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

Document Control:

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V3.0	22/05/2020		Simplification of flow-chart. No other clinical changes.
V4.0	15/08/2023	Joely Simeoni, Practice Development Midwife	Transfer to new template Update on neonatal care & resuscitation Update labour & delivery care for non-significant meconium

Previous Titles for this Document:

Previous Title/Amalgamated Titles	Date Revised
None	Not applicable

Distribution Control

Printed copies of this document should be considered out of date. The most up to date version is available from the Trust Intranet.

Consultation

The following were consulted during the development of this document:

- Drs Booth, Bhoomaiah, Clarke, Muthukumar, O'Reilly, Roy and Walston
- Practice Development Midwives
- Dr Beth Gibson – MGC Chair

Monitoring and Review of Procedural Document

The document owner is responsible for monitoring and reviewing the effectiveness of this Procedural Document. This review is continuous however as a minimum will be achieved at the point this procedural document requires a review e.g., changes in legislation, findings from incidents or document expiry.

Relationship of this document to other procedural documents

This document is a clinical guideline applicable to NNUHFT; please refer to local Trust's procedural documents for further guidance, as noted in Section 5.

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Quick reference – Management of Meconium Aspiration Syndrome

Introduction

Rationale

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. 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).

Objective

The objective of the guideline is to provide information regarding the care of infants born to mothers who have had meconium-stained liquor during labour and are at increased risk of developing Meconium Aspiration Syndrome; additionally, to provide guidance to appropriately investigate and provide first line treatment where required.

Scope

This guideline is intended for use by Midwives, Maternity Care Assistants, NICU nurses, Advanced Nurse Practitioners and Doctors within the Norfolk and Norwich University Hospital Foundation Trust who provide care for infants born to mothers who had had meconium-stained liquor during labour.

Glossary

The following terms and abbreviations have been used within this document:

Term	Definition
NNUHFT	Norfolk and Norwich University Hospital Foundation Trust
NICU	Neonatal Intensive Care Unit
MAS	Meconium Aspiration Syndrome
NICE	National Institute of Health and Care Excellence
INO	Inhaled nitric oxide
ECMO	Extra-corporeal membrane oxygenation
FBC	Full Blood Count
CRP	C-Reactive Protein
PPHN	Persistent pulmonary Hypertension of the Newborn
PEEP	Positive End Expiratory Pressures
CATS	Childrens Acute Transport Service
CFM	Cerebral Function Monitoring
CXR	Chest X-Ray
ABG	Arterial Blood Gas
HFNC	High flow nasal cannula

Responsibilities

- **Neonate:** The patient and recipient of the care outlined in the guideline.
- **Parent/Guardian:** Those who require the information within the guideline to aid decision making surrounding the care of their new-born baby.

- **Midwives:** To perform the postnatal new-born risk assessment and provide ongoing care to the babies who are placed on an observation pathway. To escalate concerns with neonatal wellbeing to the neonatal team.
- **Maternity Care Assistants:** To perform neonatal observations and to escalate concerns to midwife as per NEWTT 2 chart.
- **ANNP's/ Neonatologists:** To review all babies born in meconium-stained liquor when concerns are escalated as per NEWTT 2 chart.

Processes to be followed

The following processes should be followed to meet the objective of this guideline as detailed in section 1.2.

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 meconiumstained 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 Delivery, 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 who requires resuscitation please follow the most up to date neonatal resuscitation council guidance.

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).
- All midwives must complete the postnatal new-born risk assessment in the neonatal Kardex to determine which observation pathway to follow. Please see trust guideline "The Management of Neonatal Sepsis Risk and Observation Pathways in the Postnatal Period" for details. - Trust Doc ID 9998

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 meconiumstained 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 wellbeing [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.

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

a) General measures

- Nurse in a thermo-neutral environment of 36.0-37.0oC [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 Hypotension (Clinical guideline for management of), 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 Newborn babies at increased risk of developing neonatal infection, 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.

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.
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- 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.
- 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:

$$\frac{\text{OI} = \text{MAP (cm of water)} \times \text{fio2 (\%)}}{\text{Post-ductal pao2 (mmhg)}} \qquad (1 \text{ kpa} = 7.5 \text{ mm Hg})$$

- 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) 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.
  - <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.

Related Documents

Attendance at Delivery	Trustdocs ID: 1234
Hypotension (Clinical Guideline for Management of)	Trustdocs ID: 7561
Newborn babies at increased risk of developing neonatal infection	Trustdocs Id: 9998
Inhaled Nitric Oxide	Trustdocs Id 1280
Childrens Acute Transport service website	http://site.cats.nhs.uk/wp-content/uploads/2012/08/cats_ecmo_2011.pdf.
Cerebral Function Monitoring of neonates. EOE-005-2012 and therapeutic hypothermia.	http://bebop.nhs.uk/healthcare-professionals/identification/neuroprotectioncarepathway/
National Institute for Health and Clinical Excellence. Intrapartum care for healthy women and babies	[CG190] 2014 (last updated Feb 2017)

References

1. Management of meconium aspiration: North Trent Neonatal Network Clinical Guideline. July 2012

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

Monitoring Compliance of the service to be delivered

Compliance with the process will be monitored through the following:

Key elements	Process for Monitoring	By Whom (Individual / group /committee)	Responsible Governance Committee /dept	Frequency of monitoring
Occurrence of meconium aspiration syndrome	Datix reporting	NICU Clinical Team Datix completion	Women's and Childrens Governance	Case by Case

The Datix investigation results are to be discussed where necessary at relevant governance meetings to review the results and recommendations for further action. The Women's and Childrens Risk and Governance Team will ensure that the actions and recommendations are suitable and sufficient.

Equality Impact Assessment (EIA)

Type of function or policy	Existing

Division	Women and Children's	**Department**	Maternity Services and NICU
Name of person completing form	PDMs	**Date**	16/08/2023

Equality Area	**Potential Negative Impact**	**Impact Positive Impact**	**Which groups are affected**	**Full Impact Assessment Required YES/NO**
Race	No	No	n/a	No
Pregnancy & Maternity	No	No	n/a	No
Disability	No	No	n/a	No
Religion and beliefs	No	No	n/a	No
Sex	No	No	n/a	No
Gender reassignment	No	No	n/a	No
Sexual Orientation	No	No	n/a	No
Age	No	No	n/a	No
Marriage & Civil Partnership	No	No	n/a	No
EDS2 – How does this change impact the Equality and Diversity Strategic plan (contact HR or see EDS2 plan)?		No impact		

- **A full assessment will only be required if: The impact is potentially discriminatory under the general equality duty**
- **Any groups of patients/staff/visitors or communities could be potentially disadvantaged by the policy or function/service**
- **The policy or function/service is assessed to be of high significance**

IF IN DOUBT A FULL IMPACT ASSESSMENT FORM IS REQUIRED

The review of the existing policy re-affirms the rights of all groups and clarifies the individual, managerial and organisational responsibilities in line with statutory and best practice guidance.