



British Association of
Perinatal Medicine



Managing the Difficult Airway in the Neonate

A Framework for Practice

October 2020

Cover Photo: Photo shows a baby with a difficult airway being ventilated using a supraglottic airway device and is published with parental consent. Published with kind permission of Joyce O'Shea

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Working Group Members

Framework authors

Robert Tinnion (chair), Consultant Neonatologist, Newcastle Hospitals NHS Trust

Steven Powell, Consultant Paediatric Otolaryngologist, British Association for Paediatric Otolaryngology

Stephanie Bew – Consultant Paediatric Anaesthetist, Association of Paediatric Anaesthetists

Dan Gilpin, Consultant Paediatric Anaesthetist, Embrace/PIC transport services

Jonathan Cusack, Consultant Neonatologist, Neonatology/Resuscitation Council UK as ARNI subcommittee members

Ruksana Patel, ANNP, NNS and NNA

Claire Keeling, Paediatric Specialty Trainee

Matt Thomas, Consultant in Paediatric Respiratory Medicine, British Paediatric Respiratory Society (BPRS) TBC

David Bartle, Consultant Paediatrician and Neonatal Clinical Lead, Centre for Women's Health, Exeter

Andrew CG Breeze, Consultant in Obstetrics, Subspecialist in Maternal & Fetal Medicine, Leeds Teaching Hospitals NHS Trust, Working Group Representative for BMFMS.

Kate Dinwiddy (Secretary), Chief Executive, BAPM

Extended working group members

Barry McGuire, Consultant Paediatric Anaesthetist, Difficult Airways Society

Alok Sharma, Consultant Neonatologist, University Hospital Southampton

Carmel Cassar, Consultant Paediatric Anaesthetist, Paediatric Airway lead (Royal London Hospital) and Tutor on GOS Paediatric Difficult Airway course.

Renuka Arumainathan, Paediatric Anaesthesia Research Fellow, Royal London Hospital

Katie Misselbrook, Anaesthetic Specialty Trainee

Andrew MacLaren, Locum Consultant Neonatologist, Royal Hospital for Children, Glasgow & ScotSTAR Neonatal Transport Team

Executive Summary

This framework makes the following recommendations:

1. Every centre caring for the neonate should have an agreed approach to management of the difficult airway.
2. Difficult airway equipment should be readily available and members of the team familiar with its use.
3. Regular simulation is recommended to practise response to a difficult neonatal airway, with consideration of both technical and human factors.
4. Any centre where babies are delivered should have a designated neonatal airway lead
5. When airway problems are suspected antenatally and delivery planned in a specialist centre written information, including plans for emergency delivery, should be provided both to the family and to other centres where delivery may occur.

Introduction

Care of the neonate occurs in a wide variety of clinical and non-clinical settings. Each setting presents its own logistic challenges and uniquely available resources in the management of both expected and unexpected difficult airway.

Care in the first ten minutes of life is focussed around aeration of the lung¹⁻³ and any problem in effectively opening and maintaining the airway is immediately problematic. Similarly, the mode of arrest in the older neonate is usually respiratory and so managing the airway is key. The occurrence of a truly difficult airway is rare but time-critical. In any centre looking after neonates there has to be a clearly defined, in-house approach to this emergency as there will be little or no chance of help arriving from outside the centre in time to preserve life.

Experience from anaesthesia confirms that having routinely practised plans in place for managing the difficult airway gives the best opportunity for appropriate response to the technical and non-technical stresses of a difficult airway situation.

It is acknowledged that different resources will be available in different settings and that historically different organisations have overseen and provided guidance to different groups of practitioners addressing management of the difficult airway at different ages of patient. We are grateful for the input from the Difficult Airways Society (DAS), amongst others, to this document.

This Framework for Practice provides a template designed to be adapted locally for use in responding to the difficult neonatal airway in a stepwise fashion. The algorithm generated should be used in drills and simulation settings to allow the clinical team to practise their response to a difficult airway if it arises.

All specialty teams who will be involved in delivering the algorithm in the situation that a difficult neonatal airway situation arises should agree, as part of the finalisation of the algorithm to be followed, whether their roles as defined on the final algorithm fall within what would be considered usual scope of practice. Where utilising transferrable airway skills from practice in older patients is proposed outside of normal scope of practice but justifiable by exceptional (life-threatening) circumstances, discussions of boundaries of practice should be completed before the algorithm is finalised. An example might be the role of an obstetric anaesthetist: they may be able to help with transferrable airway skills, but their primary clinical responsibility remains with the mother.

In such cases of potential conflict of responsibility, or practice outside the normal scope of practice, advice and requirements from the relevant professional governing bodies should be taken into account. It is the responsibility of the designated Neonatal Airway Lead to ensure opportunity is provided for those contributing specialties who might provide transferrable skills to have neonatal specific training and simulation on a regular basis.

Process and Scope of Framework

This Framework for Practice has been compiled by a multidisciplinary working group drawn from a variety of specialist societies with expertise and interest in managing the difficult airway.

This Framework for Practice primarily provides an approach to the *unanticipated difficult airway in neonates* (post-menstrual age up to 44 weeks) although many of the principles will be relevant to older infants.

While uncommon, any 'routine' intubation may evolve into an unexpectedly difficult airway situation and the entire neonatal team should be aware of appropriate escalation procedures.

Where there has been a formal antenatal diagnosis or there exist high levels of suspicion of a difficult airway at birth there should be multidisciplinary planning, including the need for ENT/respiratory teams at delivery and consideration of use of specialist peripartum techniques such as an EXIT procedure. This Framework for Practice is not intended to replace antenatal planning but may be used in conjunction with existing clinical experience to facilitate such planning.

We have included some information about antenatal diagnosis of the difficult airway, both for interest and because it is possible that a baby planned for delivery in a specialist centre may be delivered unexpectedly elsewhere.

Background

There are currently no set national guidelines for management of the difficult airway in neonates, though guidelines do exist for management of the difficult airway in paediatric and adult age-groups through the Difficult Airways Society. The difficult airway situation arises most frequently in older age groups at intubation for surgical procedures, thus is generally in a controlled and well-resourced environment. In the neonate, especially at birth, the need for intubation may be unexpected and in a situation where expert airway skills are not immediately available.

With better midwifery and obstetric care and increasing use of non-invasive respiratory support, neonatal practitioners have less opportunity to practise and develop skills in advanced airway management

Anatomical Differences Between the Neonate and Older Children

The respiratory tract shares a common embryological origin with the foregut, branching from the endoderm to form the respiratory bud around 5-7 weeks of gestation. The 'airway' relevant to management of the difficult airway (from lips and nostrils to carina) is recognisably formed by these gestations.

The key differences between the neonatal airway and that of older children/adults are⁷:

- Neonates are preferential nasal breathers but can breathe through the mouth, though not enough to sustain effective breathing with concurrent nasal occlusion.
- The tongue is relatively larger. Congenital macroglossia and/or micrognathia, and/or clefting of the palate may all allow the tongue to obstruct both oro- and/or nasopharynx simultaneously.

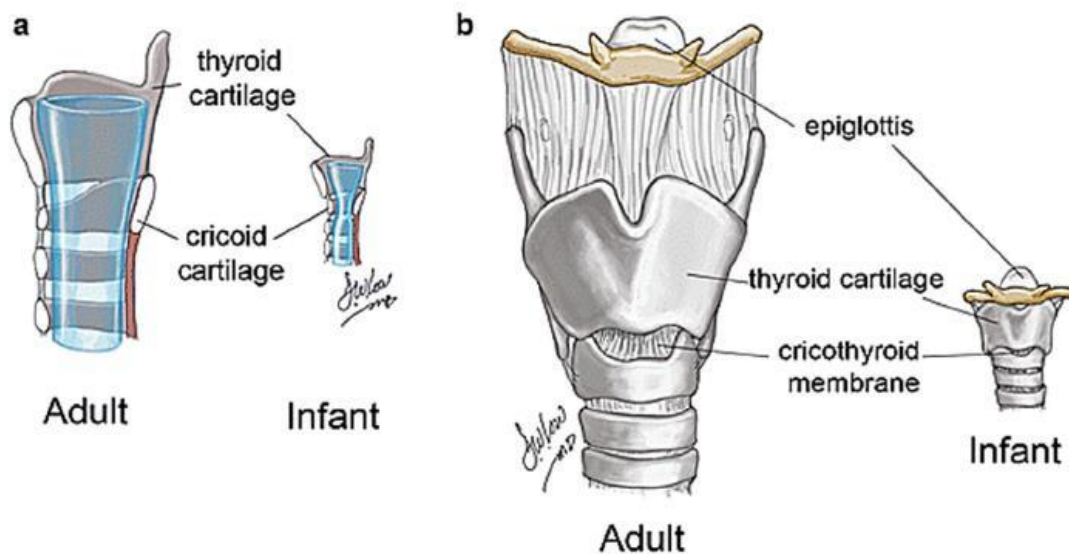


Figure 1: Anatomical comparison of the adult and infant airway. Published with kind permission of Dr Lioy.

- The epiglottis is proportionally longer, narrower, larger, and less flexible; often described as 'omega' shaped. This shape combined with short aryepiglottic folds may lead to inspiratory collapse of the upper airway to the point of obstruction (laryngomalacia).
- The larynx lies higher relative to the cervical vertebrae (descending to lie in the 'adult' position by around 6 years of age)
- The intrinsic laryngeal shape differs, being 'cone-shaped' with the narrowest point at the level of the cricoid cartilage (rather than at the glottis opening as in older

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patients).

- Immaturity of the tracheal cartilage rings may allow collapse and obstruction of the airway during inspiration (tracheomalacia).
- Long term ventilation of preterm babies may cause inflammatory change/granulation below the level of the glottis, narrowing the airway
- Small size: the neonatal trachea has a very small diameter so even tiny amounts of debris (blood, vernix, mucus, meconium) may occlude the lumen either partially (but to the point of severely restricting gas flow to the lungs) or completely.

Both laryngeal position and tracheal flexibility explain the importance of aiming for a 'neutral' head position when positioning the neonate for mask ventilation, and why not doing so risks inducing airway obstruction.

The difficult airway

A 'difficult airway' may be defined as "...a clinical situation in which a trained practitioner experiences difficulty with face mask ventilation, difficulty with tracheal intubation, or both"⁹.

Around 1-2 per 1000 liveborn babies will require some assistance in breathing to transition successfully, and of these between 2-10% may not respond to mask ventilation leading to an attempt at intubation^{16,17}. Fortunately intrauterine preparation for birth (at full term) offers significant physiological adaptation to sustained hypoxia, offering potential for some resilience in the circumstance of a difficult airway problem¹³⁻¹⁵. Unwell babies at delivery may however have less physiological reserve, particularly if they lack innate respiratory effort¹³⁻¹⁵.

Airway adjuncts may help the practitioner to manage the neonatal airway, including when tracheal intubation has not been possible. Airway adjuncts include video laryngoscopes¹⁸ and supraglottic airway devices such as the laryngeal mask airway (LMA)¹⁹. Such adjuncts are emerging technologies in the neonate^{20,21} with evidence to support neonatal use increasing as companies manufacture equipment suitable for use at term and earlier gestations²²⁻²⁴.

Practices in managing intubation of babies differ significantly, and a difficult airways plan is not present universally across UK paediatric and neonatal intensive care unit (NICU) settings^{26,27}. Whitby et al²⁸ estimated that only 2/3 of neonatal units (NNU) had specific difficult airways equipment available and only 4 of 60 had a specific 'can't intubate, can't ventilate policy' (more correctly referred to as 'can't intubate/can't oxygenate'). Variation in practice is particularly apparent in approaches to the number of intubation attempts by one practitioner^{11,29}. There is an increasing awareness of the importance of human factors including task fixation and systems optimisation in successful preparation for, and dealing with, the difficult airway situation²⁵.

If the most senior experienced practitioner present is unable to stabilise the airway of a neonate urgent assistance should be sought if practicable. Few NNUs will have immediate access to an ENT surgeon¹¹ or a paediatric respiratory specialist but most hospitals will have an anaesthetist present in the building who could be enlisted to help in emergencies.

Anticipating the difficult neonatal airway

There are broadly two instances where there is opportunity for a difficult airway to be anticipated in the neonate:

At time of planned airway intervention, especially intubation or extubation.

Babies most at risk include extremely preterm infants intubated for long periods of time, those who have had surgery (e.g. PDA ligation) and those who have grown poorly.

Any planned intubation or extubation is an opportunity to anticipate and plan for a difficult airway. A standardised approach to management of the airway, including the difficult airway and 'can't intubate/can't oxygenate' situation, reduces the number of critical incidents during intubation. All neonates who need to be intubated for planned procedures should be considered at risk of having a difficult airway, although in practice this is rare.

An 'extubation checklist' approach is as important as an 'intubation checklist'.

Antenatally diagnosed problems impacting the airway (anatomical and/or neuromuscular)

Difficult airways may (in order of likelihood) be due to:

1. External airway compression from neck masses
2. Structural compromise to the airway
3. Craniofacial structural abnormalities including cleft palate, cranial dysostosis and syndromes affecting maxillofacial structures³¹
4. Neuromuscular abnormalities

A 'trigger list' of diagnoses where difficulty with the airway during provision of respiratory support should be anticipated is provided in the resource materials document. When these conditions are diagnosed or suspected, extra care should be taken to plan for management of the difficult airway if required.

The unanticipated difficult neonatal airway: algorithm and guidance

Defining a 'difficult airway situation'

There is no absolute as to when a difficult airway situation might or should be declared. Factors which influence this declaration include:

- Environment in which the situation occurs
- Staff present
- Patient factors (gestation, aetiology of the difficulty)
- Equipment available

In the context of the unexpected difficult neonatal airway, it is likely that first responders will be trained in simple airway management (mask techniques, airway suction and possibly oropharyngeal airway use) as the principles of the Newborn Life Support algorithm (RCUK) are well known and adopted throughout the UK. More skilled help (such as proficient use of supraglottic devices or tracheal intubation) is more likely to be immediately available in busier NNUs or paediatric theatres. The majority of neonates in a delivery suite with apparent airway issues will be well served by these.

Additional help may come from those with specific airway expertise outside neonatal practice such as anaesthetists, respiratory paediatricians or ENT surgeons practised in utilising highly specialised equipment to instrument the airway. This help is unlikely to be immediately available in the majority of NNUs.

It is recommended that:

If an experienced clinician has had **up to two** intubation attempts but failed to intubate, **or** judges the airway to be a difficult airway, declare **“this is a difficult airway situation with failed intubation”** and proceed to activate the **difficult airway algorithm**.

Local centres will set their own thresholds for what locally constitutes the 'experienced' clinician, in order that the difficult airway algorithm is triggered at the appropriate time. Examples of an appropriately experienced clinician might typically include a consultant neonatologist, a senior doctor in specialty neonatal training such as a neonatal GRID trainee at ST7/8 level (or equivalent non-career grade doctor) or a consultant paediatrician with neonatal airway skills.

While all UK hospitals with medical cover will have on call support from a neonatal consultant or general paediatrician, it will not be practical for this senior cover to be

immediately available 24 hours a day. This will impact both the threshold for activating the difficult airway algorithm and the nature and speed of response which can be mounted.

Implementing the Difficult Airway Framework Algorithm

The Difficult Airway Algorithm Template should be adapted to individual centres' circumstances to provide a sensible, stepwise structure to the process management of the difficult neonatal airway in the acute situation.

It is recommended that:

A designated local Neonatal Airway Lead should take responsibility for ensuring effective implementation of the Framework in their centre.

The key responsibilities of the local Neonatal Airway Lead are:

- 1) Ensuring an easily accessible, effective plan is in place for management of the unexpectedly difficult neonatal airway
- 2) Liaising regularly with the wider hospital medical team as appropriate to facilitate help in the event of a difficult airway
- 3) Ensuring regular simulation and skills practice are completed
- 4) Communication of plans to all relevant teams, for management at birth when a difficult airway is suspected antenatally
- 5) Debrief and case review following management of a difficult airway

For the difficult airway template to work effectively in an emergency situation, three preparatory steps must have occurred:

- **Assessing resources available**
- **Compiling equipment and finalising the local Framework Algorithm**
- **Training, simulation, and debriefing**

Assessing resources

In settings with specialist services available (such as hospitals with neonatal, paediatric and maternity services at regional or supraregional level) the key aspects of resource identification centre on how to get the expertise and equipment into the room when needed in an emergency.

In settings without such specialist support (for example a NNU in a district general hospital) there will be need to consider what equipment/personnel might be available in the hospital and how to move it to the neonatal area in an emergency. Wherever possible, equipment

common to different areas of practice should be utilised as this widens the pool of people who may be able to use it. For example, if a specific supraglottic airway device is used in adult theatres and intensive care areas in a local hospital, then it will be advantageous for the NNU planning for the neonatal difficult airway to use the same make of device. Thinking outside the immediate environment may yield access to expertise and equipment not previously considered.

The timescales involved in addressing a difficult airway mean that for non-specialist centres, relying on attendance of a regional transport or surgical team should not be considered an acceptable solution to the problem.

Compiling equipment and the local Framework Algorithm

The difficult airway equipment must be kept together (e.g. in a specific box), in a safe location, regularly checked and clearly labelled. Plastic, anti-tamper seals with labels may be used to ensure that equipment remains intact following routine checking. There must be an agreed frequency of checking the equipment and agreement as to who is responsible for this check to allow it to be built into a departmental routine.

It is helpful to ensure that the equipment for each Plan (A to D) is labelled and easily accessible. Drawers can be effective in laying out equipment in this fashion but are harder to seal. To aid retrieval of equipment in the emergency situation, a photo-reference chart such as that in the template may be kept inside the difficult airway box. As equipment, practice and staff change, the airway lead is responsible for updating the algorithm and photo-reference chart.

It is recommended that laminated copies of the Framework Algorithm are kept in relevant clinical areas such that there is further direction to the difficult airway box which is not reliant on having the box in hand.

The Framework Algorithm

Appendix 1 provides a template algorithm:

- Location of the Difficult Airway box (if not kept with the algorithm)
- Key telephone numbers for expert help to be contacted together with agreed 'trigger' phraseology to guarantee a response
- Medications including doses which might be needed sedation/paralysis/reversal
- Details of equipment to be brought from other areas in the hospital and how to obtain them (e.g. tracheostomy equipment, rigid bronchoscopes, indirect laryngoscopes)

Modifying the Framework Algorithm for a local centre

The Framework Algorithm should be modified at a local level to fit the available resources, but key aspects should not be changed. This means personnel moving between centres are

broadly familiar with the layout.

The colour scheme used for the Algorithm template is similar to that used for the Difficult Airways Society (DAS) guidelines which will be familiar to anaesthetic colleagues and should be easily copied in black and white if colour is not available.

In the coloured boxes, any text highlighted in yellow can be amended to reflect the locally available equipment.

Challenge and Response

The Framework Algorithm template is written specifically to make use of 'challenge and response' technique during a difficult airway situation. Conventional checklists with inherent pauses do not work well in rare, high-stress situations.

The challenge and response paradigm relies on one team member speaking set text (most often questions/statements) out loud to the team (challenge) in a stepwise fashion. Each question requires confirmation (yes/no) at each stage, ensuring that the team moves forward through escalating levels of care in a coordinated way. The Framework Algorithm is therefore an active intervention rather than a reference tool

In the Algorithm plans A-D should be worked through sequentially:

- Plan A is designed to ensure the basics are being done optimally and set in motion the process of getting help
- Plan B is designed to encourage thinking about alternative means to ventilate/deliver oxygen
- Plan C is designed to optimise oxygenation if ventilation is difficult and to prompt minimising airway trauma from repeated attempts while further help arrives
- Plan D is the final step, utilising expert help to secure the airway

Training, simulation and debriefing

It is essential that any person involved in managing a neonatal airway is aware of the local policy and difficult airway guidance. The allocated Neonatal Airway Lead for the clinical area is responsible for setting up the equipment and ensuring team knowledge and training on relevant airway equipment.

There should be regular skills training so that all team members are familiar with the equipment to be used. In addition, simulation should be used, focussed at testing processes and infrastructure across clinical teams. Effective delivery from the MDT should be practised and not presumed. It is well evidenced that neonatal airway skills and fluency decrease with increased length of time between rehearsals/exposure^{38,39} therefore it is recommended that there should be no more than a maximum of 6 months between simulated difficult airways drills. The responsibility for ensuring that skills teaching and regular simulation occur lies with the local Neonatal Airway Lead.

A 'hub and spoke' model for training local teams using the regional airway teams has been used successfully in the South of England (the Make the Airway Safe Team) to equip non-specialist centres with skills to manage the unexpected difficult airway, built around regular updates and collaborative in-situ simulation with the multidisciplinary team identified for these emergencies³³

In line with practice recommendations around debriefing from life support organisations such as the Resuscitation Council (UK), Advanced Life Support Group, and the Difficult Airways Society, any situation in which a difficult airway is declared/experienced should be debriefed appropriately and formally reviewed. This is key to ensuring that the process in place locally worked and was followed, any learning from the event is shared and appropriate changes to process implemented. The conduct of these reviews and dissemination of learning falls under the remit of the Neonatal Airway lead in each centre.

Equipment and Human Factors

This Framework recognises that good management of a time-critical emergency requires the team to be well organised, well drilled, and familiar with the equipment they will be using³³. The human factors which impact the teamworking and team performance include organisational and individual factors; these are discussed in more detail in the resource materials document. Multidisciplinary simulation and education are key to testing the systems, equipment and deployment of the team and will identify areas where human factors require modification of the process. Some of the specific human factors relevant to deploying the algorithm in the Framework, such as when to declare the emergency, using 'challenge and response', identifying an airway lead, and organising the difficult airway equipment are discussed.

The resource materials document contains a detailed review of equipment available for management of the difficult airway. The following should be considered for addition to the basic equipment³⁴ depending on local resources/expertise:

- Specific difficult airway plan (the Algorithm from this Framework)
- Supraglottic Airway Devices
- Different Types of laryngoscope blade for laryngoscope (e.g. Macintosh, Seward)
- Neonatal Bougies/Magill's Forceps/small ET tubes (2.0mm ID)
- Indirect laryngoscope system
- Access to a videolaryngoscope system
- Access to medicines for intubation
- Equipment for ENT intubation and/or surgical airway

The key is ensuring that this equipment, if available within the care setting can be obtained in a timely fashion and used effectively in an emergency.

Front of neck airway (FONA)^{35,36}

- Neonatal airway anatomy, the shortness of the neonatal neck and the relative thickness of the anterior neck tissues mean that establishing a front of neck airway is difficult.
- In neonates, scalpel cricothyroidotomy is not possible owing to the inadequate size of the cricothyroid membrane and neonatal subglottis. Needle cricothyroidotomy will neither be successful or effective in the neonate for the same reasons.
- Under general anaesthetic, in optimal conditions, an elective surgical airway (tracheostomy) done by expert hands can be challenging but is technically possible in neonates who weigh >1.5kg. In the emergency 'can't intubate, can't oxygenate' situation in non-optimal operating conditions, the added stressors and time pressure will reduce the chances of success even with the same expert operator. **If tracheostomy is an option in 'Plan D' it must only be attempted by appropriately trained and experienced surgical personnel.**

FONA is therefore NOT RECOMMENDED as an option (planned or ad-hoc) for the management of a difficult neonatal airway in any setting outside a centre which has an established paediatric ENT surgery service.

The role of drugs in the difficult airway

- If a difficult airway is anticipated, decisions around medication and preparation of drugs should be made in advance. However, difficulty may only become apparent after sedation +/- anaesthesia and/or muscle relaxants have already been given.
- Teams should have agreed protocols for which agents, if any, they will use in the context of the difficult airway. In principle, agents chosen should be easily administered, quick acting to achieve adequate sedation and paralysis as needed, and either relatively short-acting or reversible. Staff must ensure familiarity with and competence in using any medicine chosen.
- Adequate doses of muscle relaxants will ensure paralysis and optimise intubating conditions with no risk of laryngospasm. Mask ventilation may be made easier by using muscle relaxants but if there is doubt about the ability to maintain mask ventilation after paralysis, **muscle relaxants should not be used**, and spontaneous ventilation maintained. Such decisions will depend on individual circumstances including assessment of the airway difficulty, and the skills and experience of the clinicians present.
- In the emergency where intubation and all other attempts at oxygenation have failed, muscle relaxants should be given if not already used. Paralysis may improve both mask seal and airway adjunct efficiency, resolve laryngospasm, and optimise intubating conditions.

In very rare situations in the newborn, there might be circumstances where administration of a paralytic agent unmasks an anatomically difficult airway (for example tracheal stenosis or atresia with ventilation maintained to a degree by spontaneous breathing via an oesophageal fistula). Reversing neuromuscular blockade (as listed to be considered at plan 'D') is unlikely to help most babies, but there might be one or two where the option to allow the baby to breathe spontaneously again may help.

Antenatal diagnosis and prediction

When a difficult airway is anticipated before birth, it is essential that an antenatal birth plan is agreed with parents for delivery at centre with appropriately skilled practitioners and equipment¹⁷.

Fetal anomaly indicative of a potential airway problem is most likely to be diagnosed at the routine fetal anomaly scan at around 18-22 weeks of gestation. Occasionally a later scan for maternal reassurance or for unexpected development such as polyhydramnios may suggest a potential airway problem. Rarely, fetal interventions (such as placement of an endotracheal balloon in utero to treat fetal diaphragmatic hernia) may lead to a compromised airway at delivery.

Maternity units suspicious of a fetal anomaly will generally refer the mother for review in a regional fetal medicine centre. Here multimodal, multi-disciplinary team assessment utilising three-dimensional ultrasound, and/or fetal MRI may be used to characterise the abnormality as precisely as possible and assess the implications for airway management at birth. It is essential that a multi-disciplinary, anticipatory plan of airway management is drawn up between specialities relevant to the situation at hand including, but not limited to, fetal medicine, obstetrics, neonatology, paediatric ENT, paediatric respiratory medicine, neurology, and anaesthetics. A genetic diagnosis may be helpful but will not necessarily make management of the neonate's airway any more certain.

Parents must be active partners in this planning process. The implications of the suspected anomaly, including interventions at or after birth and the likely clinical course must be fully explained to parents. Parents should be fully aware of the anticipatory planning at all stages and they must give agreement for any planned management. Not all perinatal centres will provide specialist care for babies with potential airway problems and so within each region, there should exist clear regional referral pathways to optimise the likelihood that babies needing specialist airway intervention at, or soon after birth receive this. Where a referral is made to a regional or supraregional centre in anticipation of managing a difficult airway at birth, the parents should meet the team in these centres as part of defining an agreed anticipatory plan.

Aspects to be covered in any anticipatory plan must include:

- Planned place and mode of delivery
- Staff and equipment to be alerted and/or to be present at the time of birth
- 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

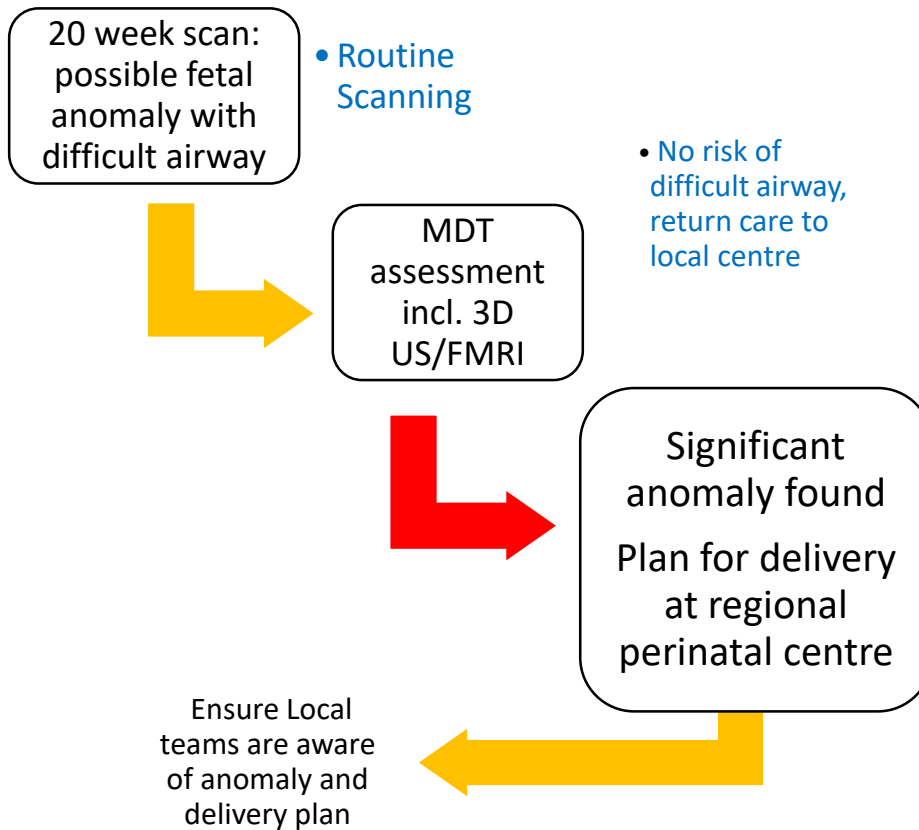


Figure 2: flowchart for assessment on antenatally anomaly suspected to include a difficult airway

In some instances, a plan for delivery and stabilisation while the fetus/neonate is being oxygenated via the placental circulation will be considered - the “Ex-utero Intrapartum Treatment” or ExIT procedure. Regional perinatal centres should develop their own guidelines and protocols, linking into their local maternity network, for occasions when a fetus that may be a candidate for this procedure is identified. In some instances this may mean care being shared with another centre if staff experience in such a procedure is limited. Centralisation of these procedures and designating a specific ‘ExIT team’ may help to concentrate expertise in performing these procedures. For a summary of antenatal care including ExIT, see Ryan, Somme and Crombleholme³².

Consideration of the Family

Family integrated/centred care should be central to the ethos of care in all NNUs³⁷. Involving the family in their baby's care encourages bonding and confidence and may shorten time to discharge home. In situations where life is limited, family integrated care is key to ensuring families can optimise the quality of their time with their baby. Three opportunities for involving the wider family in the management of a difficult airway present themselves.

Antenatal detection: the family should be counselled honestly and openly and be aware of the full spectrum of appropriate options. This may include a palliative approach, expectant assessment with palliative option, or full intervention as far as is possible. Parents' wishes within these possible options must be included in delivering a holistic approach around delivery. Where, with appropriate liaison with the specialist centre, it has been agreed that palliative care is the best option for the baby and their family, it may be appropriate for the baby to deliver in a local centre.

Where an unexpected difficult airway is found immediate management will be directed to the baby. During this process, if possible, a knowledgeable member of staff should keep parents informed. Evidence shows that many parents benefit from witnessing resuscitative attempts in later processing of grief where resuscitation was unsuccessful. In the circumstances of an unmanageable airway, the parents must be involved in the process of ceasing attempts at life-sustaining treatment in favour of ongoing comfort care.

When moving to intensive care setting for ongoing care: teams should ensure as far as possible delivery of family integrated care, but with sensible and consistently-applied modifications to ensure that the secured airway is protected (e.g. modifying the timing of skin-to-skin contact).

Ongoing patient management

Once the difficult airway has been overcome, the first priority after ensuring ongoing oxygenation and ventilation is to ensure that the airway is secured before any attempt to move the patient is made.

Where a true difficult airway has been encountered, the team should ensure that a medical alert is placed on the patient's medical notes to this effect. Specific care plans must be completed for ongoing management and anticipated future airway difficulties via suitable methods such as a tracheostomy management plan, an emergency healthcare plan, or other advanced care plan. This ensures that as the patient moves between healthcare settings, airway awareness and safety is maintained and, when needed, the appropriate level of intervention used even after discharge home.

Appendix 1 - BAPM Framework algorithm:

Unexpected Difficult Airway (Neonates)

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 box 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/paralysis: 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?

YES to all

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)

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

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)

*IF attempting further intubation consider why the previous attempt(s) failed; what needs to change

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)

Appendix 2 - Equipment: visual inventory

Store with difficult airway box

PLAN A Name and location of equipment	Add photos here
PLAN B Name and location of equipment	Add photos here
PLAN C Name and location of equipment	Add photos here
PLAN D Name and location of equipment	Add photos here

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