British Association of Perinatal Medicine

Antenatal Optimisation for Preterm Infants less than 34 weeks

A Quality Improvement Toolkit

Aims, Evidence and Rationale

October 2020

in collaboration with

NNAP
National Neonatal Audit Programme

Antenatal Optimisation: Toolkit Aims

- All women who are at risk of preterm birth (including both those in threatened preterm labour and those requiring intervention because of maternal or fetal indications), are **identified appropriately and in a timely manner** using evidence-based methods.
- 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
- 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.
- 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.
- Singleton infants less than 27 weeks of gestation, multiples less than 28 weeks of gestation and any gestation with an estimated fetal weight of less than 800g should be **born in a maternity service on the same site as a neonatal intensive care unit (NICU).**

Notes:
Aims are different to standards. This toolkit does not seek to delineate standards. The aims of this toolkit are to improve the antenatal environment for all preterm infants whilst reducing unnecessary and potentially harmful treatments in those women who do not go on to give birth prematurely. It is fully acknowledged that while units and networks will strive to achieve full compliance across all measures without unnecessary intervention, due to the complex presentation of preterm labour this may not be achievable in all circumstances.

Where there is evidence of maternal or fetal compromise necessitating urgent intervention, achievement of the above objectives should never delay birth.

The optimal timing of antenatal steroids should be achieved by more accurate prediction of preterm birth rather than a routine strategy of repeat dosing which does not improve mortality but may impact fetal growth.

Birth during transport is extremely rare. In the vast majority of cases, timely transfer is appropriate and achievable, and the benefits outweigh the risks. Every decision about appropriateness of transfer should be made by a consultant obstetrician and be based on an assessment of the risk and benefit, distance to travel and risk of birth during the journey.

The delineation of strategies to prevent preterm birth is outwith the scope of this toolkit and are covered by NICE[11] and the UK Preterm Clinical Network[12].

Parents should be actively involved in planning the birth of their preterm baby along with neonatal, obstetric and midwifery teams. At gestations <27w, parents should be involved in risk-based shared decision-making with the most senior clinicians available in accordance with the BAPM Extreme Preterm Framework[10]. This working group recognises that not all families and clinicians will opt for an active treatment pathway for infants at very high risk of a poor outcome. Staff should be aware of local bereavement care arrangements and palliative care pathways and be able to signpost to local and national bereavement organisations. Clinical teams requiring support in these challenging cases should consult their local tertiary referral units for advice and guidance.

Rationale

Prematurity is the most significant cause of mortality in children under five and is associated with significant morbidity in surviving infants. Many well-established evidence-based antenatal interventions reduce the

risk of neonatal death and associated preterm morbidities. UK audit data show there is variable uptake in these interventions with wide variability between units and networks[13]. Optimal delivery of these interventions is dependent on the accurate prediction of preterm birth and the BAPM strongly recommends adoption of the QUiPP app using the QUiPP App Toolkit[14] to improve prediction and timing of interventions. This toolkit seeks to provide users with a framework to understand the local context for QI, understanding enablers and barriers to implementation so that key interventions can be more reliably delivered.

A summary of the evidence and key drivers for antenatal optimisation is provided in Appendix 3.

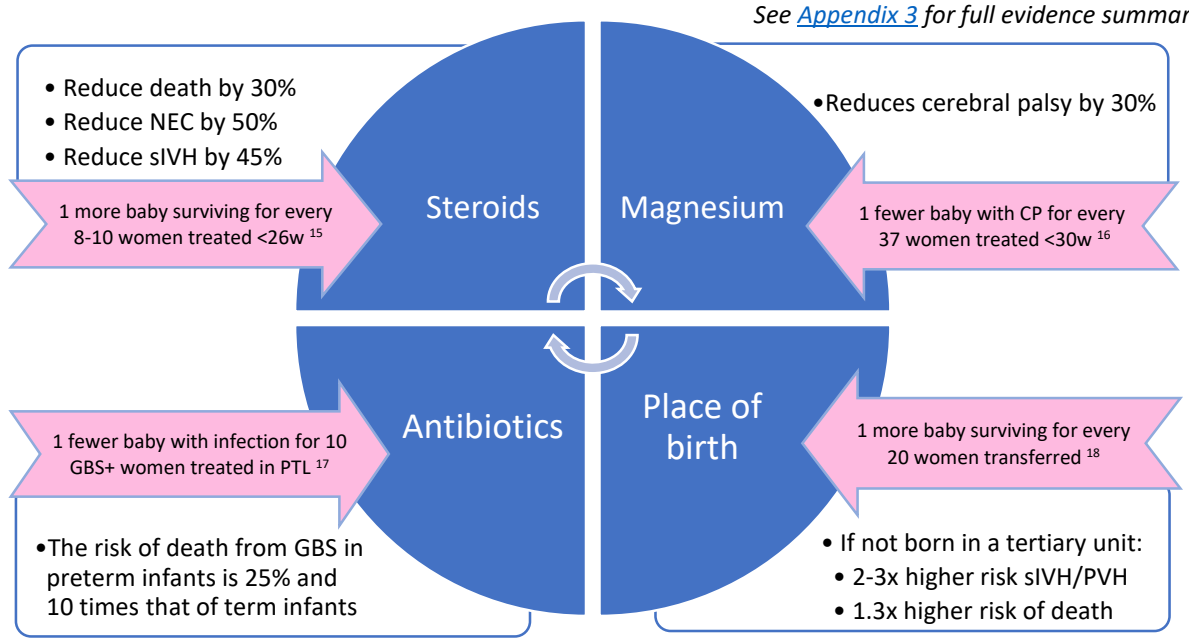
How to use this toolkit

This improvement activity referred to in this toolkit is not intended to be read as a guideline which mandates a standard improvement journey for all units. Instead it is a practical resource from which units who wish to improve compliance rates of antenatal optimisation measures can select the most suitable interventions for their particular context. For example, there are units which achieve high NNAP compliance with 'antenatal steroid administration' but this may be at the expense of optimal timing, occurring more than a week before birth with many more women treated than who go on to have a preterm birth. Another unit may have a lower compliance rate but the timing of administration is optimal. The improvement solution for each unit may be different. Similarly, optimal place of birth may be variably dictated by accuracy in predicting preterm birth or by referral, capacity or transfer issues. Individual units are encouraged to interrogate their processes in order to understand where and how optimisation measures are applied in their local setting and select interventions which are best suited to their context.

Antenatal Optimisation: Rationale and Key Elements

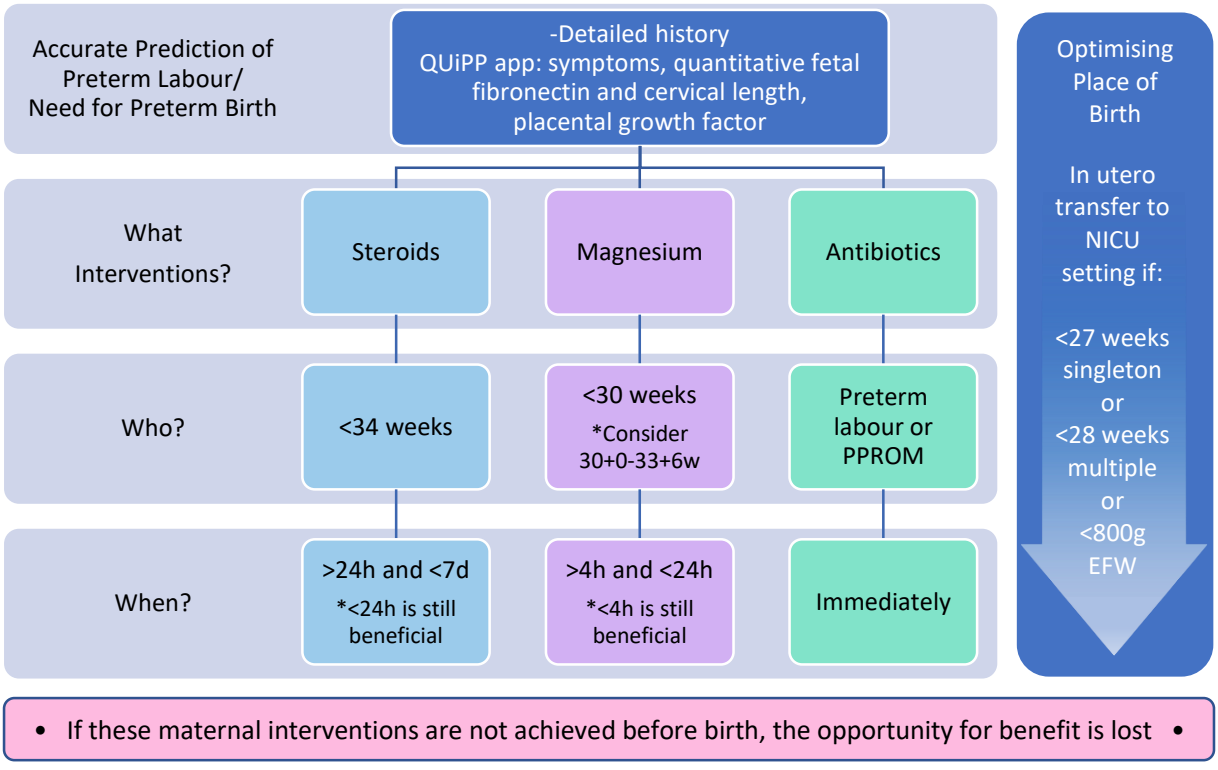
Antenatal Optimisation to Improve Preterm Outcomes- the rationale

See Appendix 3 for full evidence summary



The Antenatal Optimisation Care Bundle- the key elements

See Appendix 3 for full evidence summary



• If these maternal interventions are not achieved before birth, the opportunity for benefit is lost •

Antenatal Optimisation: Implementation evidence and resources

Table of evidence

The following table provides evidence of that which has been shown to be successful in practice in implementing the various elements of the Antenatal Optimisation pathway and lists other resources to support implementation.

Implementation strategy	Reference
Prediction of preterm birth	
Triage system for rapid assessment of women presenting in preterm labour	19
Use of clinical decision-making technology to improve accuracy	20
Guidelines for steroids, magnesium and antibiotics:	
Evidence-based	21-27
Readable, accessible and supported with training and implementation tools	21 23-29
High reliability of delivery: consistent adoption without discordant senior opinion	24-31
National or regional processes that incentivise, educate, train and support	1 23 25 27 32 33
Local, regional or national processes that support:	
Timely and efficient delivery (including standardisation, checklists, feedback, reminders, decision aids, process redundancy and default actions)	24-28
Cross disciplinary engagement and joint working	23-29 31 32 34
Clinical leadership	25 27 29
Data collection, audit and feedback	22-27 29 32 35
Training to promote benefits of interventions	24-29 31
Training in QI methodology	21 23 25 34
Change behaviour and improvements in organisational culture	21 23 25 27 28 34
Partnering with parents for improvement	26 29
Network level arrangements for:	
In utero transfer of women at risk of preterm birth	27 31 32 36
Neonatal unit capacity	27 32 36
Labour ward capacity	27 36
Centralisation of perinatal retrieval	37 38
Simplifying referral processes	27
Network level responsibility for:	
Standardising care throughout region	22 27 34 37 39-41
Reducing variation	22 27 34 39-41
Sharing performance data including exception reporting	22 27 30 34 35 39 40
Opportunities for shared learning	22 27 30 34 39 40
Organisations and resources supporting or incentivising quality improvement in Antenatal Optimisation	
Maternity and Neonatal Safety Improvement Programme, NHS England	2
Preterm Perinatal Wellbeing Package, MCQIC-SPSP	8
NNAP Online	1
Saving Babies' Lives Version 2, NHS England	4
NICE Adoption Support resource for Placental Growth Factor	42
Maternity Incentive Scheme, Clinical Negligence Scheme for Trusts, NHS Resolution	33
PReCePT	43
PERIPrem care bundle, West of England Academic Health Sciences Network	7
European Standards of Care for Newborn Health	44
Bliss Baby Charter	45

Appendix 3. Evidence Summary and Key Drivers

Prediction of Preterm Birth		
Objective: All women who are at risk of preterm birth (including both those in threatened preterm labour and those requiring to be delivered because of maternal or fetal indications), are identified appropriately and in a timely manner using evidence-based methods.		
Evidence-based interventions	**Professional Recommendations**	**Quality Improvement Initiatives**
QUiPP app: Using a 5% chance of birth, predicts PTB in next 7d in women <37w and avoids 90% of admissions[20 50] **Quantitative fetal fibronectin (qfFN):** Growing body of evidence for predictive utility across risk range Predicts PTB <30w in singleton/multiple pregnancy[51 52] Given the linear relationship between qfFN and preterm birth a variable threshold better reflects individual patient circumstances and different treatment options (awaiting QUIDS study[53]) **Cervical length (CL):** A meta-analysis of 28 studies reported a pooled PLR of 5.71 (3.77–8.65) and a NLR 0.51 (0.33–0.80) (69) suggesting that cervical length is a moderately useful test for PTB prediction[54]. The risk of PTB changes across the range of cervical lengths and gestations. **Combination of CL and qfFN:** Addition of CL refines predictive ability of qfFN[55 56] and may save €480 per patient[55] **Preterm birth history alone:** 10-57% of pregnant women with a PTB history will give birth preterm[57] **Placental growth factor and sFlt-1/PGF ratio:** Rules out pre-eclampsia within the next 7d in women with suspected pre-eclampsia <35w[58 59]	NHS England, SBLCBv2[60]: Diagnosis of preterm labour can be optimised by use of qfFN, cervical length and the QUiPP app. BAPM[14]: Endorsement of QUiPP app NICE[11]: • CL and qfFN for suspected preterm labour >30w gestation with CL <15mm deemed to be high risk. • Treat-all policy for those presenting below 30w UK Preterm Clinical Network and the RCOG Preterm CSG[12 61]: • Recommend the use of cervical length, quantitative fFN and decision aids such as the QUiPP app to facilitate prediction and management of threated preterm labour which is in line with the SBLCBv2 NICE[42]: PlGF is recommended to hep rule out pre-eclampsia in women between 20 and 34+6 weeks	• PERIPrem care bundle of the West of England AHSN[7]: use of qfFN to predict PTL • Pan London guideline for in utero transfer[62] • NHS England Accelerated Access Programme: Placental Growth Factor for improved diagnosis of pre-eclampsia[63]

Antenatal Steroids		
Objective: 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 within 24-48 hours.		
Evidence	**Professional Recommendations**	**Standards and Quality Improvement Initiatives**
Antenatal steroids: • Single course <34w reduces risk of death and major morbidity in absence of risk to mother or fetus[64] • ANS <25w may reduce mortality by 50% and severe IVH, PVL[65 66] **Optimum Timing:** • Within 7d of birth, and maximum effect on reduction of IVH and mortality if given within 48h of birth[67 68] • Benefits of steroids plateau at 12-36h and do not exceed 7d. 51% reduction in mortality if given even 6-12h before birth[68] • Only 55-68% of women receiving steroids give birth preterm[69 70] • Only 22% of women receive steroids at optimal time[71 72] **Repeat courses:** • Reduce respiratory morbidity but do not reduce mortality and may impact fetal growth[73] • Number of repeat treatment courses to be limited to 3 with total dose 24-48mg[73]	Offer ANS to women at risk of preterm birth within the next 7d: • WHO, NICE and RCOG[57 72 73]: from 24-33+6w[11 74 75] Discuss the use of ANS: •NICE[11]: between 23+0-23+6w •BAPM[10]: from 22w where active resuscitation is planned •European Consensus Guideline on the Management of Respiratory Distress Syndrome[76]: from when infant is considered viable •UK Preterm Clinical Network[12]: highlights importance of dosing between 1-7d WHO and European Consensus Guideline on the Management of Respiratory Distress Syndrome[74 76]: • Single repeat course if birth does not occur within 7d and high risk of birth within the subsequent 7d	NNAP[1]: • At least 85% of mothers who give birth 23-33+6w should receive at least one dose of steroids prior to birth • MatNeoSIP[2] • NHS England Neonatal Critical Care Quality Dashboard[77] • MCQIC-SPSP in Scotland. Preterm Perinatal Wellbeing package[8] • PERIPrem care bundle of the West of England AHSN[7]
Magnesium Sulphate		
Objective: All women giving birth before 30 weeks of gestation, should receive antenatal magnesium sulphate within the 24 hours prior to birth.		
Evidence	**Professional Recommendations**	**Standards and Quality Improvement Initiatives**
Antenatal magnesium sulphate: • Given <24h prior to birth less than 32w reduces the risk of cerebral palsy and death without risk to mother or fetus[73 78 79] **Gestation <24w:** • Limited evidence for magnesium administration but similar effects seen across range of gestations[80] • Infants have highest risk of neurodevelopmental	Offer Mg to women at risk of imminent PTB: • WHO[74]: <32w • NICE[11] and RCOG: <30w Discuss the use of Mg: •NICE[11]: between 23+0-23+6w •BAPM[10]: from 22w where active resuscitation is planned. Consider the use of Mg: •NICE[11]: Between 30-33+6w	NNAP[1]: • At least 85% of mothers who give birth <30w should receive magnesium sulphate in the 24h prior to birth • MatNeoSIP[2] • PReCePT Quality Improvement toolkit[46] • PERIPrem care bundle of the West of England AHSN-magesium[43]

impairment[10] and may be most likely to benefit • Optimum level is at least 4h after loading dose[81]	Timing: • NICE[11] and UKPCN[12]: A loading dose of 4g followed by infusion of 1g/h until birth or for 24h whichever sooner	• MCQIC-SPSP in Scotland. Preterm Perinatal Wellbeing package[8]
Antibiotics		
Objective: All women in established preterm labour should receive intrapartum antibiotic prophylaxis to prevent early onset neonatal Group B Streptococcal (GBS) infection irrespective of whether they have ruptured amniotic membranes.		
Evidence	**Professional Recommendations**	**Quality Improvement Initiatives**
Preterm prelabour rupture of the membranes and preterm labour are associated with early onset neonatal infection with GBS[82] Antibiotics given at least 4h before birth reduces the risk of GBS sepsis from 11.1% to 1.6%[17]	WHO, NICE, RCOG[11 74 82]: Antibiotic administration is recommended in preterm prelabour rupture of membranes. NICE[11]: Antibiotics can delay PTB and reduce mortality and morbidity associated with congenital infection NICE[11] and RCOG[82]: penicillin in the context of preterm labour or GBS	Neither the NNAP nor the NMPA currently collect data on administration of maternal antibiotics in these contexts. We recommend that units consider undertaking audit of this intervention to ensure optimal compliance with professional recommendations.
Place of Birth		
Objective: Singleton infants less than 27 weeks of gestation, multiples less than 28 weeks of gestation and infants with an estimated fetal weight of less than 800g should be born in a maternity service on the same site as a neonatal intensive care unit (NICU).		
Evidence	**Professional Recommendations**	**Standards and Quality Improvement Initiatives**
Reduced risk of death of extreme preterm infants if birth occurs in a high volume, neonatal intensive care setting [18 83-85] Reduction in mortality is ~50%[84] Reduction in major morbidities of extreme preterm infants if born in a tertiary centre (NEC[86] and PVL[87]) Being born in a non-NICU setting +/- transfer is associated with increased risks of mortality, IVH and severe brain injury in extreme preterm infants [18 88-90]	BAPM[10]: • In utero transfer to facilitate birth of extremely preterm infants in a tertiary centre NHS England[91]: • Infants <27w to be treated in high volume centres with sufficiently expert and experienced staff The Scottish Maternity and Neonatal Services Review[92]: • Develop formal pathways to ensure that clear agreements are in place to treat the highest risk preterm babies in fewer centres, while returning babies to their local area as soon as clinically appropriate	NNAP[1]: 85% of babies less than 27w should be born in a maternity service on the same site as a NICU The European Standards of Care for Newborn Health[93]: Perinatal centralisation of extremely preterm infants with well-organised perinatal networks • MatNeoSIP[2] • Neonatal Critical Care Quality Dashboard[77] • MCQIC-SPSP in Scotland. Preterm Perinatal Wellbeing package[8] • PERIPrem care bundle of the West of England AHSN[7]

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