

MANAGEMENT OF SEVERE PRE-ECLAMPSIA AND ECLAMPSIA	CLINICAL GUIDELINE Register number 05110 Status: Public
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Index

- 1. Purpose**
- 2. Equality and Diversity**
- 3. Incidence**
- 4. Background**
- 5. Definitions**
- 6. Symptoms and Signs of Severe Pre-eclampsia and Eclampsia**
- 7. Roles and Responsibilities of Staff**
- 8. Assessment in the Day Assessment Unit (DAU)**
- 9. Assessment of Proteinuria in Hypertensive Disorders of Pregnancy**
- 10. Management of Labour and Delivery**
- 11. Fetal Monitoring in Severe Gestational Hypertension or Severe Pre-eclampsia**
- 12. Corticosteroids for Fetal Lung Maturation**
- 13. Timing of Birth**
- 14. Pharmacological Management of Blood Pressure in Severe Pre-eclampsia**
- 15. Management of Postnatal Period**
- 16. Postnatal Management of Hypertensive Disorders**
- 17. Readmission Criteria for Hypertension in the Postnatal Period**
- 18. Antihypertensive Drugs and Breastfeeding**
- 19. Characteristics of Eclampsia**
- 20. Management of Eclampsia**
- 21. Care of the fetus during Eclampsia**
- 22. Transfer to Intensive Care**
- 23. Anaesthetic Guidelines**
- 24. Postnatal Care of Eclampsia**
- 25. Record Keeping**

- 26. Staff and Training**
- 27. Professional Midwifery Advocates**
- 28. Infection Prevention**
- 29. Audit and Monitoring**
- 30. Guideline Management**
- 31. Communication**
- 32. Auditable Standards**
- 33. Risk Management**
- 34. References**
- 35. Appendices**
 - A. Appendix A - Admission Guidelines for Patients with Severe Pre-eclampsia
 - B. Appendix B - Blood Tests for Investigation
 - C. Appendix C - Drugs for the Treatment of Hypertension at the Antenatal Period
 - D. Appendix D - Delivery Decisions in Severe Pre-eclampsia Flowchart
 - E. Appendix E - Drug Protocol: Hydralazine
 - F. Appendix F - Drug Protocol: Labetalol
 - G. Appendix G - Considerations for the Use of Magnesium Sulphate (MgSO₄)
 - H. Appendix H - Drug protocol: Magnesium Sulphate Severe Eclampsia and Eclampsia
 - I. Appendix I - Drug Protocol: Calcium Gluconate
 - J. Appendix J - Reducing Errors in Blood Pressure Measurement
 - K. Appendix K –Antihypertensive Drugs in the Postnatal Period
 - L. Appendix L - Information Regarding Self Help Groups

1.0 Purpose

- 1.1 To ensure a system of clear referral pathways are established, so that pregnant patients who require additional care are managed and treated by the appropriate specialist team when problems are identified.
- 1.2 To set clear definitions of pregnant patients who will be appropriate for referral/admission.
- 1.3 To provide an individualised service, during assessment, treatment or admission. Antenatal care should be readily and easily accessible to all patients and should be sensitive to the needs of the individual patient and local community.

2.0 Equality and Diversity

- 2.1 Mid Essex Hospital Services NHS Trust is committed to the provision of a service that is fair, accessible and meets the needs of all individuals.

3.0 Incidence

- 3.1 Maternal deaths from hypertensive disorders are at the lowest ever rate, with fewer than one death for every million women giving birth. This represents a major success for research, audit and evidence-based guidelines leading to improvements in care.

4.0 Background

- 4.1 Pre-eclampsia is also associated with fetal growth restriction, low birth weight, preterm delivery, small for gestational age (SGA) infants and respiratory distress syndrome (The Magpie Collaborative Group, 2002). 8–10% of all preterm births result from hypertensive disorders. Preterm delivery occurs in half of women with severe pre-eclampsia.
- 4.2 New hypertension can occur without significant proteinuria (gestational hypertension) or with significant proteinuria (pre-eclampsia).
- 4.3 Hypertensive disorders during pregnancy can occur in women with chronic hypertension, (pre-existing hypertension).
- 4.4 Treatment and care should take into account women's individual needs and preferences. Good communication is essential supported by evidence based information, to allow women to reach informed decisions about their care.
- 4.5 To control blood pressure and maintain Systolic pressure at ≤ 150 mmHg and Diastolic pressure at 80-100mmHg.

5.0 Definitions

- 5.1 Degrees of hypertension
 - Mild Hypertension - 140/90 – 149/99 mmHg
 - Moderate Hypertension –150/100-159/109 mmHg
 - Severe Hypertension - >160/110 mmHg

- New hypertension - hypertension at or after 20 weeks gestation in a patient with a diastolic blood pressure of less than 90mmHg before 20 weeks
- Gestational hypertension or Pregnancy induced hypertension - new hypertension presenting after 20 weeks without significant proteinuria
- Chronic hypertension - a diastolic blood pressure pre-pregnancy or at booking (before 20 weeks) of 90mmHg or more or that is being treated at the time of referral to maternity services

5.2 Degrees of proteinuria:

- New proteinuria - the presence of proteinuria as shown by 1+ (0.3g/l) or more on proteinuria dipstick testing or a urine protein excretion of 300mg or more per 24 hours
- Significant proteinuria - urine protein excretion \geq 300mg per 24 hours

5.3 Definitions of hypertension:

- Pre-eclampsia - new hypertension and significant proteinuria at or after 20 weeks of pregnancy, confirmed if it resolves after delivery
- Superimposed pre-eclampsia - the development of features of pre-eclampsia in the context of existing hypertension, existing proteinuria or both
- Severe pre- eclampsia. Pre- eclampsia with severe hypertension and/or with symptoms, and/or biochemical and/or haematological impairment
- Eclampsia Convulsive condition associated with pre-eclampsia/ patient coma with Pre-Eclampsia.

6.0 Symptoms and Signs of Severe Pre-eclampsia and Eclampsia

6.1 Pregnant women should be made aware of the need to seek immediate advice from a healthcare professional if they experience symptoms of pre-eclampsia.

6.2 Symptoms include:

- Headache
- Visual disturbances, such as blurring or flashing lights before the eyes
- Epigastric pain or right upper quadrant (RUQ) pain
- Nausea or vomiting
- Sudden swelling of the face, hands or feet
- Decreased fetal movements

6.3 Signs include:

Raised BP 160/110 mmHg or greater than

- Proteinuria
- Oedema (facial in particular)
- Clonus (>3 beats is significant)
- Liver edge or epigastric tenderness
- Papilloedema
- Blood tests abnormalities (haemolysis, alterations of liver function tests, decreased platelets, increased creatinine, increased urate)

7.0 Roles and Responsibilities of Staff

- 7.1 On admission/diagnosis of severe pre-eclampsia, the following personnel should be involved:
- 7.2 **Consultant Obstetrician early involvement** is required at consultant level in the management of patients with severe pre-eclampsia and eclampsia. The duty consultant should be informed and closely involved in formulating on going plan of care, and will provide onsite clinical expertise for junior staff. The consultant obstetrician should liaise with the consultant anaesthetist, paediatrician and labour ward co-ordinator.
- 7.3 **Obstetric Registrar** is responsible for carrying out full physical and neurological assessment of the patient, assessing the fetal condition and documenting a clear plan of care in collaboration with anaesthetic and paediatric medical staff. The obstetric registrar should update the duty obstetric consultant regarding progress and any signs of deterioration in condition. The patient and her partner should be involved in the decision making process. The registrar should review the woman at least 4-hourly. (Refer appendix A)
- 7.4 **Anaesthetic Registrar** should review the patient from the anaesthetic point of view, in order to assess the appropriateness of performing a General Anaesthetic (GA) or regional anaesthetic block if operative delivery is likely or epidural if induction of labour is feasible. The anaesthetist will have a key role in monitoring fluid balance and maintaining clear airway and ventilation when seizures occur.
- 7.5 **Consultant Anaesthetist** should be informed by the duty anaesthetist of any patient with severe pre eclampsia, and will personally provide expertise and clinical support in critical situations such as eclampsia. The consultant anaesthetist should liaise with the consultant obstetrician, paediatrician and labour ward co-ordinator.
- 7.6 **Labour Ward Co-ordinator** is responsible for the following:
- Assigning an experienced midwife to provide one to one midwifery care
 - The labour ward co-ordinator should liaise with the consultant obstetrician, consultant anaesthetist, and the paediatrician
 - To provide support and expertise to junior midwifery and obstetric staff
 - In the event of eclampsia the coordinator should in collaboration with the most senior obstetric doctor present, consider delaying any on going elective operative lists until the patient's condition is stabilised, and/or the fetus is delivered
 - Where appropriate and respecting confidentiality the patient's partner and family will be kept informed.
- 7.7 **The Midwife** assigned to the patient will be responsible for monitoring and recording observations of vital signs at the appropriate interval and recording the following information:
- Maintain a fluid balance

- Ensure all prescribed medications are given at the appropriate time (Refer to appendix H)
- A patient at risk score i.e. the Maternity Early Obstetric Warning System (MEOWS) should be commenced (Refer to the guideline for the 'Management of the severely ill pregnant patient'; register number 09095)
- The midwife will monitor fetal well-being by recording the fetal heart continuously by cardiotocography (CTG) until advised by the obstetrician
- The midwife will ensure the patient is kept fully informed and refer to the obstetric registrar or consultant on call when there is deterioration in the patient's condition
- The midwife is responsible for ensuring all tests and investigations requested by the obstetrician are carried out and sent to the respective laboratory/department
- Once results are available the midwife will inform the obstetric registrar or consultant on call immediately

7.8 **Maternity Care Assistant** will support the midwife and doctor by ensuring relevant equipment is available, organising transport of urgent blood specimens, calling extra help when requested, and supporting the immediate family, including care of the baby if applicable.

7.9 **Operating Department Practitioner** will support the duty anaesthetist in crisis situations such as eclampsia.

7.10 **Neonatal Unit and Paediatrician** if the fetus is premature or compromised by growth restriction and delivery is anticipated, where possible the duty paediatric registrar and a senior neonatal nurse should see the patient to explain the care and management that her baby may require following birth. This should include the likelihood of transfer to another hospital (i.e. if delivery is below 30 weeks gestation). The paediatrician should liaise with the consultant anaesthetist, consultant obstetrician and labour ward co-ordinator.

7.11 **Consultant Haematologist** should be informed at the earliest opportunity (if associated with major coagulopathy) in order that adequate supplies of blood and blood products are made available and sent with out delay.

8.0 Assessment in the Day Assessment Unit (DAU)
(Refer to Appendix A)

8.1 Maternal and fetal assessment to be undertaken within 30 minutes of admission to unit; once the woman has been shown to her bed or assessment area.

8.2 Large cuffs must be used for patients with an arm circumference of 41cm or more. Use equipment that is accurate in measuring hypertensive individuals; automated devices that are accurate in pregnancy can under-read by clinically significant amounts in patients with pre-eclampsia. The most accurate is the standard mercury sphygmomanometer. The environment should be relaxed, quiet and preferably after rest.

8.3 Clinical assessment by the midwife should be consistent and documented as follows in

the patient's healthcare records:

- Review of current obstetric history - note the most recent community dipstick test result and date; gestational age; booking blood pressure; booking dipstick protein results; booking risk factors
- Clinical assessment of maternal symptoms relating to pre-eclampsia – visual disturbance ('tunnelling'), headaches, nausea, epigastric pain/ right upper quadrant pain
- Clinical assessment of fetal size and wellbeing relating to pre-eclampsia. This generally includes measurement of symphysis -fundal height and clinical enquiry about fetal movements.
(Refer to the guideline entitled 'Abdominal palpation and examination in pregnancy' register number 07043; and the guideline entitled 'Reduced fetal movements', register number 06034)
- Dipstick test for proteinuria - dipstick proteinuria (none, trace, 1+, 2+, >2+ protein)
- Perform a CTG (cardiotocograph) if 28 weeks gestation and above
- Obtain PET bloods
- Obstetric review

9.0 Assessment of Proteinuria in Hypertensive Disorders of Pregnancy

9.1 Use urine dipstick or a spot urinary protein:creatinine ratio (PCR) for estimating proteinuria.

- Perform midstream specimen of urine (MSU) to exclude infection (if leucocytes and/or nitrite +)
- If dipstick urinalysis of 1+ proteinuria is obtained use a spot urinary PCR to quantify the proteinuria.

9.2 Use of PCR as a diagnostic test for PET

- Urinary PCR greater than 50 mg/mmol is diagnostic of PET and no further testing is required
- Diagnose significant proteinuria if the urinary protein: creatinine ratio is greater than 30 mg/mmol or a validated 24-hour urine collection result shows greater than 300 mg protein
- If the urine volume on 24 hour collection is less than a litre, this may result in a false negative for proteinuria.
- Consultant at any time may decide to proceed to a 24 hour urine collection.
- There is no need to repeat quantification of proteinuria once pre-eclampsia is proven

10.0 Management of Labour and Delivery

10.1 Delivery is the only known cure for pre-eclampsia. Decisions regarding the timing and mode of delivery are based on a combination of maternal and fetal factors.

- 10.1.1 Fetal factors include gestational age, evidence of lung maturity, and signs of fetal compromise.
- 10.1.2 Maternal factors include the degree to which the hypertension is controllable and any clinical or laboratory signs of impending decomposition.
- 10.2 A vaginal examination may be done to determine if the cervix is favourable for induction. This will depend on gestation and general maternal condition. (Refer to Appendix D)
- 10.3 BP and symptoms check
- Hourly in women with mild or moderate hypertension
 - Every 15 minutes in women with severe hypertension.
- 10.4 Continue use of oral **antihypertensive treatment** during labour.
- 10.5 Stabilisation of BP with oral treatment before induction or caesarean section (CS) makes hypertension in labour, delivery and the postpartum period easier to manage, and may avoid the need for parenteral therapy.
- 10.6 Intravenous access is required for all women with severe pre-eclampsia during labour and delivery.
- 10.7 Manage labour on Labour Ward
- 10.8 Use continuous CTG in labour
- 10.9 Fluid Regime for PET
- 10.9.1 PET patients tend to be relatively intravenously fluid depleted but also leak fluid from their intra-vascular compartment due to capillary endothelial damage.
- 10.9.2 The aim of fluid management is to maintain a urine output of more than 0.5ml/kg/hour (averaged out over four hour period) but to avoid fluid overload and pulmonary oedema)
- 10.9.3 Maintain fluid: Up to 85 ml crystalloid intravenously per hour or urine output in preceding hour plus 30ml. This must include the fluid contained in any drug infusions.
- 10.9.4 A CVP (central venous pressure) lines should only be inserted on the maternity unit with the involvement of the consultant anaesthetist. This procedure should be carried out under ultrasound in order to help identify the correct placement site.
- 10.10 Urine Output
- 10.10.1 If output falls below 30-40-ml/ hour for four hours, inform the obstetric registrar and anaesthetist for further management.
- 10.10.2 Repeat creatinine and potassium levels.
- 10.10.3 If oliguria persists consider CVP monitoring and transfer to ITU.

- 10.10.4 Post caesarean, the Syntocinon infusion management will be 40i.u (international units) of Syntocinon in 40 ml of Normal Saline 0.9%. The rate of infusion will be 10mls/hour. This replaces 40i.u. Syntocinon in 500mls Hartmanns at a rate of 125mls/hour. This ensures the 85ml/hour total hourly input is maintained.
- 10.11 Oral fluids
- 10.11.1 Oral fluids are to be restricted if
- Urine output is less than 80mls over 4 hours
 - If serum Albumin is <20.
- 10.12 Analgesia during Labour
- PET is not a contra-indication to epidural providing platelets >80 x 10⁹/l. If platelets <100 or liver function is abnormal clotting studies should be taken
 - Epidural infusion gives better cardiovascular stability than epidural top-ups.
 - Beware fluid overload and pulmonary oedema (especially with oxytocin). **Do not preload** women who have severe pre-eclampsia with intravenous fluids before establishing low-dose epidural analgesia and combined spinal epidural analgesia.
- 10.13 Second Stage
- Do not routinely limit the duration of the second stage of labour if blood pressure is controlled within target ranges in women with severe hypertension i.e. systolic < 150mmHg and diastolic 80-100mmHg
 - Recommend operative birth in the second stage of labour for women with severe hypertension whose hypertension has not responded to initial treatment.
- 10.14 Third Stage Management
- 10.14.1 Intravenous (IVI) Syntocinon[®] 5units should be given following delivery.
- 10.14.2 Syntometrine[®] or Ergometrine must not be given as their administration will raise blood pressure and may cause a cerebral vascular accident.
- 11.0 Fetal Monitoring in Severe Gestational Hypertension or Severe Pre-eclampsia**
- 11.1 CTG
- 11.1.1 Commence CTG at diagnosis.
- 11.1.2 If the results of all fetal monitoring are normal do not routinely repeat CTG more than weekly, unless any of the following occur:
- The woman reports a change in fetal movement
 - Vaginal bleeding
 - Abdominal pain
 - Deterioration in maternal condition
- 11.2 Ultrasound
- 11.2.1 If conservative management is planned, carry out ultrasound fetal growth and amniotic fluid volume assessment and umbilical artery doppler velocimetry at diagnosis.

11.2.2 Repeat them every 2 weeks.

11.2.3 If the umbilical Doppler is above the normal range repeat weekly if end diastolic flow present and twice weekly if absent

11.3 Care Plan

11.3.1 Document a care plan that includes all of the following:

- The timing and nature of future fetal monitoring
- Fetal indications for birth and if and when corticosteroids should be given when discussion with neonatal paediatricians and obstetric anaesthetists should take place and what decisions should be made

12.0 Corticosteroids for Fetal Lung Maturation

12.1 If birth is considered likely within 7 days in women with pre-eclampsia between 24 and 34 weeks give two doses of betamethasone 12 mg intramuscularly 24 hours apart

12.2 Consider the same treatment in women between 35 and 36 weeks.

13.0 Timing of Birth

13.1 Timing of birth: consider delivery after 37 weeks gestation, based on severity of pre-eclampsia, maternal and fetal indication as follows:

- Initial stabilization of the maternal condition leads to a safer delivery by whatever route.
- Check to see if the patient fits the criteria for inclusion in the Severe PET Protocol.
- Consultant obstetric staff should document in the woman's notes the maternal biochemical, haematological and clinical) and fetal thresholds for elective birth **before 34 weeks** in women with pre-eclampsia

13.2 Do not offer birth before 37 weeks to women with gestational hypertension whose blood pressure is lower than 160/110 mmHg, with or without antihypertensive treatment.

13.3 For women with gestational hypertension whose blood pressure is lower than 160/110 mmHg after 37 weeks, with or without antihypertensive treatment, timing of birth, and maternal and fetal indications for birth should be agreed between the woman and the senior obstetrician.

13.4 Possible criteria for intervention:

13.4.1 Fetal Indications

- No fetal growth 2-4 weeks
- Reversed EDF

13.4.2 Maternal indications

- Persistent significant symptoms of PET
- Platelets less than $70 \times 10^9 /l$
- ALT more than 100 IU/L

- Albumin less than 20 g/L
- Creatinine more than 120 µmol/L
- Inability to control SBP less than 160mmHg
- Recommend birth within 24–48 hours for women who have pre-eclampsia at 38 weeks gestation

14.0 Pharmacological Management of Blood Pressure in Severe Pre-eclampsia

14.1 To control blood pressure; systolic < 150mmHg; diastolic 80-100mmHg (Refer to table 1)

14.1.2 Table 1. Pharmacological Management of Severe Pre-eclampsia

Degree of Hypertension	Mild Hypertension (140/90-149/99 mmHg)	Moderate Hypertension (150/100-159/109 mmHg)	Sever Hypertension (160/110mmHg or higher)
Admit to Hospital	No	No	Yes (until blood pressure is 159/109 mmHg or less)
Measure Blood Pressure	Not more than once a week	At least twice a week	At least four times a day
Treatment	No changes	With first line drug therapy to keep: <ul style="list-style-type: none"> • Diastolic BP between 80-100mmHg • Systolic BP less than 150 mmHg 	With first line drug therapy to keep: <ul style="list-style-type: none"> • Diastolic BP between 80-100mmHg • Systolic BP less than 150mmHg
Test for Proteinuria	At each visit a urinalysis dipstick	At each visit a urinalysis dipstick	Daily urinalysis dipstick
Blood tests	Only those for routine antenatal care	PET Blood tests Do not carry out further blood tests if no proteinuria at subsequent visits	PET blood tests Test at presentation and then twice weekly

15.0 Management of Postnatal Period

15.1 All patients managed according to these guidelines need high dependency nursing for at least 24 hours. ITU/HDU (intensive therapy unit/high dependency unit) admission should be arranged if this is not possible at the Consultant-led Unit, based at Broomfield Hospital.

15.2 Anti -hypertensive treatment should be reduced gradually; it must be remembered that the condition may initially worsen in the immediate postpartum period. The greatest risk of eclampsia occurs within the first 24 hours following delivery.

- 15.3 Patients who develop hypertension during pregnancy should be carefully re-evaluated during the immediate postpartum months and counselled with respect to future pregnancies.
- 15.4 Any laboratory abnormality or physical finding that has not returned to normal before post delivery discharge should be reassessed at post partum-follow up with the patient's obstetrician.
- 15.5 The expectation is that hypertension and other signs or symptoms or organ dysfunction associated with severe pre-eclampsia will have remitted by the 6 weeks postpartum check.
- 15.6 Following discharge from hospital patients diagnosed with severe pre-eclampsia (i.e. treated with magnesium sulphate) during their pregnancy should be given a blood form to check their LFT's, U&E's and clotting studies (to be taken 5 weeks hence). Furthermore, a postnatal appointment should be made with the patient's obstetric consultant for 6 weeks post delivery, to attend the Maternal Medicine Clinic; Antenatal Clinic on a Tuesday morning.
- 15.7 Patients who have had pre-eclampsia are more prone to hypertensive complications in subsequent pregnancies. The risk increases with manifestation of severe-pre-eclampsia developing in early pregnancy compared with late pregnancy.
- 15.8 Factors increasing recurrence of pre-eclampsia in future pregnancies are:
- Multigravida who conceive with a new partner (even if normotensive with previous pregnancies)
 - Patients with early-onset severe pre-eclampsia
- 15.9 Factors increasing the likelihood of hypertension in later life are:
- Nulliparous patients with pre-eclampsia or eclampsia manifesting hypertension in subsequent pregnancies
 - Multiparous patients who develop the disorder
 - Severe early onset of any parity
- 15.10 Patients with early onset of severe pre-eclampsia have risk factors associated with Vascular Thombosis. The blood investigations to be requested are:
- Thrombophilia screening. This looks at:
 - Anti Thrombin III levels
 - Protein C deficiency,
 - Protein S deficiency
 - Lupus Factor
 - Factor V Leiden
 - Prothrombin gene mutations
 - Anti Cardiolipin Antibodies, IgG and IgM.

16.0 Postnatal Management of Hypertensive Disorders

16.1 Pre-existing Hypertension

- 16.1.1 Aim to keep blood pressure lower than 150/100 mmHg
- 16.1.2 Restart pre-pregnancy antihypertensive treatment (consider compatibility with breast feeding).
- 16.1.3 If a woman has taken Methyldopa during pregnancy, stop within 2 days of birth and change to Atenolol 50mg OD, or Nifedipine SR 10-40 mg BD, or Amlodipine 5-10mg OD.
- 16.1.4 Avoid diuretic treatment if woman breastfeeding.
- 16.1.5 Check BP:
 - Daily for the first 2 days after birth
 - At least once between day 3 and day 5 after birth
 - As clinically indicated if antihypertensive treatment is changed after birth
- 16.1.6 Review long-term antihypertensive treatment 2 weeks after the birth by her GP.

16.2 Gestational Hypertension

- 16.2.1 Check BP:
 - Daily for the first 2 days after birth
 - At least once between day 3 and day 5 after birth
 - As clinically indicated if antihypertensive treatment is changed after birth
- 16.2.2 Aim to keep blood pressure lower than 150/100 mmHg
- 16.2.3 For women with gestational hypertension who did not take antihypertensive treatment during pregnancy, start antihypertensive treatment if BP>149/99 mmHg.
- 16.2.4 Continue antenatal antihypertensive treatment.
- 16.2.5 If a woman has taken Methyldopa during pregnancy, stop within 2 days of birth. Change to Atenolol 50mg or Nifedipine SR 10-40 mg or Amlodipine 5-10mg daily.
- 16.2.6 Consider reducing antihypertensive treatment if their blood pressure falls below 140/90 mmHg.
- 16.2.7 Reduce antihypertensive treatment if their blood pressure falls below 130/80 mmHg.
- 16.2.8 Offer a medical review (generally by her GP) 2 weeks after transfer to community care for long-term antihypertensive treatment review. A subsequent medical review 6-8 weeks after delivery may also be needed.
- 16.2.9 Write a care plan for women with gestational hypertension who have given birth and are being transferred to community care that includes:

- Who will provide follow-up care
- Frequency of BP check
- Thresholds for reducing or stopping treatment (should be written when possible, as part of discharge information)
- Risk of recurrence and hypertension in later life. Tell women who have had PIH that:
 - Their risk of developing gestational hypertension in a future pregnancy ranges from 16-47%
 - Their risk of developing pre-eclampsia in a future pregnancy is 2-7%
 - This condition is associated with an increased risk of developing hypertension and its complications in later life

16.3 **Pre-eclampsia**

16.3.1 Please ensure that when transferred to the Postnatal Ward the ward staff are aware the woman had severe PET.

16.3.2 Ask women with pre-eclampsia who have given birth about pre-eclampsia symptoms each time BP is measured.

16.3.3 44% of eclamptic fits occur after delivery.

16.3.4 Check BP:

- In women with pre-eclampsia who took antihypertensive treatment antenatally:
 - At least four times a day while the woman is an inpatient
 - At least once a week for up to 2 weeks after transfer to community care until the woman is off treatment and has no hypertension.
- In women with pre-eclampsia who did not take antihypertensive treatment:
 - At least four times a day while the woman is an inpatient
 - At least once between day 3 and day 5 after birth
 - On alternate days until normal if blood pressure was abnormal on days 3–5.

16.3.5 Aim to keep blood pressure lower than 150/100 mmHg

16.3.6 For women with pre-eclampsia who did not take antihypertensive treatment during pregnancy, start antihypertensive treatment if BP > 149/99 mmHg.

16.3.7 Continue antenatal antihypertensive treatment.

16.3.8 Consider reducing antihypertensive treatment if their blood pressure falls below 140/90 mmHg.

16.3.9 Reduce antihypertensive treatment if their blood pressure falls below 130/80 mmHg.

16.3.10 If a woman has taken Methyldopa during pregnancy, stop within 2 days of birth. Change to Atenolol 50mg or Nifedipine SR 10-40 mg or Amlodipine 5-10mg daily

16.4 **Biochemical Parameters**

16.4.1 In women who have **pre-eclampsia**, or after step-down from critical care:

- Measure platelet count, transaminases and serum creatinine 48–72 hours after birth or step-down
- Do not repeat platelet count, transaminases or serum creatinine measurements if results are normal at 48–72 hours.
- If biochemical and haematological indices are improving but stay within the abnormal range in women with pre-eclampsia who have given birth, repeat platelet count, transaminases and serum creatinine measurements as clinically indicated and at the postnatal review (6–8 weeks after the birth).

16.5 Risk of recurrence of hypertensive conditions and increased cardiovascular risk

16.5.1 Tell women who had pre-eclampsia that their risk of developing:

- Gestational hypertension in a future pregnancy ranges from 13% to 53%.
- Pre-eclampsia in a future pregnancy is up to 16%; and up to 25% if their pre-eclampsia was complicated by severe pre-eclampsia, HELLP syndrome or eclampsia and led to birth before 34 weeks; and about 55% if it led to birth before 28 weeks.
- Women with pre-eclampsia have a three- to four- fold increased risk of developing chronic hypertension and DM type 2, and an approximately two-fold increased risk of ischaemic heart disease, stroke and venous thromboembolism.

17.0 Readmission Criteria for Hypertension in the Postnatal Period

17.1 If the blood pressure is above 160/100 mmHg re-admit.

17.2 Consider additional antihypertensive treatment if blood pressure is above 160/100 mmHg.

17.3 Once their blood pressure falls below 140/90 mmHg for 24 hours; discharge and consider referral to the Thursday Obstetric Medicine Clinic.

18.0 Antihypertensive Drugs and Breastfeeding (Refer to Appendices C and K)

18.1 There is insufficient evidence on the safety in babies receiving breast milk of the following antihypertensive drugs: ARBs; Amlodipine; ACE inhibitors other than Enalapril and Captopril. (NICE 107).

18.2 Safe drugs

18.2.1 ACE inhibitors: Enalapril (5-20mg bd).

18.2.2 Calcium Channel Blockers:

- Nifedipine SR (10-40mg bd). Preferred in Afro-Caribbeans.
- Amlodipine 5-10mg can be used. There is insufficient evidence on the safety of Amlodipine in breast-fed babies but it is thought probably compatible with breastfeeding.

18.2.3 Beta Blockers:

- Labetalol (100-500mg tds)
- Atenolol (25-50mg od)
- Metoprolol (25-100mg tds)

18.2.4 To avoid due to insufficient evidence on safety:

- ARBs
- Doxazosin. If an alpha-blocker is required, Prazosin should be prescribed as it is not thought to accumulate in milk as Doxazosin may do.
- Although diuretics are safe, they may be less well tolerated causing excessive thirst if the mother is breast feeding.

19.0 Characteristics of Eclampsia

19.1 Eclampsia is the occurrence of seizures in a patient with pre-eclampsia or coma in a woman with Pre-eclampsia, not attributable to any other cause.

19.2 Eclampsia is characterised by the appearance of seizures in a patient that usually has pre-eclampsia. Eclampsia is a life-threatening emergency and requires proper care to avoid compounding morbidity or increasing mortality.

19.3 The clinical course eclamptic seizures develop quickly but in stages:

- General vagueness
- Twitching
- Facial congestion
- Deepening loss of consciousness
- Tonic phase of deep muscular rigidity developing to a rhythmic muscular contractions and relaxation.

19.4 These events last about one to one and a half minutes, during which time the patient is without respiratory effort. Eventually the seizure ends with the woman in a coma, but breathing. Finally the patient may begin to gain consciousness but is confused and agitated.

20.0 Management of Eclampsia

20.1 Pull emergency call-bell to alert other members of staff to emergency. Consider crash call (**Code Red**) via switchboard, confirming the ward and bed number.

20.2 Do not attempt to shorten or abolish the initial convulsion by using drugs such as diazepam or phenytoin. These drugs lead to respiratory depression, aspiration, or frank respiratory arrest, particularly when they are given repetitively or used in combination with magnesium sulphate.

20.3 Protect the airway and minimize the risk of aspiration by placing the women head down and on her side and suctioning any foam and secretions from her mouth.

20.4 Administer oxygen 10 litres/min.

- 20.5 Prevent maternal injury, providing close observation, soft padding and use of side rails on the bed may help prevent injury.
- 20.6 Obtain intravenous access (a cut down set may be required)
- 20.7 The initial dose of MgSo₄ in eclampsia should be 4g over 5mins followed by the infusion as described
(Refer to Appendix H)
- 20.8 Recurrent seizures should be treated by a further bolus of magnesium sulphate 2g.
(Refer to Appendix G)
- 20.9 Attach the following monitoring: pulse oximetry / electrocardiograph (ECG) / dinamap.
- 20.10 Have the emergency crash trolley ready nearby.
- 20.11 Be prepared to intubate the patient (remove head of bed) in event of apnoea, severe respiratory depression or loss of airway reflexes.
- 20.12 If repeated seizures occur despite Magnesium, options include Diazepam (10mg IV) or Thiopentone (50mg IV). Thiopentone is an anaesthetic induction agent and as such should only be administered by a qualified anaesthetist.
- 20.13 Further seizures should be managed by intermittent positive pressure ventilation and muscle relaxation.
- 20.14 Blood pressure control should be managed as for severe pre-eclampsia.
(Refer to point 14.0)
- 20.15 Fluid balance control should be managed as for severe pre-eclampsia.
(Refer to point 10.10)

21.0 Care of the Fetus During Eclampsia

- 21.1 During an eclamptic seizure, the fetus will frequently manifest bradycardia due to hypoxia, since the mother is not breathing and the uterine arteries are in severe vasospasm. In the absence of other severe medical or obstetric complications, the fetus usually recovers and may have a good outcome despite the eclampsia.
- 21.2 Delivery following eclampsia is the definitive treatment for eclampsia.
- 21.3 Attempts to prolong pregnancy in order to improve fetal maturity are unlikely to be of value.
- 21.4 It is inappropriate to deliver an unstable mother even if there is fetal distress.
- 21.5 Once seizures are controlled, severe hypertension treated, and hypoxia corrected, delivery can be expedited.
- 21.6 Vaginal delivery should be considered but caesarean section is likely to be required in primigravidae remote from term with an unfavourable cervix.

22.0 Transfer to Intensive Care

To be read in conjunction with: Guideline for High Dependency Care/Transfer to ITU (Register no: 04232)

- 22.1 This is arranged by the duty anaesthetist, in consultation with the on call consultant anaesthetist, consultant obstetrician and Intensive Care consultant and should be considered if:
- 22.1.1 The patient is having recurrent convulsions despite therapeutic levels of anticonvulsant.
- 22.1.2 The patient has a diastolic BP consistently above 110mmHg or MAP above 125mmHg despite full treatment with hydralazine and beta-blockers.
- 22.1.3 There is **any** respiratory problem i.e. pulmonary oedema, airway oedema or loss of protective reflexes.
- 22.1.4 The blood pressure is very unstable with very high **or** low swings.

23.0 Anaesthetic Guidelines

- 23.1 Oral intake and antacid prophylaxis. All patients treated under the severe pre-eclampsia guidelines are regarded as being at high risk of needing obstetric intervention and must therefore be kept nil by mouth, at least until post delivery.
- 23.2 They must also receive 150 milligrams (mg) ranitidine 6 hourly, orally.
- 23.3 At the time of the decision to perform a LSCS patients should receive 10mg of metoclopramide IV.
- 23.4 30 (millilitres) ml of 0.3M sodium citrate should be given immediately before induction of general anaesthesia.
- 23.5 Labour management - epidural is the preferred method of analgesia, sited by an experienced anaesthetist.
- 23.6 Preload with 500mls Hartmanns over 15 minutes prior to block.
- 23.7 Thereafter continue with Hartmanns up to 80ml / hour unless oliguric
- 23.8 Top-ups should be given carefully and incrementally to minimise the risk of hypotension.
- 23.9 Contraindications of an epidural:
- Platelet count < 80,000 x 10⁹/L
 - Abnormal clotting
 - Informed maternal refusal
- 23.10 Caesarean section - spinal block is the preferred method of anaesthesia sited by an experienced anaesthetist (Refer to 24.9 for contraindications)

- 23.11 Fluid preload – For an elective caesarean section, preload with 500 ml Hartmanns over 15 minutes prior to block
- 23.12 Emergency caesarean section (CS) Extend block without additional preload if a functioning block exists. If a functioning block has not been established, then either a regional technique with preload of 500 ml Hartmanns or general anaesthesia should be employed depending on urgency of CS.
- 23.13 Managing hypotension - hypotension is best managed with vasopressors, thus avoiding excess fluid loading. This can be achieved with phenylephrine infusion or by bolus doses of ephedrine, according to the clinician's preference.
- 23.14 General anaesthesia - In addition to the chosen standard procedure, an attempt to attenuate the pressor response to laryngoscopy and intubation should be made.
- 23.15 Esmolol 2mg /kilogramme (kg) given intravenously 2 minutes prior to induction of anaesthesia is the recommended drug.
- 23.16 Great care should be taken at extubation, as airway obstruction due to oedema may be a serious hazard. If there is any doubt, admission to ITU and delayed extubation should be arranged.

24.0 Postnatal Care of Eclampsia

- 24.1 Following delivery, the patient should be assessed by the consultant obstetrician and consultant anaesthetist and decision made to transfer to ITU or to provide high dependency care on the Labour Ward. High dependency care should be continued for a minimum of 24 hours.
- 24.2 Patients and partners are often traumatised and unprepared for the unexpected outcome, requiring extra care and support by all clinicians and carers.
- 24.3 Most patients who suffer seizures will have no recollection of events and should be given the opportunity to discuss the events surrounding her care.
- 24.4 Extra midwifery support should be provided in the community possibly extending postnatal visits until the patient feels confident in her recovery and care of her baby.
- 24.5 During the immediate postnatal period the patient may be too unwell to breast-feed her baby and every effort should be made to help initiate lactation.
- 24.6 The baby may be transferred to the neonatal unit (NNU) for care if the patient is too unwell or if the mother is transferred to ITU.
- 24.7 Every effort should be made to involve the immediate family in caring for the baby and at the earliest opportunity encouraging maternal bonding and initiation of breast-feeding (if this method of feeding is the wish of the mother).
- 24.8 All professionals should endeavour to keep the patient and her family closely informed of events and progress. Whilst an inpatient (prior to discharge) the consultant involved in her care should visit, in order to answer any immediate concerns that the woman and her partner may have.

24.9 Following discharge from hospital patients diagnosed with eclampsia during their pregnancy should be given a blood form to check their LFT's, U&E's and clotting studies (to be taken 5 weeks hence). Furthermore, a postnatal appointment should be made with the patient's obstetric consultant for 6 weeks post delivery, to attend the antenatal clinic.

24.10 The patient may benefit from contacting self-help groups.
(Refer to Appendix L)

25.0 Record Keeping

25.1 The standard of all the entries entered into the patient's handheld records should be of a high professional standard and should reflect the guidance stated in the guideline entitled 'Maternity record keeping including documentation in the handheld records'; register number 06036.

26.0 Staffing and Training

26.1 All midwifery and obstetric staff must attend yearly mandatory training which includes kills and drills training, maternal resuscitation and early recognition of the ill patient.
(Refer to 'Mandatory training policy for Maternity Services (incorporating training need analysis)'; register number 09062)

26.2 All midwifery and obstetric staff are to ensure that their knowledge and skills are up-to-date in order to complete their portfolio for appraisal.

27.0 Professional Midwifery Advocates

27.1 Professional Midwifery Advocates provide a mechanism of support and guidance to women and midwives. Professional Midwifery Advocates are experienced practising midwives who have undertaken further education in order to supervise midwifery services and to advise and support midwives and women in their care choices.

28.0 Infection Prevention

28.1 All staff should follow Trust guidelines on infection prevention by ensuring that they effectively 'decontaminate their hands' before and after each procedure.

28.2 All staff should ensure that they follow Trust guidelines on infection prevention, using Aseptic Non-Touch Technique (ANTT) when carrying out procedures i.e. obtaining blood samples and conducting epidural procedures.

29.0 Audit and Monitoring

29.1 Audit of compliance with this guideline will be considered on an annual audit basis in accordance with the Clinical Audit Strategy and Policy (register number 08076), the Corporate Clinical Audit and Quality Improvement Project Plan and the Maternity annual audit work plan; to encompass national and local audit and clinical governance identifying key harm themes. The Women's and Children's Clinical Audit Group will identify a lead for the audit.

29.2 As a minimum the following specific requirements will be monitored:

- Assessment and diagnosis of severe pre-eclampsia and eclampsia

- Clear lines of communication between the consultant obstetrician, consultant anaesthetist, paediatrician and labour ward coordinator
- Blood pressure control and fluid balance
- Prevention and/or control of eclamptic seizures
- Fetal assessment and delivery planning
- Postnatal follow up
- Process for audit, multidisciplinary review of audit results and subsequent monitoring of action plans

29.3 A review of a suitable sample of health records of patients to include the minimum requirements as highlighted in point 29.2 will be audited. A minimum compliance 75% is required for each requirement. Where concerns are identified more frequent audit will be undertaken.

29.4 The findings of the audit will be reported to and approved by the Multi-disciplinary Risk Management Group (MRMG) and an action plan with named leads and timescales will be developed to address any identified deficiencies. Performance against the action plan will be monitored by this group at subsequent meetings.

29.5 The audit report will be reported to the monthly Directorate Governance Meeting (DGM) and significant concerns relating to compliance will be entered on the local Risk Assurance Framework.

29.6 Key findings and learning points from the audit will be submitted to the Patient Safety Group within the integrated learning report.

29.7 Key findings and learning points will be disseminated to relevant staff.

30.0 Guideline Management

30.1 As an integral part of the knowledge, skills framework, staff are appraised annually to ensure competency in computer skills and the ability to access the current approved guidelines via the Trust's intranet site.

30.2 Quarterly memos are sent to line managers to disseminate to their staff the most currently approved guidelines available via the intranet and clinical guideline folders, located in each designated clinical area.

30.3 Guideline monitors have been nominated to each clinical area to ensure a system whereby obsolete guidelines are archived and newly approved guidelines are now downloaded from the intranet and filed appropriately in the guideline folders. 'Spot checks' are performed on all clinical guidelines quarterly.

30.4 Quarterly Clinical Practices group meetings are held to discuss 'guidelines'. During this meeting the practice development midwife can highlight any areas for further training; possibly involving 'workshops' or to be included in future 'skills and drills' mandatory training sessions.

31.0 Communication

- 31.1 A quarterly 'maternity newsletter' is issued and available to all staff including an update on the latest 'guidelines' information such as a list of newly approved guidelines for staff to acknowledge and familiarise themselves with and practice accordingly.
- 31.2 Approved guidelines are published monthly in the Trust's Focus Magazine that is sent via email to all staff.
- 31.3 Approved guidelines will be disseminated to appropriate staff quarterly via email.
- 31.4 Regular memos are posted on the guideline notice boards in each clinical area to notify staff of the latest revised guidelines and how to access guidelines via the intranet or clinical guideline folders.

32.0 Auditable Standards

- 32.1 Rate of documented involvement by the consultant obstetrician and the anaesthetist in an acute management.
- 32.2 The proportion of patients with the full complement of appropriate investigations.
- 32.3 The proportion of patients in whom fluid has been restricted to 85 ml/hour.
- 32.4 The proportion of patients receiving the appropriate magnesium sulphate prophylaxis.
- 32.5 The proportion of patients with eclampsia that are treated with magnesium sulphate.
- 32.6 The proportion of patients that attend a postnatal review and/or pre-conceptual counselling.

33.0 Risk Management

- 33.1 A 'risk event form' should be completed by a member of staff involved in the immediate care of the patients in the event of severe pre-eclampsia and /or eclampsia. The form is sent to the Labour Ward manager.
- 33.2 The Labour Ward Co-ordinator is responsible for informing the Labour Ward Manager and the Maternity Risk Manager of any patient who has eclampsia.
- 33.3 Eclampsia has to be reported to the United Kingdom Obstetric Surveillance System - Maternity Risk Manager will notify UKOSS on a monthly basis of any women with eclampsia.

34.0 References

Mothers and babies: Reducing risk through audits and confidential enquiry across the UK (2016) Saving Lives, Improving Mothers' Care. Surveillance of maternal deaths in the UK 2012-14 and lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2009-14. MBRRACE: December

National Institute for Clinical Excellence (2010) NICE Guideline. Hypertension in Pregnancy - The Management of Hypertensive Disorders in Pregnancy.

Advanced Life Support in Obstetrics Provider Manual (2014) ALSO; Third Edition
Nelson- Piercy, C (2015) Handbook of obstetric medicine (5th Edition). CRPress
National Institute for Clinical Excellence (2010) NICE Guideline. Hypertension in
Pregnancy – diagnosis and management.

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Admission Guidelines for Patients with Severe Pre-eclampsia

1. Hospital admission for close observation
2. Vital signs (blood pressure, pulse, resps and O₂ sats) all documented on the relevant observation chart which incorporates the MEOWS.
3. Deep tendon reflexes and neurological checks at least hourly until stable.
4. Foley catheter, urine output and dipsticks to check protein hourly
5. Intravenous (IVI) fluids to maximum of 85ml/hr; to monitor urine output 0.5ml/kg/hr, total input (IVI and oral) should not exceed 85ml/hr.
6. Continuous cardiotocograph monitoring
7. Tests - Full blood count (FBC), liver function tests (LFT's), Clotting, Urea and electrolytes (U&E's), LDH (lactate dehydroginase)
8. Medication:
 - Magnesium Sulphate
 - For diastolic BP greater than 110 give **one** of the following to achieve diastolic BP 90-100:
 - i. Hydralazine IVI (see Appendix E)
 - ii. Labetalol IVI (see Appendix F)
 - iii. Nifedipine 10mg orally (PO) repeat every 20 minutes

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Blood Tests for Investigation

Haematology:

Full blood count	EDTA (Red bottle)
Coagulation screen	Green bottle
Group and Save	Blue bottle

Biochemistry:

Liver Function tests)
Urea & Electrolytes) Brown bottle
LDH	

All above tests will be repeated as necessary, until normalising levels resume

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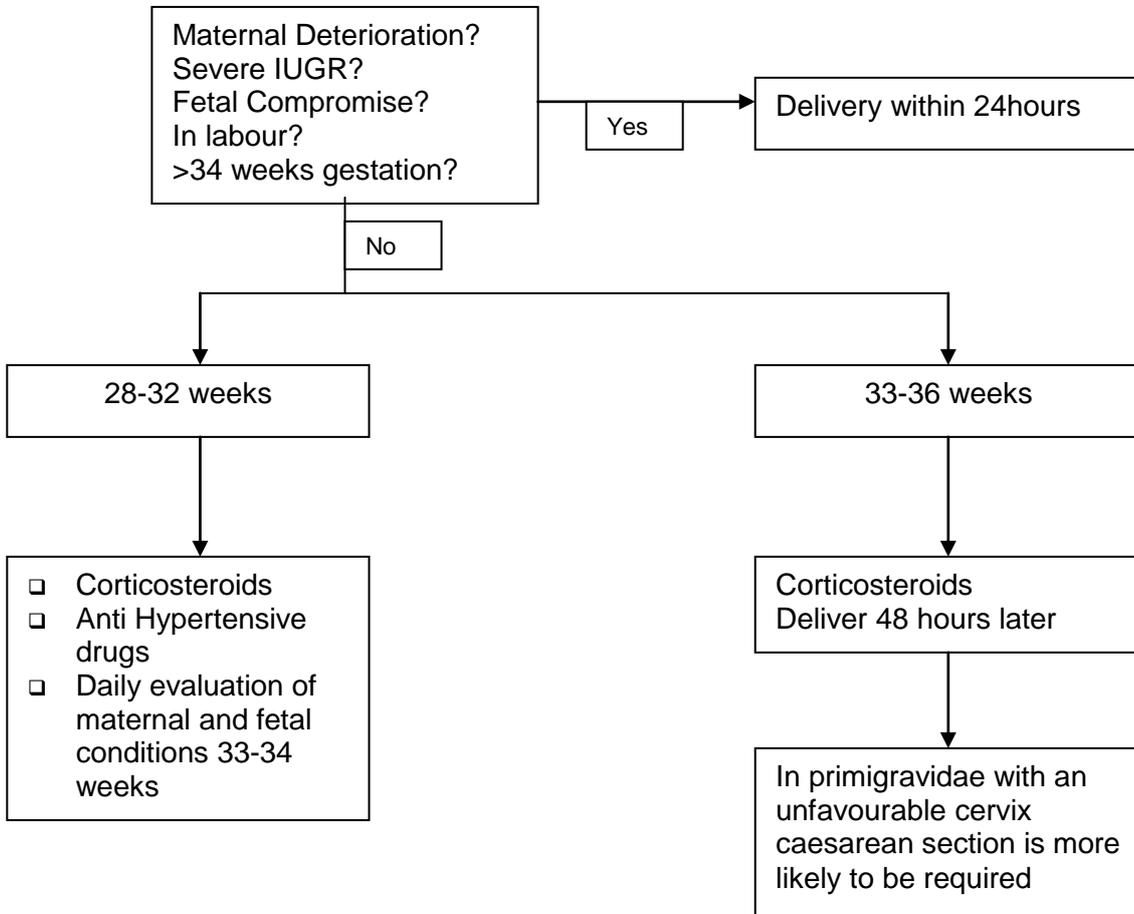
Drugs for the Treatment of Hypertension at the Antenatal Period

AGENTS

DOSE COMMENTS		
aLabetalol	200 mg bd – 600 mg qds	Contraindicated in moderate-severe asthma. May be associated with neonatal bradycardia.
aMethyldopa	250 mg bd – 1g tds	May cause lethargy and dizziness or rarely depression. Can cause deranged liver function tests. Do not use it after delivery.
aNifedipine	10 mg SR bd – 40 mg SR bd	Possible interference with labour. Hypotension reported with concomitant use of magnesium sulphate in preeclampsia.
Hydralazine		25mg tds – 75mg tds Second / Third line therapy.
Amlodipine	5mg-10mg od	Third line therapy if intolerant of Nifedipine or poor concordance
Doxazosin		1mg od – 8 mg bd
aThese agents have equal ranking as first line therapy		Antihypertensive drugs in the Postnatal period

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Delivery Decisions in Severe Pre eclampsia



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Drug Protocol for Intravenous Hydralazine

- 1.0 Bolus dose:** Reconstitute 1 ampule of Hydralazine 20mgs with 1ml of sterile water. This should then be further diluted with 10mls of 0.9% sodium chloride.
- 1.1 Give an intravenous bolus of 5mg (2.5mls) over 5 minutes**
- If a reduction in diastolic to a mean arterial pressure (MAPS) of < 125 mmHg and <100mmHg diastolic is not achieved within 20 minutes; further 5 -10mg increments can be given by slow IV bolus until this is achieved (**up to a maximum cumulative dose of 20 mg**)
- 1.2 The effect of a single dose can last up to six hours.
- 1.3 If the MAP remains above 125 mmHg and pulse rate is > 120 beats per minute or if 20mg of hydralazine in total has been given; the Labetalol Protocol should be followed.
- 1.4 If no lasting effect with the administration of bolus doses, consider an infusion at 2mg/hour increasing by 0.5mg/hour as required (2 - 20 mg/hour is usually required).
- 2.0 Preparation for Continuous Infusion using Syringe Pump**
- 2.1 Add 50mg hydralazine in 50mls of 0.9 % normal saline.
- 2.2 Start infusion at 5mgs per hour (5mls per hour), increasing to a maximum rate of 40mgs per hour.
- 2.3 The infusion should be titrated against the maternal blood pressure, to achieve a mean arterial pressure (MAP) of 125 mmHg and < 100 diastolic mmHg.
- 2.4 Close observation of maternal blood pressure must be maintained during this infusion.
- 2.6 Administration of this drug may precipitate fetal distress and therefore continuous fetal monitoring is essential.
- 2.7 Anaesthetic team should be informed as plasma expansion and invasive monitoring may be necessary.
- 3.0 Post delivery**
- 3.1 The hydralazine should be reduced after 4 hours by 1mg/hour and oral administration of antihypertensives should be considered such as Labetalol. Methyldopa should be avoided post-delivery because of its mood-lowering side effects.

TREATMENT PACKS OF THIS DRUG ALONG WITH THE DRUG REGIEME ARE STORED IN A SELF CONTAINED BOX IN THE LOCKED CLEAN UTILITY BY THE CD DRUG CUPBOARD ON LABOUR WARD.

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Drug Protocol for Intravenous Labetalol

- 1.0 Labetalol** should be avoided in patients with asthma as it may precipitate bronchospasm.
- 1.1 **If indicated give an intravenous bolus dose of 50mgs over a period of at least one minute.** This does not need diluting. If necessary further doses of 50mgs may be repeated at five minute intervals until a satisfactory response occurs. The total dose should not exceed 200mgs.
- 2.0 Preparation for Continuous Infusion**
- 2.1 Dilute one ampule of Labetalol (100mgs) in 100mls of 5% Dextrose.
- 2.2 Using the Infusomat pump, start the infusion at 20 mg/hour (set pump at 20 ml/hour) the dose can be doubled every thirty minutes to a maximum of 160 mg/hour (160ml/hour).
- 20mls=20mg
 - 40mls=40mg
 - 80mls=80mg
 - 160mls=160 mg
- 2.3 The aim of treatment is to control the blood pressure, but to avoid a rapid fall in blood Pressure. Infusions must therefore be titrated carefully to achieve the desired result.
- 3.0 Contra-indications to Labetalol**
- Asthma (moderate/ severe)
 - Heart block
 - Heart failure
- 3.1 Administration of this drug may precipitate fetal distress and therefore continuous fetal monitoring is essential.

TREATMENT PACKS OF THIS DRUG ALONG WITH THE DRUG REGIEME ARE STORED IN A SELF CONTAINED BOX IN THE LOCKED CLEAN UTILITY BY THE CD DRUG CUPBOARD ON LABOUR WARD.

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Considerations for the use of Magnesium Sulphate (MgSO₄)

1.0 General considerations before commencing administration of magnesium sulphate (MgSO₄).

- 1.1 MgSO₄ overdose causes loss of deep tendon reflexes, followed by respiratory depression and ultimately respiratory arrest. Calcium Gluconate (treatment for respiratory depression due to overdose of MgSO₄). (Refer to Appendix G)
- 1.2 Overdose is more likely if there is poor renal function. Blood levels must be monitored.
- 1.3 Therapy can be monitored clinically

2.0 Clinical Monitoring (commence high dependency chart)

Check deep tendon reflexes after loading then hourly (use reflexes at elbow or wrist if epidural in progress)

- Hourly respiratory rate (should be > 14 / minute)
 - Continuous pulse oximetry
 - Half-hourly BP and MAP recordings
 - Hourly urine output – strict fluid balance. If the patient is oliguric only the loading dose should be given.
- 2.1 If tendon reflexes are absent, no further magnesium should be given until plasma concentrations are known.
- 2.2 The drug must be given slowly; the patient will first feel warm.
- 2.3 If given too fast, the patient will be will be nauseated and vomit. If this happens stop the infusion until the symptoms subside and the patient is no longer nauseated.

The maintenance infusion should be terminated and urgent magnesium blood levels should be sent off and the Anaesthetist informed if:

- The patella reflex is lost
- The respiratory rate is less than 14 / minute
- Oxygen saturation is persistently less than 95% on air or oxygen

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1.0 Drug Protocol for Magnesium Sulphate (MgSO₄) for Severe Pre-eclampsia and Eclampsia

- 1.1 In eclampsia a bolus of MgSO₄ 4g should be given over 5mins followed by a maintenance infusion of 1g/hr for 24hours.
- 1.2 In severe pre-eclampsia a bolus of 4g of MgSO₄ should be given over 20 mins followed by a maintenance infusion of 1g/hr for 24hours.
- 1.3 In the event of further convulsions a further bolus dose of 2g MgsO₄ can be given over 5 minutes.

2.0 Preparation

- 2.1 Reconstitute 2 ampoules of magnesium sulphate (each containing 5g of magnesium sulphate in 10 ml) with 30 ml of sodium chloride 0.9% in a luer lock 50 ml syringe. This makes a solution of 50mls of 20% magnesium sulphate i.e. 5mls contains 1g magnesium sulphate.

3.0 Loading Dose

- 3.1 Give 4g of MgSO₄ over 20 mins in severe pre-eclampsia or over 5 mins in eclampsia.
- 3.2 Use a Braun Syringe Driver following the manufacturer's instructions for loading the syringe.
- 3.3 Set rate to 60mls per hour
Set the VTBI to 20 mls (20mls = 4gms)
Set the time to 20 minutes (should automatically display this)
- 3.4 The syringe driver will alarm and stop after 20 minutes.

4.0 Maintenance Dose

- 4.1 1g magnesium sulphate (5mls) per hour for at least 24 hours then review.
- 4.2 Set rate to 5mls per hour
Set VTBI to 50mls (total amount in full syringe)
Time should be calculated to ten hours Nb: syringe will need changing twice in 24hr period.
- 4.3 It can be continued at this rate unless the knee jerks are abolished, urine output falls below 50ml in 2 hours or if the respiratory rate falls below 14 / minute. Magnesium administration must be stopped if oliguria persists.
- 4.4 Magnesium sulphate should be continued for at least 24 hours (in the absence of any of the above signs) and in cases of eclampsia treatment should continue 24 hours following last seizure.

5.0 Optional Regime for Administration of IV Magnesium Sulphate for Loading Dose (not involving Luer lock procedure)

5.1 The decision for this option should be undertaken by the obstetric registrar or obstetric consultant

5.2 Procedure:

- 1 ampoule of magnesium sulphate (containing 5g of magnesium sulphate in 10 ml)
- Into a 20 ml syringe, draw 8ml of magnesium sulphate (discard the remaining 2ml)
- Add 12ml of normal saline to the 8ml of magnesium sulphate
- This constitutes 20ml of 20% of magnesium sulphate
- This can be administered intravenously over 5 minutes

5.3 If the patient continues to fit 2g of intravenous of magnesium sulphate needs to be administered. In this case refer to the following procedure:

- 1 ampoule of magnesium sulphate (containing 5g of magnesium sulphate in 10 ml)
- Into a 20 ml syringe, draw 4ml of magnesium sulphate (discard the remaining 6ml)
- Add 6ml of normal saline to the 4ml of magnesium sulphate
- This constitutes 10ml of 20% of magnesium sulphate
- This can be administered intravenously over 5 minutes

6.0 Contraindications

6.1 For cases involving cardiac disease and acute renal failure, IV diazepam should be used instead: Initial dose -10mg, followed by 2.5mg / hour.

TREATMENT PACKS OF THIS DRUG ALONG WITH THE DRUG REGIEME ARE STORED IN A SELF CONTAINED BOX IN THE LOCKED CLEAN UTILITY BY THE CD DRUG CUPBOARD ON LABOUR WARD.

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Drug Protocol for Calcium Gluconate

- 1.0 Treatment for respiratory depression due to overdose of MgSO_4 .
- 1.1 Significant respiratory depression should be treated with calcium Gluconate, 1g IV should be given slowly over ten minutes (10 ml 10% solution).

CALCIUM GLUCONATE IS KEPT IN THE MAGNESIUM SULPHATE TREATMENT BOX.

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Reducing Errors in Blood Pressure Management

- 1.0 Use accurate equipment (mercury sphygmomanometer or validated alternative method).
- 1.1 Use sitting or semi-reclining position so that the arm to be used is at the level of the heart.
- 1.2 Do not take the blood pressure in the upper arm with the woman on her side as this will give falsely lower readings.
- 1.3 Use appropriate size of cuff: standard size (13x23cm) for an arm circumference of up to 33cm, a large size (33x15cm) for an arm circumference between 31 and 41cm and a thigh cuff (18x36cm) for an arm circumference of 41cm or more. There is less error introduced by using too large cuff than too small a cuff.
- 1.4 Deflate the cuff slowly, at a rate of 2mmHg to 3mmHg per second, taking at least 30 seconds to complete the whole deflation.
- 1.5 Use Korotkoff V (disappearance of heart sounds) for measurements of diastolic pressure, as this is subject to less intra-observer and inter-observer variation than Korotkoff IV (muffling of heart sounds) and seems to correlate best with intra-arterial pressure in pregnancy. In the 15% of pregnant women whose diastolic pressure falls to zero before the last sound is heard, then both phase IV and V readings should be recorded (i.e. 148/80/0mmHg).
- 1.6 Measure to the nearest mmHg to avoid digit preference.
- 1.7 Obtain an estimated systolic pressure by palpation, to avoid auscultatory gap.
- 1.8 If two readings are necessary. Use the average of the readings and not just the lowest reading. This will minimise threshold avoidance (the tendency to repeat a reading until one that is below a known threshold is recorded that requires no action).

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Antihypertensive Drugs in the Postnatal Period

1.0 Safe drugs:

- ACE inhibitors:
- Enalapril (5-20mg bd)
- Calcium Channel Blockers:
 - Nifedipine SR (10-40mg bd). Preferred in Afro-Caribbeans.
 - Amlodipine 5-10mg od can be used.
- Beta Blockers:
 - Atenolol (25-50mg od)
 - Labetalol (100-500mg tds)
 - Metoprolol (25-100mg tds)

2.0 Insufficient evidence on the safety:

- ARBs
- Doxazosin
- Although diuretics are safe, they may deter the lactation process and be less well tolerated causing excessive thirst if the mother is breast feeding.

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Information Regarding Self-help Groups

- Action on Pre Eclampsia (APEC)
84-88 Pinner Road
Harrow
Middlesex
HA1 4HZ
Tel: 020 8863 3271
Email: info@apex.org.uk
Helpline: 020 8427 4217
www.apex.org.uk