



# Management of Preterm Birth

## Including:

- **Threatened preterm labour**
- **Established preterm labour**
- **Planned preterm birth**

Produced by NENC Preterm Birth Group

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## 1. Introduction

Preterm birth (PTB) is a common complication of pregnancy, comprising around 8% of births in England and Wales. It is the most important single determinant of adverse infant outcome with regards to survival and quality of life. Babies born preterm have high rates of early, late, and post-neonatal mortality and morbidity. PTB is estimated to cost health services in England and Wales £3.4bn per year.

There are many well-established evidence-based antenatal interventions to improve preterm outcomes. 'Perinatal optimisation' refers to the process of reliably delivering these interventions in the antenatal, intrapartum and neonatal period. The British Association of Perinatal Medicine has created four toolkits (antenatal optimisation, optimal cord management, normothermia and maternal breast milk) to support the delivery of these initiatives, and together, these make up the 'Perinatal Optimisation Care Pathway'.



## 2. Guideline Scope

The aim of this guideline is to support staff in providing care based on best practice and best available evidence. It is intended for all health professionals involved in the care of women who present with signs and symptoms of preterm labour (PTL), or those requiring medically indicated preterm delivery.

Management strategies for prevention of preterm birth in 'at risk' women are addressed separately in local Preterm Prevention Clinic Guidelines.

### 3. Extreme preterm birth <24 weeks

Survival of extremely preterm infants has increased steadily since 2006 with greater willingness to offer neonatal intensive care.

Guidance from the British Association of Perinatal Medicine (BAPM) suggests neonatal stabilisation may be considered for babies born from 22+0 weeks of gestation following assessment of risk and multiprofessional discussion with parents. This is not appropriate for all infants and the decision for resuscitation needs to be made after counselling from a Neonatal Consultant in a level 3 unit considering all risk factors. At gestations under 23 weeks, this discussion should take place prior to antenatal optimisation, as interventions would usually be offered only when there has been a decision for active (survival focused) care, rather than palliative (comfort focused).

There is regional consensus from the Northern Neonatal Network that women can be considered for in utero transfer to a level 3 unit so that counselling and antenatal optimisation can be offered from 22+0 weeks. At under 23 weeks, antenatal optimisation should not be commenced prior to parental multidisciplinary counselling.

Critical decisions to offer active (survival focused) neonatal care at gestations below 24 to 25 weeks, do not imply that the obstetric team will enact active obstetric interventions such as CTG monitoring or caesarean section (CS). This is a separate critical decision to be discussed and agreed on a case-by-case basis by the multidisciplinary team.

Appendix 1 expands upon the Obstetric principles of care at 22-22+6 weeks (counselling re neonatal survival, obstetric intervention, use of CS, fetal monitoring) and can be used to help clinicians when planning intrapartum care at extreme preterm gestations.

### 4. Diagnosis and Management of PPROM

- PPROM is the presenting symptom in around 20% of women who go on to develop spontaneous PTL.
- Those women who do not labour are at risk of infection ascending into the uterine cavity, which may have serious consequences for both mother and baby.
- The diagnosis and management of women with PPROM who are not in labour is addressed in the flowchart 'Suspected preterm pre labour rupture of membranes < 37 weeks' (Appendix 2):
  - In women who report symptoms suggestive of PPROM, a sterile speculum examination should be offered to look for pooling of amniotic fluid and take HVS.
  - If pooling of amniotic fluid is noted, no further diagnostic tests are required.
  - If pooling of amniotic fluid is not noted, consideration should be given to performing a point of care test (insulin-like growth factor-binding protein 1 or placental alpha microglobulin-1). If this is negative, the woman should be reassured and discharged.



- The role of ultrasound assessment of amniotic fluid volume is unclear in the diagnosis of PPROM. USS confirming oligohydramnios may be useful to support the clinical diagnosis of PPROM and therefore may be considered on an individual basis if point of care testing is not available.
- Diagnostic tests for PPROM are not appropriate if the woman is clearly in PTL.
- If confirmed PPROM – admit for 24-48 hours.
  - Observe for infection/preterm delivery.
  - A combination of clinical assessment, maternal blood tests (C-reactive protein and white blood cell count) and measurement of fetal heart rate using cardiotocography should be used to diagnose chorioamnionitis in women with PPROM: these parameters should not be used in isolation.
  - Decision to deliver if suspected sepsis should be made by a Consultant Obstetrician
  - If no fetal/maternal concerns at 24 - 48 hours: can be managed as out-patient (See Appendix 1) and IOL offered at 37 weeks.
  - Known GBS carrier: over 34+0 weeks immediate birth should be offered<sup>1</sup>. Woman to be counselled by consultant.
- Diagnostic tests such as cervical length measurement and fetal fibronectin (FFN) are not suitable in women who have ruptured membranes.

## 5. Threatened preterm labour (TPTL)

### Definition of preterm labour

Preterm labour can be defined as regular painful contractions leading to cervical dilatation before 37 weeks gestation. However, preterm labour can be relatively asymptomatic and so clinicians need to have a high index of suspicion when women present with symptoms such as vaginal discharge, antepartum haemorrhage, urinary tract symptoms etc.

### Initial assessment

Where a woman presents and preterm labour is suspected, a history should be taken and the following examinations and investigations should be performed. The woman should be kept informed throughout the process. The findings and plan of care should be documented in the maternal records.

The known diagnostic tests for TPTL are transvaginal US to measure cervical length (CL) and quantitative fetal fibronectin (FFN). The QUIPP App ([www.quipp.org](http://www.quipp.org)) is a clinical decision-making tool that can use CL and/or FFN to help clinicians determine the risk of preterm birth in women with symptoms of threatened preterm labour.

For women with signs or symptoms of suspected preterm labour **<34<sup>+6</sup> diagnostic testing is recommended<sup>3</sup>**. This allows for antenatal optimisation; transfer to appropriate place of birth and administration of corticosteroids, magnesium sulphate and antibiotics where appropriate.

- Maternal history should include:
  - Previous obstetric and medical history
  - History of present pregnancy including gestational age
  - Frequency and strength of contractions/presence of abdominal or back pain
  - History of any vaginal loss (blood/liquor/discharge)
  - Symptoms of systemic illness
  - Urinary/bowel symptoms
  - Fetal movements
- Maternal pulse, BP and temperature.
- On abdominal examination, the fundal height should be estimated and the presenting part determined. The presence of uterine or renal angle tenderness should be recorded. The frequency and duration of any uterine contractions should also be noted.
- The fetal heart should be auscultated.
- Ultrasound scan to confirm presentation.
- If the gestational age is  $\geq 26$  weeks CTG monitoring should be commenced. At  $< 26$  weeks there should be a discussion between a senior obstetrician and the patient regarding fetal monitoring.
- Fetal fibronectin (FFN) testing should be performed on ALL women presenting with symptoms of threatened preterm labour, unless there is a clear contraindication.
- A speculum examination (**without gel – use water only**) should be performed in order to:
  - Assess cervical effacement and dilatation
  - Assess for evidence of PPROM
  - **Take swab for FFN & consider HVS**
- **Gel should not be used to lubricate the speculum as it may affect the FFN results; water should be used instead.**
- Digital examination should be avoided if at all possible as this may increase the risk of infection. However a digital examination can be done after a speculum examination if the extent of cervical examination cannot be assessed on speculum examination.
- The following investigations should be performed:
  - Blood for FBC, G+S and CRP
  - Urine dipstick analysis +/- MSU
  - TV USS Cervical length (if available)

Use the 'Symptomatic' function in the QUiPP app to calculate the risk of delivery.



## QUIPP App

The QUIPP app is a decision support tool that uses medical history, fetal fibronectin and/or cervical length to give an individualised risk of having a spontaneous preterm delivery. Including both FFN and cervical length offers the most accurate predictive value. There are 2 functions within the app (screening in asymptomatic vs symptomatic women) and the correct function should be selected. The app is free to download on Apple or Android and it is also available to use online at [www.quipp.org](http://www.quipp.org)

Management should be dependent on QUIPP risk and location:

- If the **risk of delivery within 1 week is  $\geq 5\%$ , in utero transfer (if required) and antenatal optimisation are recommended.**
- If the probability of delivery within 1 week is  $< 5\%$  - low chance of spontaneous preterm birth. Reassure woman and consider alternative cause of abdominal pain.

Geographical location should be taken into account when making decisions about in utero transfer based on risk of delivery.

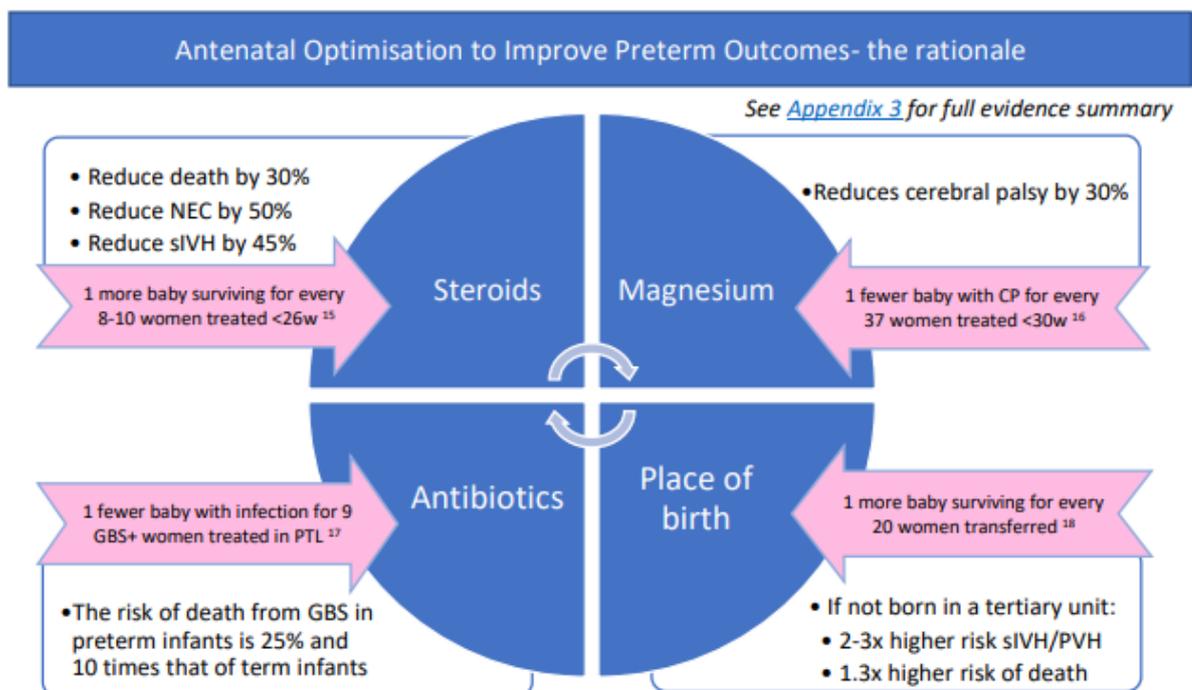
- If **transfer duration is  $> 1$  hour** (eg transfers from Cumbria), units may wish to consider transfer when **risk of delivery in 1 week is  $\geq 1\%$**
- These women would be transferred for observation only and antenatal optimisation would not be recommended in this group.



## 6. Antenatal Optimisation

Antenatal optimisation can be summarised using the acronym S.T.A.M.P.E.D.

- S. Steroids:** if <34+0. Give so that course is completed around 24h before birth and not more than 7 days before birth. Benefit remains if given <24h, if birth is imminent.
- T. Transfer:** <30+0 weeks (QEH, Gateshead Trust <32+0), any EFW <1250g → Level 3 NNU
- A. Antibiotics:** if labour is established, start GBS prophylaxis with optimal timing at least 4h before birth. If premature rupture of membranes, follow local guidance.
- M. Magnesium:** if <30+0 (consider up to 34+0). Give a loading dose of intravenous magnesium sulphate then a maintenance infusion. Pause for transfer if necessary and restart after. Optimal timing to start at least 4h before and continuing up until birth but benefit may remain if given <4h, if birth imminent.
- P. Parents:** establish parental understanding and discuss risks and benefits of PTB and potential interventions. This should include the neonatal team, describe likely neonatal journey and offer tour.
- E. Evaluate for Tocolysis:** consider only if it allows administration of steroids or transfer.
- D. Delivery Plan:** to include early discussion with neonatal team, intrapartum monitoring, mode of birth, optimal cord management and whether active or palliative management for baby at birth.



## 6.1 Steroids

Aim: All women giving birth before 34 weeks of gestation, should receive a **full course of antenatal steroids no longer than 7 days prior to birth**, and ideally completed 24-48 hours before birth.

A full course of antenatal steroids consists of **2 IM doses of either Betamethasone 12mg or Dexamethasone 12mg, 24 hours apart. Clinicians should not give the second dose at 12 hours as there is some evidence that this may increase the risk of NEC<sup>4</sup>.**

In women at risk of preterm birth a single course of antenatal corticosteroids reduce the risk of neonatal death by 30%, respiratory distress syndrome (RDS) by 44% and intraventricular haemorrhage by 45%. Antenatal corticosteroid use is also associated with a reduction in necrotising enterocolitis, respiratory support, intensive care admissions and systemic infections in the first 48 hours of life when compared with no treatment or treatment with placebo.

For women who are in suspected, diagnosed or established preterm labour, are having a planned preterm birth or have P-PROM;

- **Offer maternal corticosteroids to women between 24+0 and 33+6 weeks**
- **Consider maternal corticosteroids for women between 34+0 and 35+6 weeks**
- Between **23+0 and 23+6 weeks, discuss with the woman** (and her family members or carers as appropriate) the use of maternal corticosteroids in the context of **her individual circumstances**
- At **22+0 to 22+6 weeks**, the decision to offer antenatal corticosteroids **should only be taken after parental counselling with a level 3 unit neonatal consultant.**

Optimal benefit is observed if delivery is between 24 hours and 7 days of administration. Benefit is seen when delivery occurs within 24 hours, therefore steroids should still be given even if delivery is expected within this time. There is evidence that the beneficial effects from antenatal corticosteroids diminish and are lost when birth occurs >7 days from the last dose.

The timing of antenatal steroids is therefore of paramount importance, and should be improved by more accurate prediction of preterm birth using diagnostic tests such as CL and FFN, and clinical decision aids such as the QUiPP calculator.

### Repeat Course of Antenatal Steroids

The gold standard of care remains a single course of antenatal steroids timed so as birth occurs between 24 hours and 7 days from administration. However, in those circumstances when a previous course has been given >7 days earlier, a repeat course of antenatal steroids significantly reduces respiratory morbidity in preterm babies. Whilst there is a reduction in birth weight there is no convincing evidence of harm for either mother or infant.

**A single repeat course of antenatal corticosteroids can be considered in women who are less than 32 weeks of gestation who are at risk of preterm delivery within 7 days, and whose prior course of**



**antenatal corticosteroids was administered more than 7 days previously<sup>5</sup>.** This decision should only be taken by a Consultant Obstetrician and should be based on a convincing change in clinical condition (such as cervical change, ROM, active labour).

Regularly scheduled repeat courses or serial courses (more than two) are not recommended.

## 6.2 Transfer in Utero

Aim: Any infants **less than 30 weeks of gestation (<32 weeks QEH, Gateshead Trust)**, and any gestation with an **estimated fetal weight of less than 1250g** should be born in a maternity service on the **same site** as a level 3 **neonatal intensive care unit (NICU)**.

The Northern Neonatal Network comprises a group of Level 1 and Level 3 units as below.

Level 1	Level 3
Northumbria Emergency Care Hospital, Cramlington	Royal Victoria Infirmary, Newcastle
Queen Elizabeth Hospital, Gateshead	Sunderland Royal Hospital, Sunderland
University Hospital of North Durham, Durham	James Cook University Hospital, Middlesbrough
University Hospital of North Tees	
Darlington Memorial Hospital, Darlington	
Cumberland Infirmary, Carlisle	
West Cumberland Hospital, Whitehaven	

When extreme preterm infants are born in a high volume, neonatal intensive care setting, mortality is reduced by around 50%. There is also evidence that ex utero transfer of extreme preterm babies increases the risk of IVH and severe brain injury.

There is a regional agreement to transfer in utero if the QUIPP risk of delivery in 1 week is  $\geq 5\%$  or there is other objective evidence of preterm labour (PPROM, cervical change, significant APH).

In utero transfers must be arranged through the Northern Neonatal Transport Service (NNeTS) who will identify the most appropriate receiving unit. There should then be a Consultant to Consultant Obstetric referral, and once accepted, the referring midwife should contact the receiving unit's Delivery Suite Coordinator to handover. An IUT transfer document (Appendix 4) should be completed and women are transferred by ambulance with a midwife.

The timing and safety of the transfer is at the discretion of the referring unit. There is no need for a fixed period of observation prior to transfer.

**Where NNU capacity exists, there is a regional Maternity Unit policy of 'auto-acceptance' unless the receiving unit is closed to all admissions. Any Obstetric refusal for IUT should be made by the Consultant Obstetrician at the receiving unit. Liaison with the NNeTS Consultant may be required.**

***Northern Neonatal Transport Service: 0191 2303020***

### 6.3 Antibiotics

Aim: All women in established **preterm labour (<37 weeks)** should receive **intrapartum antibiotic prophylaxis** to prevent early onset neonatal Group B Streptococcal (GBS) infection, irrespective of whether they have ruptured amniotic membranes<sup>1</sup>.

- Preterm or low birthweight babies are particularly vulnerable to Group B Streptococcal sepsis, so all women in preterm labour should be given intrapartum antibiotic prophylaxis (3g benzylpenicillin IV loading dose, then 1.5g benzylpenicillin IV four-hourly until birth)<sup>1</sup>. Follow local antibiotic guidance for penicillin allergy.

### 6.4 Magnesium

Aim: All women giving birth **before 30 weeks** of gestation, should receive a loading dose and ideally a minimum of 4 hour infusion of **antenatal magnesium sulphate within the 24 hours prior to birth**.

- Offered to all women between 24<sup>+0</sup> and 29<sup>+6</sup> weeks gestation inclusive, who are in established preterm labour or having a planned preterm birth within 24 hours.
- Considered in women between 30<sup>+0</sup> and 33<sup>+6</sup> weeks, or 22<sup>+0</sup> and 23<sup>+6</sup> of pregnancy who are in established preterm labour or having a planned preterm birth within 24 hours. In extreme prematurity this should be a consultant decision taking parental wishes into account.

#### Treatment Regimen

- Loading Dose
  - 4g (40ml) of 10% MgSO<sub>4</sub> infused IV over 15 minutes (rate=160ml/h).
- Maintenance Dose
  - 1g (10ml) of 10% MgSO<sub>4</sub> infused IV hourly (rate=10ml/h)

#### Monitoring

- Pulse, blood pressure, respiratory rate and reflexes should be recorded with each loading dose, and 4 hourly after that.
- Medical staff should review the patient urgently if the respiratory rate falls below 12 breaths per minute, or falls by more than 4 breaths per minute from baseline.
- Medical staff should review the patient urgently if the diastolic blood pressure falls by more than 15mmHg from the baseline.
- ECG/pulse oximetry: ECG is mandatory during and for 1 hour post loading dose. Pulse oximetry is required for the duration of treatment.



Magnesium Sulphate should be discontinued at delivery, or if delivery is no longer thought to be imminent, or if the duration of treatment has exceeded 24 hours.

Repeat courses for further episodes of threatened preterm delivery can be considered by individual consultants.

Contraindications:

- previous hypersensitivity to Magnesium Sulphate
- hepatic coma
- myasthenia gravis

Renal impairment is not a contraindication but if the patient develops oliguria or other signs of renal failure magnesium levels should be monitored and signs of toxicity looked for more closely. Consider reducing the dose of magnesium sulphate. In the absence of pre-eclampsia fluid restriction is not required.

**If undergoing intrauterine transfer**, give the loading dose followed by the maintenance dose until the ambulance arrives. **Stop the maintenance dose during transfer**, and reassess on arrival at tertiary unit. Recommence if still indicated.

## 6.5 Parents

In order properly to involve parents as equal partners in care and decision-making for their babies, all parents facing potential extreme preterm birth need to understand the risks associated with their baby's birth, and possible treatment options.

Consultation should be provided by the most experienced members of the perinatal team and where possible should be delivered as a joint Neonatal, Obstetric and Midwifery approach. Supporting written information should also be provided (Appendix 4 – Very Early Baby Leaflet).

## 6.6 Evaluate for Tocolysis

There is no clear evidence that use of tocolytic drugs reduces perinatal or neonatal mortality, or neonatal morbidity, and therefore it is reasonable not to use any tocolytic drug.

Tocolysis is considered in the following circumstances since these women are most likely to benefit from tocolysis:

- those who have not completed a full course of corticosteroids
- those requiring transfer to another unit

NICE recommend Nifedipine as the first line tocolytic.

Tocolysis is contraindicated in the presence of antepartum haemorrhage, chorioamnionitis, abnormal fetal heart rate, cervical dilatation >4cm.

The decision to commence tocolysis should be discussed with a consultant obstetrician.

### Nifedipine

Nifedipine is a calcium channel blocker; it should be considered as the first line tocolytic agent in the management of suspected or diagnosed preterm labour.



- Nifedipine should be *considered* for tocolysis in women between 22<sup>+0</sup> and 25<sup>+6</sup> weeks pregnant who have intact membranes and are in suspected labour.
- Nifedipine should be offered to women between 26<sup>+0</sup> and 33<sup>+6</sup> weeks of pregnancy who have suspected or diagnosed preterm labour.

Adverse effects include:

- Flushing
- Palpitations
- Nausea and vomiting
- Hypotension
- Pulmonary oedema

Presence of maternal cardiac disease is a contraindication for the use of nifedipine for tocolysis.

The recommended nifedipine regime is:

- 20mg Nifedipine stat
- 20mg Nifedipine three times a day for 48 hours

If nifedipine is used for tocolysis, monitoring (maternal BP every 15 minutes and CTG) should be instituted for at least the first 2 hours.

### Atosiban (Tractocile)

- Atosiban is an oxytocin receptor antagonist; it is the only tocolytic drug licensed in the UK for the treatment of threatened preterm labour.
- Nifedipine and atosiban have comparable effectiveness in delaying birth for up to seven days.
- Atosiban may be administered even if other tocolytics have already been administered.
- Atosiban is administered intravenously and treatment costs are high. It should only be offered for tocolysis after discussion with a consultant.

Its use should be considered:

- when there is maternal cardiac disease
- when there is an adverse reaction/allergy to nifedipine

The recommended regimen is intravenous administration in 3 successive stages:

1. Bolus dose of 6.75mg	Dilute 1x 0.9ml vial atosiban for injection with 10 ml N/Saline; inject over 1 minute IV
2. Continuous high dose infusion at a dose of 18mg/hr for 3 hours	Remove 10ml from a 100ml bag of N/Saline and add 2x 5ml (7.5mg/ml) vials of atosiban for infusion; infuse at 24ml/hr
3. Continuous low dose infusion at a dose of 6mg/hr for up to 45 hours.	Reduce rate of above infusion to 8ml/hr



## 6.7 Delivery Plan

This should be made in consultation with parents and should include decisions regarding:

- intrapartum monitoring
- mode of birth
- optimal cord management
- active or palliative management for baby at birth
- importance of early breast milk expression

### Intrapartum Care

- At gestations of less than 34+0
  - Do not use FSE
  - Do not use FBS
  - Do not use ventouse
- FSE use can be considered between 34<sup>+0</sup> and 36<sup>+6</sup> weeks of pregnancy if it is not possible to monitor the fetal heart rate using external cardiotocography or intermittent auscultation
- Offer the following investigations following preterm birth:
  - placental histology
  - placental microbiology (swab for C&S)

### Postnatal Review

Following delivery, parents should be offered a postnatal review appointment to discuss the results of any investigations. This is particularly important when PTB has occurred at <30 weeks.



## 7 Peripartum Optimisation

### 7.1 Optimal Cord Management

**Aim: All babies born <34 weeks gestation should have their umbilical cord clamped at least 60 seconds or more after birth unless there are specific documented maternal or fetal conditions to justify earlier clamping.**

Optimal Cord Management (OCM) is an evidence-based, simple and effective non-intervention for improving newborn outcomes. Preterm babies particularly benefit from this enhanced placental transfusion and physiological transition.

- **Optimal Cord Management reduces death in preterm babies by nearly a third**
- **The number of babies needing to receive OCM to prevent a death is around 30-50 overall and may be as low as 20 in the least mature babies**

Parents should receive information about OCM at the time of antenatal counselling about their imminent preterm birth, along with information about the importance of early breast milk expression.

Contraindications to OCM are extremely rare but include:

- The need for maternal resuscitation in the face of massive, acute haemorrhage.
- A ruptured vasa praevia, snapped cord or other trauma to the cord vessels which will result in haemorrhage from the baby.

Cord milking is not sufficiently well researched to be introduced formally at this time. Evidence suggests potential harm (increased incidence of IVH) in babies under 27 weeks gestation (22% vs 4%)<sup>6</sup>. This will be open to review as more evidence becomes available.

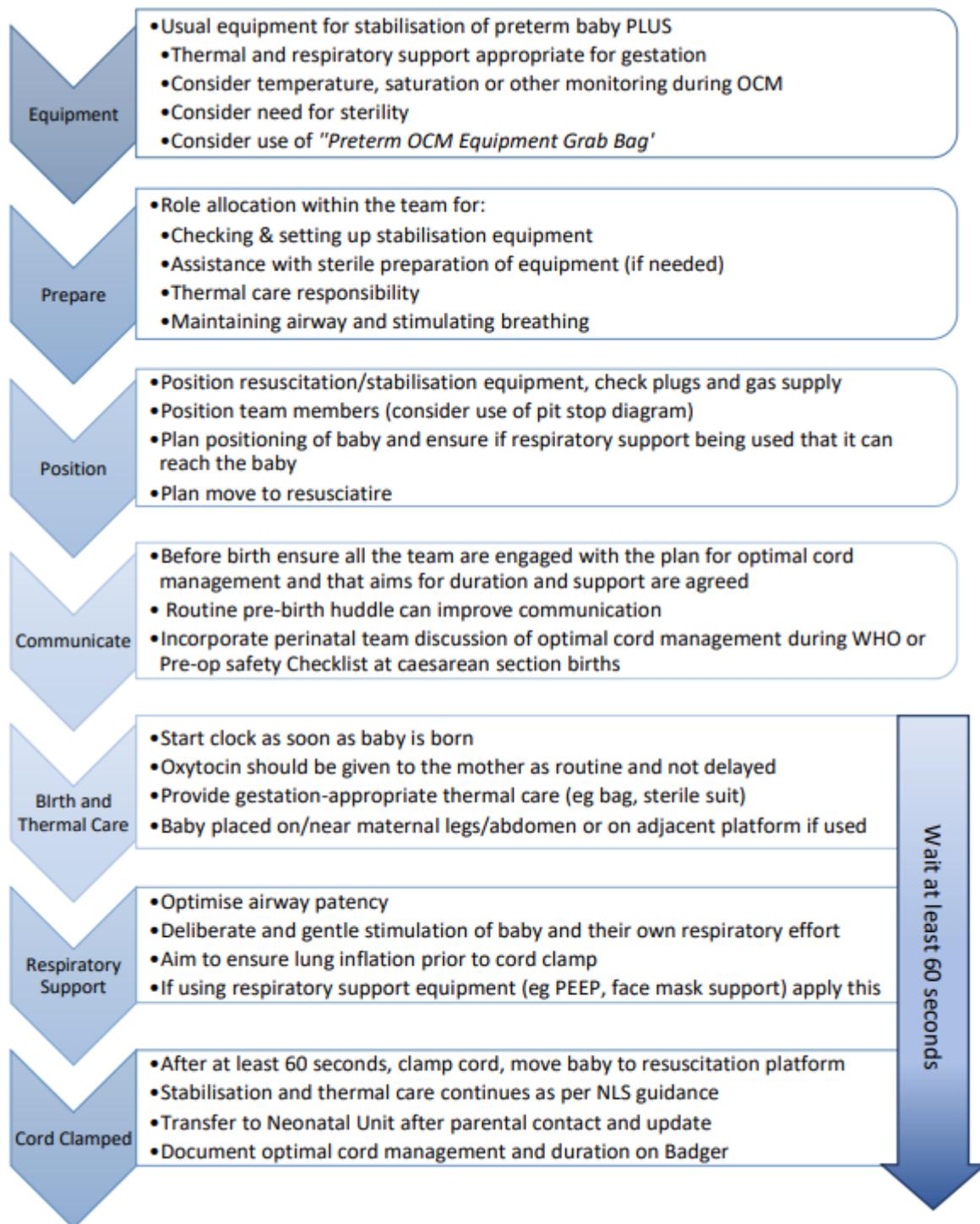
Despite clear evidence of the advantages of OCM, available data suggests that the practice of delayed cord clamping is variable, especially amongst preterm babies. From 2020, the National Neonatal Audit Programme (NNAP) will report on rates of cord clamping at or after 1 minute for infants < 32 week. Recent data suggests a national rate of 34.6% so there is likely to be significant scope for improvement.

Despite the first minute after birth being a potential risk period for thermoregulation, there is no evidence for an increased risk of hypothermia in preterm babies who receive Optimal Cord Management. OCM is consistent with good thermal practices, such as putting the baby in a bag, drying, putting a hat on, and/or bringing an external heat source to the bedside. Teams should identify the risks and put in place measures to minimise hypothermia.

An awareness of human factors and an effective perinatal team are important in the optimal management of preterm birth. The BAPM flowchart below highlights areas to be focussed on to achieve best practice for OCM.



## Best Practice Flowchart for OCM



A suggested pathway for achieving Optimal Cord Management in different settings (delivery room vs theatre) can be found in Appendix 6.



## 7.2 Normothermia

Aim: All babies **less than 34 weeks** gestational age have a documented **first temperature of 36.5°C to 37.5°C within one hour of birth.**

The World Health Organisation (WHO) defines infant hypothermia as a core body temperature of <36.5°C, or a skin temperature of <36.0°C. Preterm babies are at particular risk of hypothermia with associated adverse effects including an increased risk of hypoglycaemia, hypoxia and metabolic acidosis, respiratory distress and chronic lung disease, necrotising enterocolitis, intraventricular haemorrhage, late-onset sepsis and death.

There are a wide range of strategies to minimise heat loss and promote normothermia. Some of these interventions can be found in the table below.

	Mechanism of heat loss	Intervention	Evidence or Professional Recommendation
Evaporation	Loss of moisture and heat from warm wet skin into a low humidity, cooler environment	Occlusive plastic wrap/bag  Woollen or plastic hat	A 2018 Cochrane Review concluded that plastic wraps improved core body temperature on admission to NICU and that fewer infants had hypothermia on admission to NICU or up to 2 hours after birth with a number needed to treat for an additional beneficial outcome of 4 <sup>3</sup> .
	Loss of moisture and heat from respiratory tract mucosa	Warm, humidified gases	Two multicentre, randomised controlled trials have shown significant reductions in admission hypothermia in preterm infants resuscitated using warm, humidified inspired gases above standard care (wrap, woollen hat and radiant heat) <sup>20,21</sup> .
Convection	Heat loss due to cooler circulating air, particularly in the context of open windows and doors	Increased room temperature	The American Heart Association (AHA) <sup>22</sup> , European Resuscitation Council (ERC) <sup>23</sup> , UK Resuscitation Council <sup>24</sup> , World Health Organisation (WHO) <sup>1</sup> and International Liaison Committee for Resuscitation (ILCOR) <sup>4</sup> all recommend increased room temperature for anticipated preterm deliveries <32 weeks. The recommended temperature varies from 23-26°C. There are multiple studies demonstrating the benefit of increased room temperature on body temperature at 5 mins from birth and admission temperature <sup>25-30</sup> .
Conduction	Heat loss due to direct contact with cooler surfaces	Transwarmer or exothermic mattress	The Cochrane review reports meta-analysis of two studies (119 infants) comparing plastic bags and thermal mattresses with plastic bags alone for infants <31 weeks gestation <sup>3</sup> . Results showed improvement in core body temperature on admission to the NICU or up to two hours after birth but with an increase in elevated temperature. NB: Manufacturer safety guidance recommends these mattresses should not be used in conjunction with other heat sources due to the risk of overheating and the rare but potentially serious risk of severe burns. Units who choose to use transwarmers should be aware of this guidance. Strict vigilance must be undertaken to ensure skin integrity, to avoid hyperthermia by continuous temperature monitoring and to limit the duration of use particularly in the context of radiant heat.
Radiation	Non direct transfer of heat to cooler mediums	Radiant heat source	Recommended as standard care by ILCOR and UK Resuscitation council <sup>4, 24</sup> .

### 7.3 Maternal Breast Milk

Aim: All babies **less than 34 weeks** gestational age to **receive maternal breast milk** (Including **buccal colostrum** or maternal breast milk as mouth care) **within 6 hours of birth**.

Maternal breast milk is the optimal form of feeding for all babies. Specific health benefits for the preterm infant include (compared to formula feeding):

- lower mortality rates
- lower rates of sepsis and necrotising enterocolitis
- improved neurodevelopmental outcomes
- lower rates of bronchopulmonary dysplasia
- lower rates of retinopathy of prematurity
- fewer hospitalizations in the first year after discharge

Women at high risk of preterm birth should be counselled about the benefits of maternal breast milk in the antenatal period. The importance of maternal breast milk should also form part of the perinatal counselling of all women who present with threatened preterm labour, or require planned preterm birth.

BAPM recommends women who have given birth prematurely are shown how to express **within 2 hours of birth**, and that the infant should then **receive colostrum within 6 hours of birth**. Even infants with complex health concerns can receive buccal colostrum. Early expression facilitates early colostrum receipt and improves total volumes of breast milk received overall.

Counselling should be supported with written information (See Appendix 7 for current RVI patient information leaflet on early expression/importance of colostrum).

National audit will be undertaken through NNAP. BadgerNet also now carries specific detail on colostrum under the 'UNICEF' heading.

There are very few situations in which maternal breast milk is contraindicated for a preterm baby (outside of situations where all enteral intake is contraindicated, and in many of these situations buccal colostrum may still be given safely). These include maternal HTLV lymphoma, infant classical galactosaemia, congenital lactose intolerance and maternal HIV infection.

### 8. NIHR Clinical Research Trials

Please consider offering entry into relevant NIHR 'portfolio' research trials that are running in your unit. This may also be discussed when patients are transferred to units with level 3 neonatal care.

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## Appendix 1 - Extreme Preterm Birth: Principles of Obstetric Care at 22-22+6 weeks

### Counselling about prognosis when delivery may occur at 22+0 to 22+6 weeks

The counselling of parents about the likely prognosis of babies born at 22+0 to 22+6 weeks will be based on the outcomes that were described in the recent BAPM Framework for Practice (2019), many of which were based on the findings from the MBRRACE-UK 2018 dataset. The key statements within the BAPM document are summarised below. The following pictorial representation may also be useful when counselling women.

#### Survival

The survival rates in the MBRRACE-UK dataset were as follows:

- About 63% of babies born at 22+0-22+6 weeks were live born
- Resuscitation was attempted in 23% (n=43) of all live born babies
- Survival to 1 year
  - Of all babies alive at the start of labour 5%
  - Of those receiving active resuscitation 35%
  - Of those admitted to NNU 54%

These figures are shown graphically in the algorithm on the next page. This may be useful to share with patients during discussions.

The BAPM Framework for Practice acknowledges that since only a small proportion of babies born at 22 weeks of gestation within this case series received active treatment, there is the possibility of selection bias and survivors may represent a sub-group of 22 week gestation babies with more favourable risk factors. Hence, it seems likely that the more widespread resuscitation of babies at this gestation (and potentially including those who might not have a full range of 'favourable' risk factors) will be associated with survival rates that are less than 35%.

#### Morbidity

The BAPM Framework for Practice suggested that severe morbidity (at 2 years) was evident in about 1 in 3 surviving babies born at 22+0 to 22+6 weeks (as based on four major studies).

The severe impairment category includes any of:

- severe cognitive impairment with an IQ lower than 55 (< -3 standard deviation); this will usually result in the need for special educational support and require supervision in daily activities
- severe cerebral palsy – classified as Gross Motor Function Classification System (GMFCS) grade 3 or greater
- blindness or profound hearing impairment

#### Individualised decision-making

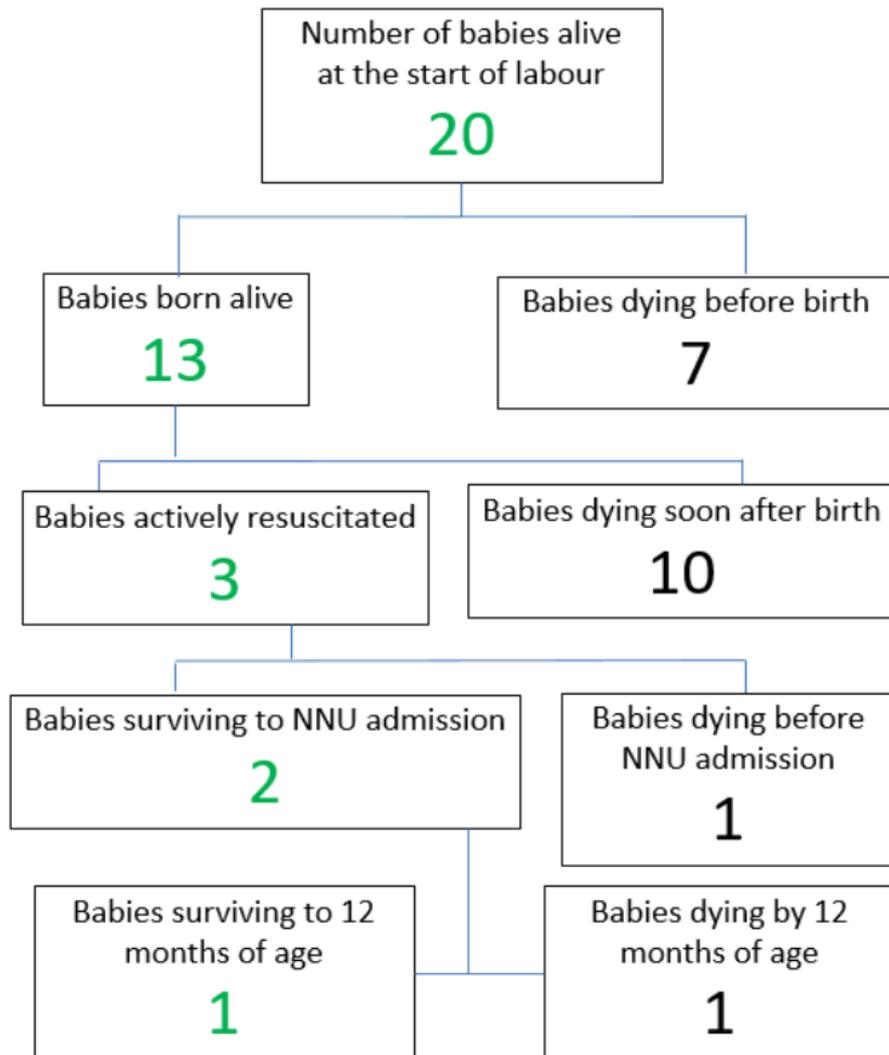
Several non-modifiable risk factors are known to be associated with an increased risk of adverse outcomes in babies born at the margins of viability, including fetal growth restriction, male sex, multiple pregnancy and chorioamnionitis. Modifiable risk factors associated with an improved chance of a good outcome include the administration of antenatal steroids, magnesium sulphate, and birth in a hospital with a NICU.

However, it is difficult to quantify the relative risks associated with each of these factors in babies born at 22+0 to 22+6 weeks. Hence, while it is appropriate to include these factors in decision-making and the counselling of parents at risk of PTB at 22+0 to 22+6 weeks, careful and cautious senior clinical judgement is needed when adjusting risks based on any of the above.

Reference

Smith LK, Draper ES, Manktelow BN, Fenton A, Kurinczuk J on behalf of the MBRRACE-UK Collaboration. MBRRACE-UK Report on survival up to one year of age of babies born before 27 weeks gestational age for births in Great Britain from January to December 2016. Leicester: The Infant Mortality and Morbidity Studies, Department of Health Sciences, University of Leicester. 2018.

### Outcomes for babies alive at the start of labour at 22+0 to 22+6 weeks



#### The role of caesarean section (CS)/hysterotomy at 22+0 - to 22+6 weeks gestation.

At periviable gestations (in particular at 22+0 to 22+6 weeks) the greatest benefit in terms of reducing neonatal mortality and morbidity is for the baby to remain *in utero*. A gain of even a few days can make a significant difference to neonatal outcome. Obstetric intervention in labour is not routinely recommended as there is a lack of high quality evidence to suggest that neonatal outcomes are improved (1).

Caesarean section (CS) at periviable gestations is a significant undertaking. The uterus is relatively small, making the likelihood of hysterotomy (using a vertical 'upper segment' incision) much greater. A vertical uterine incision is associated with a higher risk of maternal haemorrhage and four times the risk of placenta accreta spectrum in a future pregnancy (2). Patients should also be aware that CS at very early preterm gestations is associated with an increased risk of uterine rupture in future pregnancy (the risk of rupture being 25 in 1000 compared to 5 in 1000 for CS at term) (3).

The potential for adverse effects on reproductive outcome in subsequent pregnancies, has led professional bodies to recommend against **routine** use of CS below 23+0 weeks (4). The information above should be used when counselling women and their partners, helping them to reach an informed decision about the role of CS *in labour* below 23+0 weeks gestation. It is accepted that after counselling and despite concerns raised, women may still occasionally request delivery by CS. The obstetric team should adopt a conservative approach to suspected preterm labour at 22+0 to 22+6 weeks, as this frequently settles with observation. Therefore, CS should **not** be undertaken too early because of the neonatal benefits associated with remaining *in utero*/prolonging gestation.

#### References

1. *Alfirevic, Z., Milan, S. J. & Livio, S. Caesarean section versus vaginal delivery for preterm birth in singletons. Cochrane Db Syst Rev 9, CD000078 (2013).*
2. *Gyamfi-Bannerman, C. et al. Risk of Uterine Rupture and Placenta Accreta With Prior Uterine Surgery Outside of the Lower Segment. Obstetrics Gynecol 120, 1332 (2012).*
3. *Lannon, S. M. R., Guthrie, K. A., Vanderhoeven, J. P. & Gammill, H. S. Uterine Rupture Risk After Periviable Cesarean Delivery. Obstetrics & Gynecology 125, (2015).*
4. *Periviable birth. Obstetric Care Consensus No. 6. American College of Obstetricians and Gynecologists. Obstet Gynecol 2017;130:e187–99*

### **Gestational threshold for 'antenatal optimisation'**

In women < 23+0 weeks gestation

- 'Antenatal optimisation' entails preparation of the fetus at the tertiary centre when threatened preterm labour occurs prior to 23+0 weeks' gestation (i.e. consideration of steroids, magnesium sulphate etc)
- If after an initial conversation, the woman wishes to consider active intervention in the form of 'antenatal optimisation', arrange transfer to a centre with neonatal intensive care such that this can be achieved from 22+0 weeks
- Explain that a further confirmatory discussion with the parents will take place in the tertiary centre, after which a final decision would be taken with regards to subsequent management.
- On occasions, this may mean arranging transfer just prior to 22+0 weeks in order to allow full optimisation from 22+0 weeks onwards.
- Antenatal optimisation would be implemented only after multi-disciplinary counselling of the family at the tertiary level 3 centre.



## The diagnosis of threatened preterm labour at 22+0 to 22+6 weeks

- There will be a cohort of patients in obvious preterm labour presenting with painful uterine contractions and; cervical change, ruptured or bulging membranes.
- There will be another cohort that present at an earlier stage where the physical signs are not yet as apparent. Here we recommend diagnostic testing. Given the availability and ease of use we recommend units use quantitative fetal fibronectin (qFFN) in combination with a decision support tool (QUIPP)(1,2). This will generate a risk of delivery within 1 week. If this risk is  $\geq 5\%$  this would be regarded as a positive test.
- If the patient is not at a level 3 unit we recommend that the case is discussed with the neonatal transfer team and there is a consultant to consultant discussion between the obstetrician looking after the patient and the receiving obstetrician at the level 3 unit.
- We do not recommend antenatal optimisation at this stage, as this should be done at the level 3 unit after the patient and partner have been counselled by the level 3 neonatal and obstetric team.

Note: Testing with qFFN cannot be performed in some patients due to contraindications; recent sexual intercourse within 24 hours, antepartum haemorrhage, vaginal examination using gel prior to considering the test. In these patients, where possible, a transvaginal cervical length ultrasound scan should be performed in combination with QUIPP.

### References

1. Carter, J. et al. Development and validation of predictive models for QUIPP App v.2: tool for predicting preterm birth in women with symptoms of threatened preterm labor. *Ultrasound in Obstetrics & Gynecology* 55, (2020).

2. <https://quipp.org>

## Fetal monitoring in the context of extreme prematurity 22+0-24+0 weeks (note this covers a wider gestation)

Fetal condition may be monitored in 4 ways:

1. Reported fetal movements
2. Ultrasound assessment
3. Fetal heart rate auscultation
4. Fetal CTG monitoring

And in three circumstances:

1. Prior to labour
2. During the first stage of labour
3. During the second stage

The purpose of fetal monitoring is twofold:

1. To determine whether the fetus is alive
2. To determine whether there are signs of fetal hypoxia



All women require a documented plan on the agreed method and frequency of fetal monitoring. Even if there is an agreement not to act in the fetal interest based on fetal monitoring there are maternal benefits to fetal monitoring and this should be made clear.

### **Fetal monitoring at 22+0-24+0**

#### **(1) Fetal movements at 22+0-24+0 (note wider gestation)**

Reported fetal movements provides a degree of reassurance but are subjective.

Document at which gestation fetal movements were regularly felt and their typical pattern. Do not rely on fetal movements as a monitoring strategy at 22+0-24+0, instead establish an agreed objective monitoring strategy with suitable frequency.

- a. It follows that reassuring fetal movements should not replace the object assessment of viability.
- b. It also follows that a lack of fetal movements need not trigger an object assessment of viability.

#### **(2) Ultrasound assessment at 22+0-24+0 (note wider gestation)**

This is useful to assess lie, presenting part, placental position, amniotic fluid index, growth and umbilical artery Doppler (where indicated) as baseline. Subsequent ultrasound assessments may be required to determine whether the fetus is alive should this be technically challenging by other means.

#### **(3) Fetal heart rate auscultation antenatally & during the first stage of labour at 22+0–24+0 (note wider gestation)**

***This will be the monitoring used for the vast majority.*** It will confirm whether the fetus is alive. A necessary part of auscultation is to determine the fetal heart rate as distinct from the mother's. Clinical weight may be given to developing fetal tachycardia for example in the context of suspected chorioamnionitis. Further interpretation of the auscultated fetal heart should not take place.

At the time of measuring the fetal heart rate the maternal heart rate should always be documented. The minimum auscultation frequency should therefore be the same as the frequency of the maternal observations. As such this frequency will vary due to the maternal circumstances.

A decision to auscultate the fetal heart rate more frequency than the maternal observations should be accompanied by a clear rationale in the notes.

Benefits of fetal auscultation

- a. To reassure
- b. To establish if there is fetal demise as this will likely alter the maternal management and may reduce maternal risks by allowing obstetric intervention to augmenting labour or delivery
- c. Fetal tachycardia from an earlier normal baseline *may* increase suspicion of chorioamnionitis

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**(4) Fetal heart rate auscultation during the second stage of labour at 22+0-24+0 (note wider gestation)**

At the confirmation of full dilatation the fetal heart should be documented along with the maternal rate. As active second stage may not necessarily be encouraged at this point further assessments will typically be hourly and not less than at the frequency of maternal observations.

At the onset of active second stage the fetal heart rate should again be documented along with the maternal rate.

Further auscultation is likely to be technically challenging and may require the support of ultrasound. The purpose of monitoring in the second stage is to simply confirm viability and not to influence the mode of delivery.

**(5) CTG analysis (computer-based) at 22+0-24+0 (note wider gestation)**

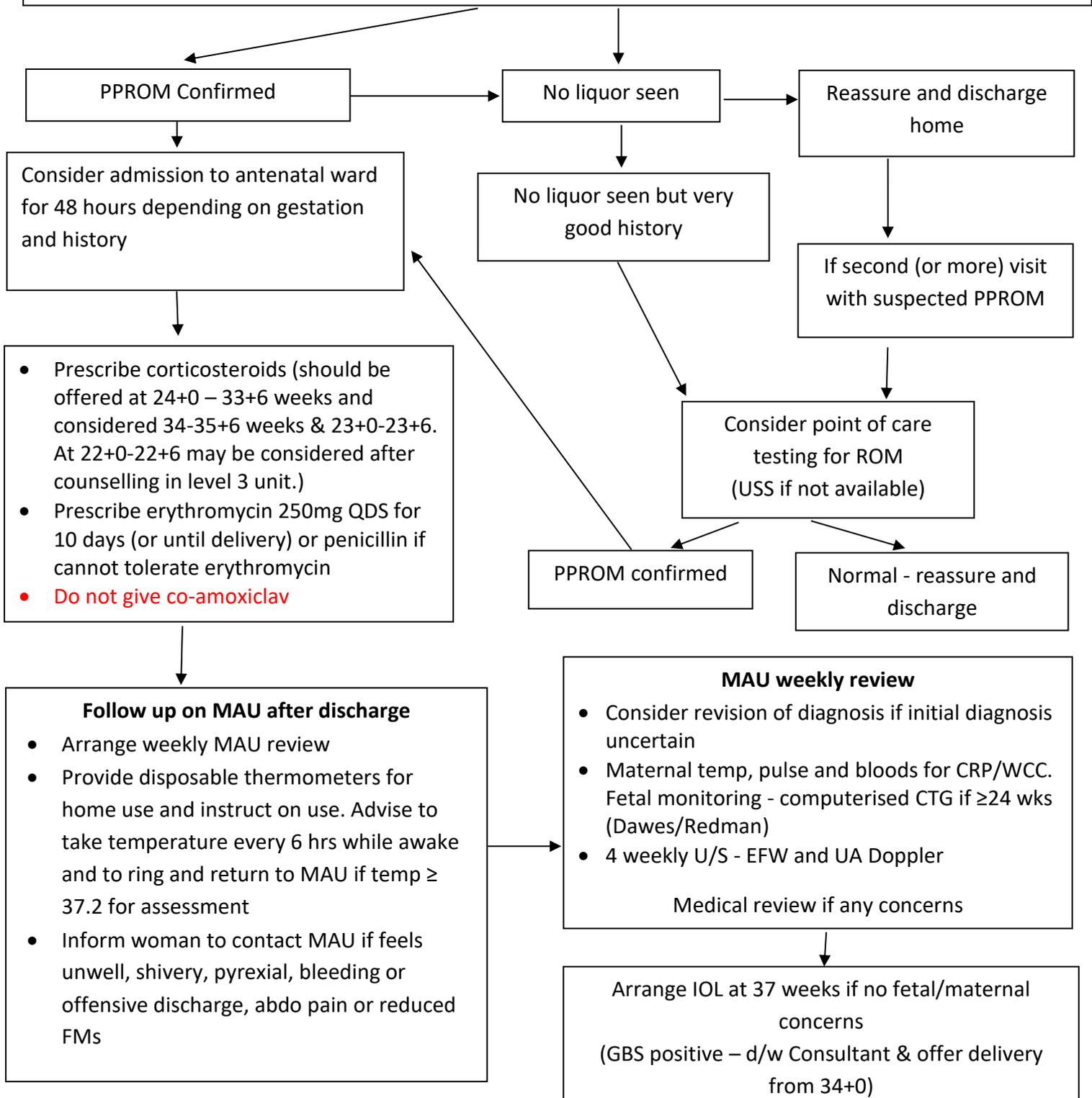
There is no evidence of benefit for this group. Neither a computerised CTG prior to labour, nor an intrapartum CTG analysis have not been shown to be appropriate in this group and both are likely to lead to increased obstetric intervention without evidence of benefit.



## Appendix 2: Antenatal Flowchart

### Suspected Prelabour Premature Rupture of Membranes < 37 weeks (PPROM)

- History/Examination: Abdominal palpation and amount/colour of PV loss. Temp, pulse, BP, Urinalysis (+/- MSU). Bloods (CRP/WCC) on admission if suspected chorioamnionitis.
- Fetal Observations: FHR/CTG
- Speculum examination to visualise cervix/posterior fornix - ? liquor & consider HVS



## Appendix 3

### Use of QUIPP App in Symptomatic Women

<https://quipp.org/symptomatic.html>

A tool to predict spontaneous preterm birth, incorporating fetal fibronectin and cervical length, in symptomatic women and high-risk asymptomatic women

QUIPP Home Symptomatic Asymptomatic User guide About Privacy Feedback

### Symptomatic

1. SYMPTOMS SUGGESTIVE OF ABNORMAL OR PREMATURE UTERINE ACTIVITY?  Yes  No

2. PREVIOUS CERVICAL SURGERY?  Yes  No

3. PREVIOUS PRETERM BIRTH  $\leq 36^{+6}$ ?  Yes  No

4. PREVIOUS PPROM?  Yes  No

5. NUMBER OF FETUSES

6. GESTATION OF TEST Weeks   Days

7. SHORTEST CERVICAL LENGTH (MM)

8. fFN RESULT (NG/ML)

**Appendix 4 - In Utero Transfer Document**

Transferring Unit \_\_\_\_\_

Gestation	_____
EDD	_____
FFN	_____
Cervical length	_____
QUIPP risk of delivery in 1 week	<input type="checkbox"/>

Patient ID Label
------------------

IUT transfer required:	
• Neonatal hotline contacted	<input type="checkbox"/> <b>0191 2303020</b>
• Receiving Unit	_____
• Obstetric Consultant to Consultant referral	<input type="checkbox"/>
• Midwifery handover of care	<input type="checkbox"/>
• NEAS contacted	<input type="checkbox"/> Time _____
○ Priority of transfer	1      2      3
○ Time of departure	_____

**S** Steroids 1<sup>st</sup> dose  Date \_\_\_\_\_ Time \_\_\_\_\_

2<sup>nd</sup> dose  Date \_\_\_\_\_ Time \_\_\_\_\_

**T** Transfer required  Date \_\_\_\_\_ Time \_\_\_\_\_

**A** Antibiotics GBS  Date \_\_\_\_\_ Time \_\_\_\_\_

**M** Magnesium Loading  Date \_\_\_\_\_ Time \_\_\_\_\_

Infusion  Date \_\_\_\_\_ Time \_\_\_\_\_

**P** Parent discussion  Date \_\_\_\_\_ Time \_\_\_\_\_

**E** Evaluate for tocolysis  Date \_\_\_\_\_ Time \_\_\_\_\_

**D** Delivery plan made  Monitoring, mode of birth, resuscitation



The Northern Neonatal Network  
An Operational Delivery Network  
Website - [www.nornet.org.uk](http://www.nornet.org.uk)



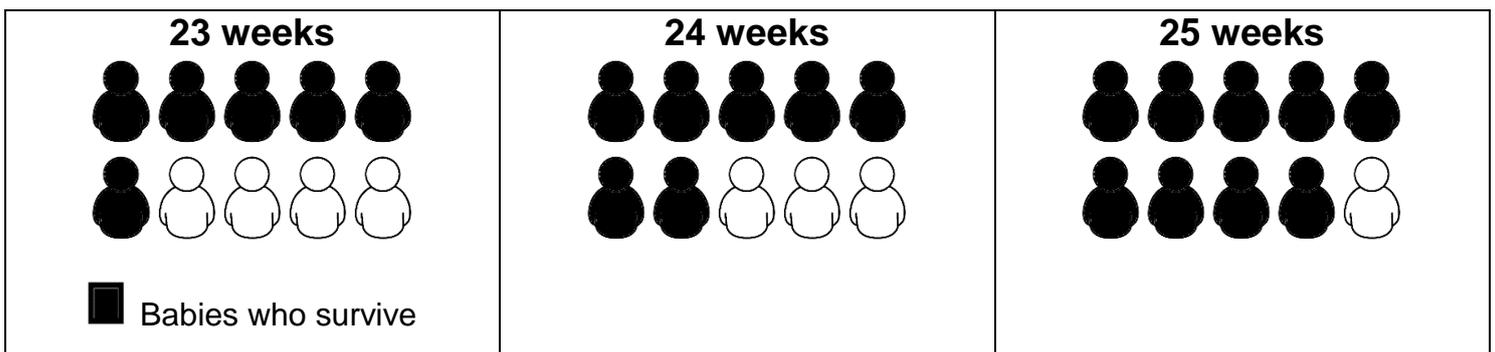
## The Very Early Baby

### Parent Information Leaflet

Having a new baby is an exciting event, but if your baby is born very early this can be stressful. We want you to have the most up-to-date information about what it means to be born this early. This may help you with decisions you are asked to make at this time.

**Each baby is different.** The information below shows survival for babies born in the Northern Neonatal Network, and admitted alive to the Neonatal Intensive Care Unit.

#### What are the chances my baby will survive?



Based on our previous experience and national recommendations, our advice is:

- 22 weeks; intensive care may be offered in some situations after detailed discussion
- 23 weeks; intensive care is offered
- 24 weeks and above; intensive care is given

Other factors, as well as being born very early, can affect whether a baby survives and whether they have long term problems. These include:

- Multiple births (twins, triplets)
- Babies with other abnormalities or genetic problems
- Infection in the womb
- Leaking of fluid from the womb for days or weeks before delivery
- Babies who are smaller than average

The needs of each family are different and your needs will be discussed with you.

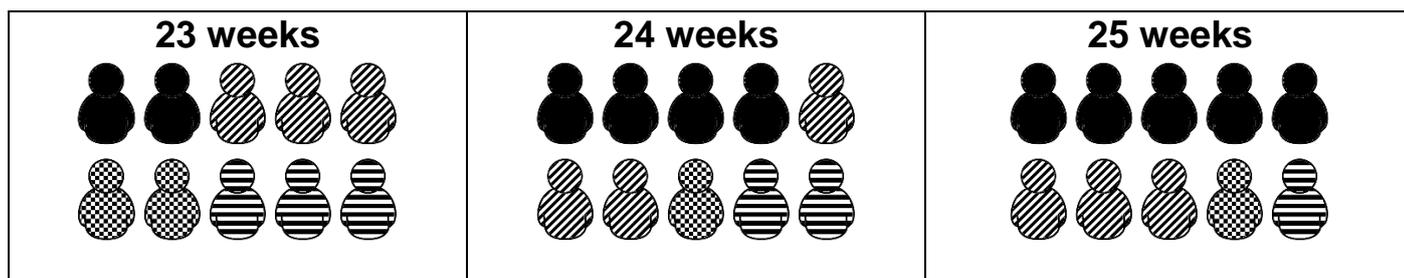
## If my baby survives, will he/she have problems in the future?

The following information is provided to help you better understand the concerns if your baby is born very early. We have defined different kinds of disabilities as follows:

	Movement	Understanding & learning	Hearing	Eyesight
Mild disability	Does not cause major problems on a day to day basis e.g. may be clumsy/struggle with pencil work	Learning difficulties e.g may need extra help with school work	Mild hearing loss, but does not need hearing aids	Likely to need glasses
Moderate disability	May have a condition called cerebral palsy*, but can walk	Needs extra support to be able to learn	Needs hearing aids	Poor eyesight, even with glasses
Severe disability	Unable to walk without help	Likely to need lifelong care	Deaf	Blind

\*Cerebral palsy: a condition that affects muscle control and movement

## If my baby survives, what are the chances he/she will have a disability?



No disability
  Mild disability
  Moderate disability
  Severe disability

- Some problems only become clear when a child is older (e.g school age).
- Approximately 2 out of 3 children born very early will need some extra help at school. The main problems seem are problems with attention and short term memory.
- Approximately one out of ten children born very early have autism spectrum disorder (a condition that affects the way a person communicates and relates to people around them).

---

It is important to remember that a baby's family and surroundings play a very important role in development. Your Doctor and/or physiotherapist can give you more information about how to help your baby's development.

**We hope this information is useful to you and your family. We are here to support you. If you have any questions please ask us.**

## For further information

### Contact details

Neonatal Consultant or Sister  
Please ask for details of your local contacts

### Useful Resources

Charitable organisations:  
Tiny Lives: <http://www.tinylives.org.uk/>  
BLISS: [www.bliss.org.uk](http://www.bliss.org.uk).

NHS Website: <https://www.nhs.uk/conditions/pregnancy-and-baby/premature-early-labour/>

Patient Advice and Liaison Service (PALS): Freephone: 0800 032 0202

Northern Neonatal Network. Modified from BC Womens Health Centre, Vancouver with permission

Reviewed: September 2021

Review date: September 2023

# Delayed Cord Clamping in Preterm Birth

## Delivery Room

- Ensure correct size bag and hats are available
- Neonatal team to remind delivery team of plan for  $\geq 60$  second DCC

**Neohelp Bag Size**  
 Small <26 weeks  
 Medium 26-32 weeks

$\geq 32$  weeks use  
 warm towels & hat

- Neonatal team prepares Neohelp bag and brings to bedside
- Neonatal team member assists midwife in securing baby in Neohelp bag

- Neonatal team start timer & inform at 60 seconds
- Neonatal team member at bedside (or midwife) confirms fetal HR >60

- At  $\geq 60$  seconds (prompt by neonatal team) cord clamped and cut

- Baby moved to Variotherm in Neohelp bag for ongoing care

## Theatre

- Ensure correct size bag and hats are available
- Alert team re plan for  $\geq 60$  second DCC during pre op checklist

- Scrub nurse given Neohelp bag and places on table in preparation for delivery

- Neonatal team start timer & inform at 60 seconds
- Obstetrician places baby inside Neohelp bag, seals around body and close hood

- Obstetrician to confirm fetal heart rate >60. If <60 inform neonatal team
- At  $\geq 60$  seconds (prompt by neonatal team) cord clamped and cut

- Baby moved to cot in Neohelp bag for ongoing care

**At delivery**

## Appendix 7 – Early Expression & Colostrum Information



North East and North Cumbria  
Local Maternity System

SUPPORTED BY



## PROVIDING COLOSTRUM FOR YOUR BABY

### What is Colostrum?

Colostrum is the first milk your body makes. Acting 'like a medicine' it can help their immune system, gut and brain and protect from infection. It starts to work as soon as it is given. **Even very small, sick or early babies can have colostrum as soon as they are born.** We will show you how to express it. **Your colostrum is unique**, made by you especially for your baby's needs and expressing it can help you feel close to them. The earlier you express the sooner your baby can have colostrum and the more milk your body will make overall. **Ideally express within 2 hours after birth. At first you will produce very small amounts – every drop is precious and will help your baby.**



### How to express Colostrum

Being **close to your baby can help expressing** or look at a **photograph** or inhale their **scent**. Skin-to-skin contact will help – ask your nurse about this.

**Scan the QR code: you will be taken to a video showing you how to hand express colostrum (watch from 31 seconds)**

[Hand Expressing Video](#)



Credit: Unicef UK Baby Friendly Initiative Hand expression - YouTube



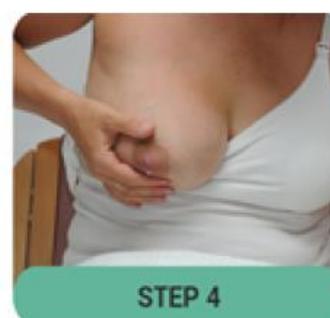
Maternity  
Clinical Network  
North East and North Cumbria



North East and North Cumbria  
Clinical Networks

## How to express Colostrum – Step by Step Guide

- Gently massage the breast and stimulate the nipple.
- Have the little purple syringe to hand.
- Make a C shape with your hand and place your thumb and forefinger 2-3 cm behind your nipple.
- Gently squeeze and release. Press back while doing this if you can and try not to slide your fingers along the breast. Compress and release – it shouldn't hurt.
- Repeat and build up a rhythm. A few drops may appear – if not re position your fingers and do it again – it often takes a little while.
- Drops will appear and this will increase over time. Once this stops, rotate your fingers around the breast so that every part of the breast is expressed.
- Do both breasts each time.
- LABEL the syringe and buzz the midwife and ask them to take the milk to Neonatal unit, if your baby is there, or help you give it if you have your baby with you
- Aim to hand express colostrum 8-10 times in 24 hours.
- Even if you get nothing or the tiniest drop please continue to massage and express every 2-3 hours – it will come.



## Colostrum Expressing Record

	<b>Time and Date</b>	<b>Amount Obtained</b>
<b>First Hand Expressed</b>		
<b>2 – 6 hours</b>		
<b>6 – 10 hours</b>		
<b>10 – 14 hours</b>		
<b>14 – 18 hours</b>		
<b>18 – 24 hours</b>		
<b>24 – 30 hours</b>		
<b>Other</b>		
<b>Electric Pump Demo</b>		



**Baby/ies Information**

**Baby/s MRN Sticker**

**Time of Birth**

