostomy kit)

(what)..... (where).....

.....

To be accessed by contacting ..... on .....


PLAN A
Priority: Mask ventilation and oxygenation
We need to optimise mask ventilation:
Is the mask an appropriate size?
Is head position correct (neutral position)?
Is T-Piece/BMV/Ayres circuit at appropriate pressures?
Is the 2 person technique effective?
Consider:
Get the Videolaryngoscope if available
Smaller mask/use longer Ti/Higher PIP/PEEP
Increase oxygen to 100%
Gastric tube passage/CO2 detector in circuit
Oropharyngeal airway
If ETT 'in': remove with suction (meconium aspirator)
YES to all
Is the chest moving (and has the heart rate increased?)
Yes
Continue mask ventilation until help arrives and plan for definitive airway* (see plan C/D)
No
PLAN B
Priority: Oxygenation and ventilation
We need to optimise oxygenation:
Is the set oxygen 100%?
Try a supraglottic device: Consider: LMA or iGEL or Nasopharyngeal airway.
Consider:
Increase oxygen to 100%
Gastric tube passage
CO2 detector in circuit
IV access (UVC/IO)
Are we able to oxygenate and ventilate?
Yes
Continue with effective method until help arrives and plan for definitive airway* (see plan C/D)
Consider optimising location: is it safe to move to better location?
No
PLAN C
*IF attempting further intubation consider why the previous attempt(s) failed; what needs to change
Priority: Oxygenation
We need to optimise oxygenation:
Is the set oxygen 100%: add supplemental nasal cannula oxygen (or HHFNC oxygen if available without delay) Attempt secondary intubation with help arrived, no more than two attempts.
USE.....(locally available device here)
Consider:
Bougie, smaller ETT
Indirect laryngoscope
Videolaryngoscopy
Sedation and paralysis (reversible agents available?)
Has a definitive airway been established?
Yes
Secure airway using (local fixation)
Confirm with CO2 detection
Consider optimising location: is it safe to move to better location?
Plan for further action (incl. Family)
No
PLAN D
Priority: Rescue methods
Continue to optimise oxygenation
Do we need to reverse paralysis?
Expert help to establish airway
Experienced personnel in life threatening situations:
Rigid endoscopy + railroaded ETT
Flexible endoscopy + railroaded ETT
Emergency tracheostomy (ENT only)

Contents

1. Introduction

This guideline has been developed for teams looking after newborn infants in Scotland. This guideline aims to assist teams in applying the *BAPM Framework for Practice: Managing the Difficult Airway in the Neonate* (https://www.bapm.org/resources/199-managing-the-difficult-airway-in-the-neonate) to their unit and outlining the suggested referral pathway.

Care of the neonate in Scotland happens across a variety of settings which will have their own unique available resources, skill sets and proximity to tertiary centres with specialist teams. Therefore, the importance is on preparedness and knowing where additional support is available. Each unit should have an Airway Lead responsible for applying the algorithm locally, training and clarifying the referral pathway.

Care in the first 10 minutes of life is focused around aeration of the lung[1-3]. Similarly, the mode of arrest in older infants is respiratory and managing the airway is key.

The rapid provision of effective ventilation is the single best predictor of successful neonatal resuscitation[4]. Ineffective ventilatory support leads to hypoxia and increased morbidity and mortality[5]. The primary goal is to adequately oxygenate the baby and ensuring the basics are done well until a definitive airway can be established. Intubation is not always required in order to achieve this. Multiple unsuccessful intubation attempts can further compromise a difficult airway.

A difficult airway situation can arise for a number of reasons; patient factors, environment, available skills and equipment. The occurrence of a truly difficult airway is rare but time critical. Having routinely practiced plans in place gives the best opportunity to manage these situations.

The BAPM Framework for Practice provides a template designed to be adapted locally for responding to an unexpected difficult airway in a stepwise fashion.

2. Equipment

This equipment must be kept in a specific location, be accessible quickly and the neonatal team must know what equipment is available and how to use it. A mobile equipment trolley or box will be useful. Labelling equipment to the corresponding plan (plan A-D) as well as having a photo reference chart can be useful. The equipment must be checked regularly, including after use, by a named member of staff.

I. Basic equipment:

Equipment found on a standard resuscitation trolley.

Different sizes of masks

Bag valve mask

Laryngoscope handles

Miller blades size 00, 0, 1

Endotracheal tubes 2.0, 2.5, 3.0, 3.5

Colorimetric CO2 detector (e.g. pedicap)

ET tube fixator/tapes (unit dependent)

Introducers

Supraglottic airway device (e.g. iGel size 1)

Guedel airway size 00, 0, 1

Yankauer suction catheters

Lubricating gel

Equipment for needle thoracocentesis

Difficult Airway Algorithm

II. Additional Equipment:

The following should be considered in addition to the basic equipment. This will be unit specific depending on local resources/expertise.

Videolaryngoscope

Other Indirect laryngoscopy device (e.g. glidescope)

Different laryngoscope blades (e.g. Macintosh, Robert Shaw)

Neonatal bougie

Magills forceps

Equipment for ENT intubation/surgical airway

3. Airway Lead

Every unit should have a designated Airway Lead who is responsible for ensuring effective implementation of the framework in their centre.

Key responsibilities:

1. Ensuring an easily accessible, effective plan is in place for management of the unexpected difficult airway
    I. Assess available resources and equipment
    II. Liaising with wider hospital medical team to identify appropriate help in the event of a difficult airway
    III. Finalising Local Framework Algorithm
2. Ensuring regular simulation and skills practice are completed
3. Debrief and sharing of learning from cases
4. Identifying a clear referral pathway for infants with a difficult airway where transfer may be appropriate

Ensuring an easily accessible, effective plan is in place for management of the unexpected difficult airway

The Airway Lead will make an assessment of the equipment needed in managing the difficult airway. A basic set of equipment is suggested in this guideline (see section 2). They will be responsible for ensuring that this equipment is maintained and easily accessible. The equipment must be kept in a specific location and clearly labelled. Labelling equipment to the corresponding plan (plan A-D) as well as having a photo reference chart can be useful.

Available resources and skills will vary across sites. The Airway Lead must liaise with the wider medical team and agree who will be available, what skills they can offer and how to contact them in an emergency, for example anaesthetic teams and adult ENT teams. It is recognised that managing the neonatal airway may fall out with normal scope of practice, however, transferable skills may be invaluable in these situations. It is recommended that the Airway Lead offers opportunities for neonatal specific training to be provided to contributing specialities.

This should then be finalised on the Difficult Airway Algorithm which should accompany the equipment and also be easily accessible in clinical areas.

Ensuring regular simulation and skills practice are completed

It is essential that any person involved in managing a difficult airway is aware of the local policy and guidance. The Airway Lead is responsible for ensuring that all team members are familiar with the equipment and know where it is located. There should be regular simulation and skills drills with the neonatal and the wider medical team. Simulation should be used to practice the Algorithm as well as the processes / infrastructure around the wider team. It is recommended that difficult airway simulation occurs a minimum of every 6 months.

Debrief and sharing of learning from cases

Cases of manging difficult airway occur infrequently therefore, sharing learning throughout the Scottish Perinatal Network and specialist teams is paramount to improving processes. It is recommended that this occurs on a regular basis.

Identifying a clear referral pathway for infants with a difficult airway where transfer may be appropriate

Available resources and specialist teams will vary across Scotland. Centres with on-site paediatric ENT will have a different referral process from those without. A suggested referral process is outlined in this guidance. The Airway Lead is responsible for clarifying this process in their local region.

4. Difficult Airway Algorithm Notes

The Algorithm is located at the front of this guideline: Unexpected Difficult Airway

- There are many factors that may contribute to a situation becoming a difficult airway scenario (patient factors, environment, staff, available equipment).
- The focus should be on early identification and activation of the algorithm.
- A suggested trigger to activate the algorithm is if an experienced clinician has had up to two attempts and fails to intubate or judges the airway to be difficult.
- What constitutes an experienced clinician will differ between centres and is down to the local team to decide at what threshold the algorithm is activated. We recommend that this is a Consultant Neonatologist or Paediatrician.
- The yellow boxes in the following Algorithm should be modified by the Local Airway Lead to fit available resources.
- The Airway Lead should clarify the roles and expectations of support offered by all specialist teams involved in the Algorithm.
- The Algorithm is designed for the challenge and response technique whereby a member of the team vocalises the statements in a stepwise manner, with each question/statement is met with a response.
- The Algorithm follows an A-D format
    - Plan A: Optimise the basics + summon help
    - Plan B: Alternate means to oxygenate/ventilate
    - Plan C: Optimise oxygenation if ventilation challenging + reduce trauma
    - Plan D: Expert help to secure airway
- Plan D should only be attempted by trained surgical personnel. Neonatologists should **not** perform Front of Neck Access (FONA).
- In life threatening situations it is justified for local ENT teams to attempt FONA, acknowledging that this falls out with normal scope of practice.

5. Referral Process

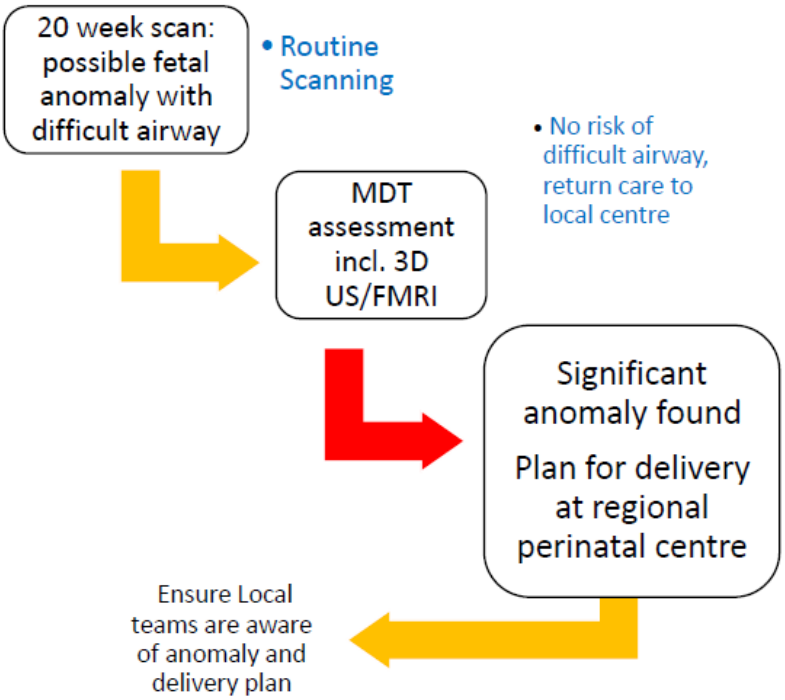
Difficult Airways will fall into 2 pathways; anticipated and unexpected.

Anticipated Difficult Airway

When a difficult airway is anticipated before birth, it is essential that a birth plan is agreed with parents for delivery at a centre with appropriately skilled practitioners and equipment.

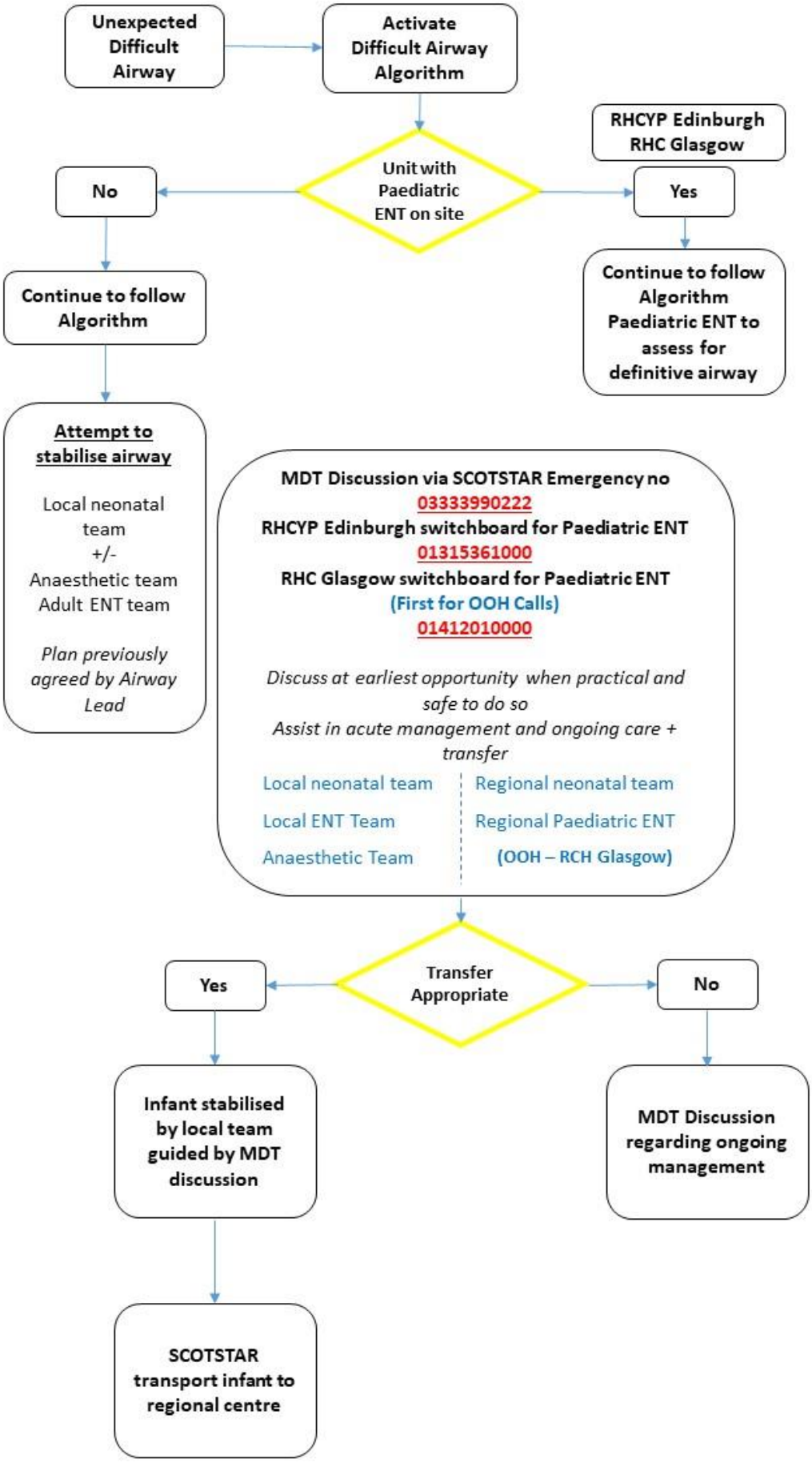
Aspects to be covered in any anticipatory plan must include:

- Planned place and mode of delivery
- Staff to be alerted and equipment prepared for delivery
- Contingency plans in the event of an unplanned delivery due to unexpected complications
- Consideration of hospice/palliative care team involvement if appropriate
- Consideration of extended admission to the planned maternity unit (in advance of delivery) if - for example - significant polyhydramnios develops, increasing the risk of preterm delivery and/or membrane rupture



Unexpected Difficult Airway

- The Airway Lead should identify what resources and skills are availble to assist in stabilisation of the unexpected difficult airway. (See Algorithm).
- Early MDT discussion should be had when safe and practical via Scotstar Emergency referral line. This can assist in acute management and transfer. This should be with the local teams involved in stabilising the airway as well as regional neonatology and Paediatric ENT.
- It is recommended that Out of hours (OOH) referrals are directed towards RHC Glasgow in the first instance. Due to the potential complexity of these infants presentations and to avoid delays in optaining specialist advice. RHC Glasgow has on call Paediatric ENT, The National ECMO service and Paediatric Cardiac Service on site
    - RHCYP Edinburgh OOH ENT provision is adult/paediatric crosscover therefore a Paediatric ENT team is not always available. It is recommended that these cases be discussed with Paediatric ENT at Glasgow.
- To achieve the best possible outcome, stabilisation and transfer to a regional centre with Paediatric ENT is recommended.
- When this is not possible in an emergency situation, local ENT should attempt to achieve a definitive airway if indicated. It is recognised that this falls outwith scope of routine practice, however, due to the exeptional life-threatening circumstance can be justified. *(This has been agreed by the multidisciplinary team involved in this guideline development).*
- The following is the suggested referral pathway in Scotland. It is the Airway Leads' responsibility to clarify this with the teams that would be involved.


Unexpected Difficult Airway
Activate Difficult Airway Algorithm
Unit with Paediatric ENT on site
RHCYP Edinburgh
RHC Glasgow
Yes
No
Continue to follow Algorithm Paediatric ENT to assess for definitive airway
Continue to follow Algorithm
Attempt to stabilise airway
Local neonatal team
+/-
Anaesthetic team
Adult ENT team
Plan previously agreed by Airway Lead
MDT Discussion via SCOTSTAR Emergency no
03333990222
RHCYP Edinburgh switchboard for Paediatric ENT
01315361000
RHC Glasgow switchboard for Paediatric ENT
(First for OOH Calls)
01412010000
Discuss at earliest opportunity when practical and safe to do so
Assist in acute management and ongoing care + transfer
Local neonatal team
Local ENT Team
Anaesthetic Team
Regional neonatal team
Regional Paediatric ENT
(OOH – RCH Glasgow)
Transfer Appropriate
Yes
No
Infant stabilised by local team guided by MDT discussion
MDT Discussion regarding ongoing management
SCOTSTAR transport infant to regional centre

6. References

1. Wyllie J, Ainsworth S, Tinnion R, Hampshire S (Eds) (2015); *Newborn Life Support Course (aims) in Newborn Life Support (4th Edition)*, London, Resuscitation Council UK: p1.
2. Hooper SB, Kitchen MJ, Polglase GR, Roehr CC, Te Pas AB. The physiology of neonatal resuscitation *Curr Opin Pediatr*. 2018 Apr;30(2):187-191.
3. Hooper SB, Te Pas AB, Kitchen MJ. Respiratory transition in the newborn: a three-phase process. *Arch Dis Child Fetal Neonatal Ed*. 2016 May;101(3):F266-71.
4. Kattwinkel J. *Textbook of Neonatal Resuscitation. 4th Edition*. Illinois. American Academy of Pediatrics: 2000.
5. Johansen L.C., Mupanemunda R.H., Danha R.F. Managing the newborn infant with a difficult airway. *Infant* 2012; 8(4): 116-19.

Appendix 1: Guideline Development Group Membership

Thomas Marriage, Consultant Neonatologist, NHS GGC, ScotSTAR Neonatal Transport (Chair)

Andrew MacLaren, Consultant Neonatologist, ScotSTAR Neonatal Transport, NHS GGC

Kirsty Bates, Complex Airway Nurse Specialist, NHS GGC

Shetty Bhushan, Consultant Neonatologist, NHS Tayside

Andy Clement, Consultant Paediatric ENT Surgeon, NHS GGC

Matthew Corr, Paediatric Registrar, NHS Lothian

Omayma Hemida, Locum Consultant Neonatologist, NHS Grampian

Lesley Jackson, Consultant Neonatologist, NHS GGC, Clinical Lead SPN NNN

Ewen Johnston, Consultant Neonatologist, NHS Lothian

Carsten Mandt, Senior Programme Manager, Scottish Perinatal Network

Simon McKean, Consultant ENT Surgeon, NHS Highland

Susanna Mendes, Programme Manager, National Neonatal Network

Joyce O'Shea, Consultant Neonatologist, NHS GGC

Jennifer Reekie, Paediatric Registrar, NHS Tayside

Lyndsey Stewart, Advanced Neonatal Nurse Practitioner (ANNP), ScotSTAR

Saulius Satas, Consultant Neonatologist NHS Grampian

Roberta Shanks, Programme Support Officer, National Neonatal Network

Emma Thompson, Programme Manager, National Neonatal Network

Philine Van Der Heide, Consultant Neonatologist, NHS Highland

Asma Yasmeen, Consultant Neonatologist, NHS Fife