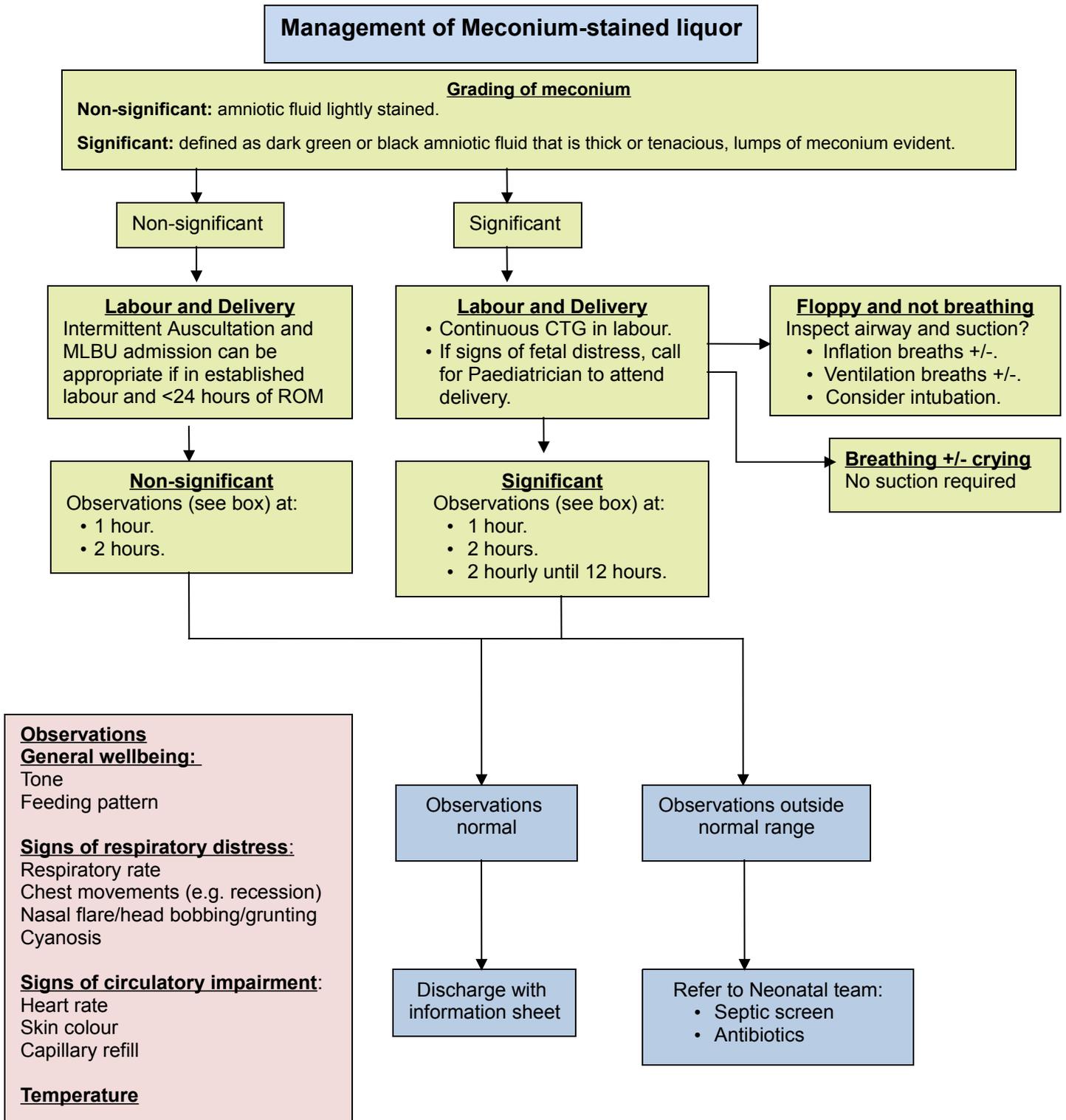


**Trust Guideline for the Management of:
Newborn Babies Born to Mothers with Meconium Stained Liquor**

For Use in:	Maternity services, Delivery Suite, NICU, Postnatal ward
By:	Midwives and Maternity Care Assistants, NICU medical and nursing staff
For:	Meconium stained liquor: management of infants at risk of Meconium Aspiration Syndrome
Division responsible for document:	Division 3 Women & Children
Key words:	Liquor, Meconium, Meconium-staining, Meconium Aspiration Syndrome, Observations
Name of document authors:	Dr Mark Dyke
Job title of document author:	Consultant Neonatologist
Name of document author's Line Manager:	Jo Nieto
Job title of author's Line Manager:	Chief of Division – Women and Children
Supported by:	Drs Booth, Bhoomaiah, Clarke, Muthukumar, O'Reilly, Roy and Walston Practice Development Midwives Dr Beth Gibson – MGC Chair
Assessed and approved by the:	Maternity Guidelines Committee (MGC) If approved by committee or Governance Lead Chair's Action; tick here <input type="checkbox"/>
Date of approval:	22/05/2020
Ratified by or reported as approved to (if applicable):	Clinical Safety and Effectiveness Sub-Board
To be reviewed before: This document remains current after this date but will be under review	22/05/2023
To be reviewed by:	Dr M Dyke
Reference and / or Trust Docs ID No:	IO17 - ID No: 9999
Version No:	3
Compliance links: (is there any NICE related to guidance)	NICE [CG190] Published date: December 2014 Last updated: February 2017
If Yes - does the strategy/policy deviate from the recommendations of NICE? If so why?	No

Trust Guideline for the Management of: Newborn Babies Born to Mothers with Meconium Stained Liquor

Quick reference guideline 1



Trust Guideline for the Management of: Newborn Babies Born to Mothers with Meconium Stained Liquor

Version and Document Control:

Version Number	Date of Update	Change Description	Author
3	22/05/2020	Simplification of flowchart, no other clinical changes.	

This is a Controlled Document

Printed copies of this document may not be up to date. Please check the hospital intranet for the latest version and destroy all previous versions.

1. Background

Meconium stained liquor occurs in up to 10% of deliveries – approximately 2% of these babies (0.2% of total births) develop meconium aspiration syndrome (MAS). It is possible that symptoms associated with meconium aspiration will not appear immediately. So it is recommended that babies born through meconium-stained liquor are observed for a period of time in all birth settings (NICE Intrapartum care 2014). This guideline provides information to Midwives and Maternity Health Care Assistants caring for infants born to mothers who have had meconium stained liquor during labour and thus are at increased risk of developing Meconium Aspiration Syndrome; also, to NICU nurses, advanced nurse practitioners and doctors to guide appropriate investigation and first line treatment where required.

2. Actions with meconium stained liquor

a) Labour and delivery care

- Continuous external fetal monitoring is recommended for women with significant meconium-stained liquor (defined as dark green or black amniotic fluid that is thick or tenacious, or any meconium-stained amniotic fluid containing lumps of meconium). NICE 2014.
- A NICU staff member trained in advanced neonatal life support should be present at a delivery where meconium liquor is present **and** additional signs of fetal compromise indicate an increased risk of meconium aspiration (e.g. abnormalities in fetal heart monitoring, decreased fetal movements). See Guideline for Attendance at Deliveries, [Trustdocs ID: 1234](#).

b) Assessment and care of baby at birth

- In the first minutes after birth, evaluate the condition of the baby – specifically respiration, heart rate and tone – in order to determine whether resuscitation is needed according to nationally accredited guidelines on neonatal resuscitation.
- A baby who cries after birth can be assumed to have a patent airway. No further immediate action is required for such infants.
- For a baby born in the presence of significant meconium and with no respiratory effort, using a laryngoscope, visualise the oropharynx and if meconium is seen use a Yankauer suction catheter to clear it. Proceed to inflation breaths and resuscitation.

Trust Guideline for the Management of: Newborn Babies Born to Mothers with Meconium Stained Liquor

- If inflation breaths are ineffective, it is possible that particulate meconium is causing an obstruction more distally in the airway. Intubation and suction via the endotracheal tube (ETT) should be carried out to remove meconium from the larynx and trachea.
- Standard NLS resuscitation measures should be followed after attempted removal of significant meconium, with an emphasis on achieving effective lung inflation.

c) Subsequent Observation

- Symptoms of respiratory distress associated with meconium aspiration may not appear immediately. It is therefore recommended that babies should be observed in hospital (NICE Intrapartum care 2014, updated 2017).

Grading of meconium: 2 grades of meconium staining of the liquor are described.

Non-significant: Large amount of amniotic fluid lightly stained by meconium

Significant: dark green or black amniotic fluid that is thick or tenacious, or any meconium-stained amniotic fluid containing lumps of meconium.

- Asymptomatic well babies with non-significant meconium staining require observations at 1 and 2 hours of age, in all birth settings.
- Those who have significant meconium staining require observations at 1 and 2 hours of age and then 2 hourly to 12 hours of age.
- A set of hospital notes should be generated for infants requiring observations.
- Mothers of babies who are born at home with significant meconium liquor present should be advised to transfer to hospital so that their babies may be observed in accordance with this Trust guideline. If a mother declines, then the advice given and her decision should be clearly documented in her records.

Observations: should be recorded on the Observations chart in the Neonatal record and include the following:

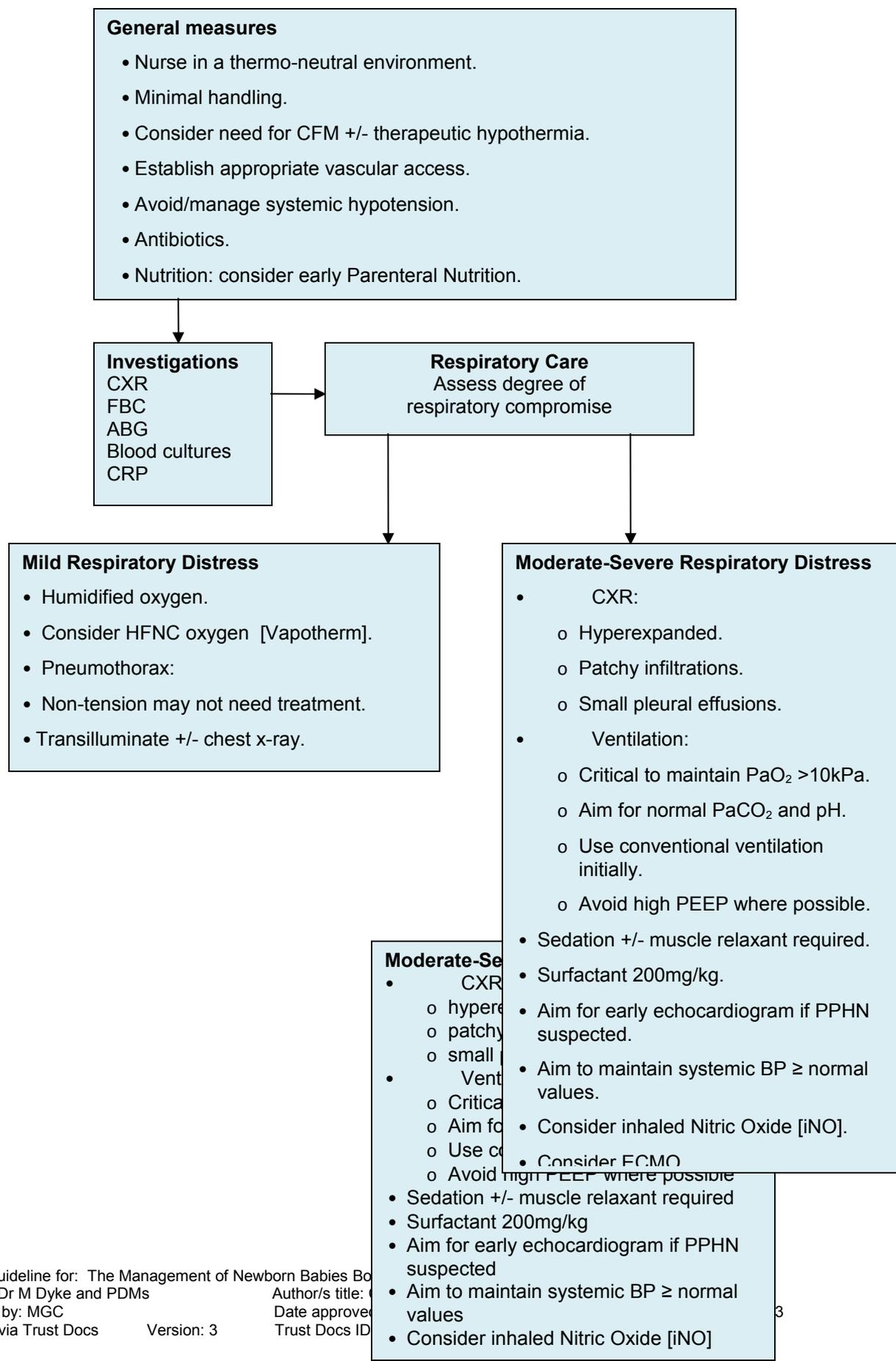
- General well being [including tone and feeding pattern].
- Signs which may indicate respiratory distress:
 - Respiratory rate.
 - Chest movements (eg sub-costal and inter-costal recession).
 - Nasal flare / head bobbing.
 - Cyanosis.
 - Grunting.
- Signs which may indicate circulatory impairment:
 - Heart rate.
 - Skin colour.
 - Capillary refill.
- Temperature.

Any abnormality should be reported to a Neonatologist for a clinical review.

Trust Guideline for the Management of: Newborn Babies Born to Mothers with Meconium Stained Liquor

Quick reference guideline 2

Management of Meconium Aspiration Syndrome



Trust Guideline for the Management of: Newborn Babies Born to Mothers with Meconium Stained Liquor

3. Care of Infants admitted to NICU with Meconium Aspiration Syndrome (MAS)

a) General measures

- Nurse in a thermo-neutral environment of 36.0-37.0°C [to minimise secondary reperfusion injury to the neonatal brain].

If there is evidence of significant peri-partum hypoxia-ischaemia, consider the need for Cerebral Function Monitoring (see Regional Guideline for Cerebral Function Monitoring of Neonates EOE-005-2012) and therapeutic hypothermia [see Regional Guideline at: <http://bebop.nhs.uk/healthcare-professionals/identification/neuroprotectioncarepathway/>]

- Minimal handling: this may help to reduce pulmonary hypertensive crises.
- Establish peripheral venous access and consider early arterial and central venous access.

b) Investigations

- **CXR:** may demonstrate a spectrum of disease from widespread patchy infiltration, +/- small pleural effusions, to diffuse homogenous opacification. With severe disease a picture similar to CLD can be seen as the disease progresses.
- **Blood tests**
 - FBC.
 - ABG.
 - Blood cultures.
 - CRP.

c) Avoid hypotension

- Consider intra-arterial monitoring early.
- Use inotropes to maintain the systemic blood pressure at or slightly above normal values to reduce right to left shunting (see Guideline on Management of Hypotension in Newborn Infants, [Trustdocs ID: 7561](#)).

d) Start antibiotics

Although meconium is a sterile substance the mechanical obstruction in the distal airways predisposes to infection. Use routine antibiotics in these infants unless otherwise indicated (see Trust Guideline on Neonatal Infection: management of infants at risk, [Trustdocs Id: 9998](#)).

e) Maintain nutrition

Start parenteral nutrition early in infants requiring ventilatory support. For infants with less severe respiratory distress and no significant peri-partum hypoxia-ischaemia, start feeds.

Trust Guideline for the Management of: Newborn Babies Born to Mothers with Meconium Stained Liquor

f) Respiratory care

MAS can be very difficult to manage as there is a wide spectrum of severity of respiratory disease and many potential complications. It is very important to match the degree of intervention very closely to the needs of the individual infant as some complications may be prevented through careful attention to detail e.g. persistent pulmonary hypertension of the newborn [PPHN] which is exacerbated by hypoxaemia, acidosis and hypercapnia or pneumothorax caused by positive pressure ventilation. Infants should be managed with adequate respiratory support dependent upon their clinical condition as indicated by:

- Effort of breathing.
- Oxygen requirement: aim to keep pre-ductal oxygen saturations 95-98%.
- Blood gas indices.

Mild respiratory distress

- Using humidified oxygen if required, aim to keep:
 - Pre- and post-ductal oxygen saturations 95-98%.
 - Difference between pre- and post-ductal oxygen saturations <5%.
- Vapotherm: consider humidified high-flow nasal cannula oxygen [hhfnc] for those with:
 - Increasing work of breathing.
 - High oxygen requirements.
 - Mild-moderate respiratory acidosis.
- Nasal cpap may be used as an alternative to hhfnc but is often tolerated poorly by term and near-term babies, and agitated babies may be at greater risk of pneumothorax.
- Small non-tension pneumothoraces may not always need treatment. However, the patient must be very closely observed for signs of respiratory deterioration.
- Pneumothorax: if there is clinical suspicion of a pneumothorax, transillumination [or, if time allows, a chest x-ray] should be performed immediately. In an infant with mas who is not collapsed it is advisable to obtain a chest x-ray.

Moderate-severe respiratory distress

- Mechanical obstruction of the distal airways with meconium causes patchy widespread atelectasis and may create a “ball-valve” effect resulting in increased airway resistance, pulmonary over-expansion and a significantly increased incidence of pneumothorax and other air leaks. The thorax may look hyperinflated with a barrel-shaped appearance and increased anterior-posterior diameter.
- Chest x-ray with hyper-expanded lung fields, along with widespread patchy infiltrations and in 20-30% of cases small pleural effusions may be seen.
- Ventilation:
 - It is critically important to optimise oxygenation [whilst minimising air-trapping] to reduce the risk of pulmonary hypertension.
 - Use of conventional modes is recommended initially.
 - As airway resistance is high a long inspiratory time of ≥ 0.5 sec is usually required.

Trust Guideline for the Management of: Newborn Babies Born to Mothers with Meconium Stained Liquor

- Aim to use slow rates which allow longer expiratory times to facilitate gas removal from the lungs.
 - High positive end expiratory pressures [PEEP] should be used with caution. Values of 5-8cm H₂O are usually sufficient; higher values may occasionally be required when atelectasis is severe; lower values may be needed if gas trapping is evident.
 - High frequency oscillatory ventilation should be used where optimal gas exchange cannot be effected using conventional ventilation [and before the use of inhaled nitric oxide – see below].
 - Ventilated infants will generally require sedation with morphine and possibly midazolam.
 - Maintain a low threshold for using muscle relaxation.
 - Arterial blood gases should be frequently reviewed and the use of transcutaneous paco₂, in addition to routine saturation monitoring, is useful. Good oxygenation [pao₂ > 10 kpa] should be the aim whilst the paco₂ [4-6 kpa] and ph [>7.3] should be maintained in the normal range.
 - Clinically significant pneumothoraces require chest drain insertion.
- Calculate the Oxygenation Index [and record on blood gas chart] for each ABG to help guide management:

$$\text{OI} = \frac{\text{MAP (cm of water)} \times \text{fio}_2 (\%)}{\text{Post-ductal pao}_2 (\text{mmhg})} \quad (1 \text{ kpa} = 7.5 \text{ mm Hg})$$

- Surfactant: Give surfactant 200 mg/kg to all infants requiring intubation for MAS. Second and subsequent doses may be required based on clinical status rather than a defined time period.
- Echocardiography: where there is suspicion of PPHN, it is advisable to obtain an echocardiogram as early as possible to help guide further therapy.

Other strategies: for preventing/improving PPHN include:

- Maintaining adequate oxygenation - oxygen is a potent pulmonary vasodilator.
- Minimal handling.
- Sedation and muscle relaxation.
- Inhaled nitric oxide [see trust guideline for inhaled nitric oxide therapy for neonates [Trustdocs Id 1280](#)].
- Extra-corporeal membrane oxygenation [ecmo]. Where pphn develops and fails to respond to the above measures, consideration should be given to referral for ecmo and this should be discussed with an ecmo centre and/or the children's acute transport service [cats] as early as possible. Full guidance is available via the cats website http://site.cats.nhs.uk/wp-content/uploads/2012/08/cats_ecmo_2011.pdf.
- current referral criteria for ECMO are:
 - Failure to respond to maximal conventional treatment.
 - Disease thought to be reversible.

Trust Guideline for the Management of: Newborn Babies Born to Mothers with Meconium Stained Liquor

- <10 days of high pressure ventilation (this is not absolute).
- Weight > 2.0 kg.
- Newborn > 35 weeks gestation.
- Oxygenation index >25.
- Severe barotrauma (pie, chest drains).
- No contraindication to systemic anticoagulation (intracranial haemorrhage).
- No lethal congenital abnormalities.
- No irreversible organ dysfunction including neurological injury.
- No major immunodeficiency.

Clinical Audit standards derived from guideline

The Maternity & Neonatal Services are committed to the philosophy of clinical audit, as part of their Clinical Governance programme. The standards contained in this clinical guideline will be subject to continuous audit, with multidisciplinary review of the audit results at one of the monthly departmental Clinical Governance meetings. The results will also be summarised and a list of recommendations formed into an action plan, with a commitment to re-audit within three years, resources permitting.

References

1. National Institute for Health and Clinical Excellence. Intrapartum care for healthy women and babies [CG190] 2014 (last updated Feb 2017)
2. Resuscitation and support of transition at birth Resuscitation Council (UK) 2015
3. Management of meconium aspiration: North Trent Neonatal Network Clinical Guideline. July 2012
4. Respiratory Support in Meconium Aspiration Syndrome: a Practical Guide. Dargaville PA. Int J Ped 2012 (2012) ID 965159

Distribution List/Dissemination

Trust Intranet: Maternity Guidelines & Neonatal Guidelines