HYPERTENSIVE DISORDERS IN PREGNANCY

TARGET AUDIENCE	Primary and Secondary Care. Obstetric Lanarkshire Service: Obstetricians and Midwives..
PATIENT GROUP	Women's Services Directorate.

Clinical Guideline Introduction

Hypertensive disorders during pregnancy occur in women with pre-existing primary or secondary chronic hypertension, and in women who develop new onset hypertension in the second half of pregnancy.

They are a significant cause of morbidity and mortality in the UK and worldwide, with effects on both mother and baby. Pre-eclampsia in particular results in major perinatal, and long-term, complications. In the most recent triennial report 2019-2021 (published 2023), it was a leading cause of maternal death (hypertensive disorders: 6th cause of deaths not due to non-obstetric complications). Many deaths are related to poor management of severe hypertension and eclampsia. Foetal implications include increased incidence of placental abruption, preterm delivery and foetal growth restriction. These risks are not exclusive to pre-eclampsia.

Contents

DEFINITIONS

- **Chronic hypertension** that is present at the booking visit or before 20 weeks or if the women is already taking antihypertensive medication when referred to maternity services. This guideline in not intended to specifically address this condition
- **Gestational hypertension** (previously known as Pregnancy Induced Hypertension, PIH) is new hypertension presenting after 20 weeks without significant proteinuria.
- **Pre-eclampsia** is new hypertension presenting after 20 weeks with significant proteinuria. (SBP ≥140mmHg &/or DBP ≥90 mmHg on 2 occasions at least 4 hours apart, or any single reading of ≥160/110mmHg. Or severe hypertension not responding to treatment. Or with typical end organ disease/placental dysfunction
- **Proteinuria**: In pregnancy a spot urinary Protein/Creatinine ratio >30mg/mmol is significant. **PCR** is now the main urinary test. This is at least 2+ protein on urinalysis. A PCR > 300mg/mol is considered "severe" and such levels can be seen in nephrotic syndrome. Always seek senior review in such cases.
- **Eclampsia**: Seizures occurring in pregnancy or the puerperium that cannot be attributed to other causes in a woman with pre-eclampsia (but it may appear unexpectedly in a patient with minimally elevated blood pressure and no proteinuria).
- **HELLP syndrome** is haemolysis, elevated liver enzymes and low platelet count. It is a manifestation of pre-eclampsia occurring in ~20% of severe cases. ELLP can occur without evidence of haemolysis

CLASSIFICATION OF HYPERTENSION

1. **Mild hypertension:** Systolic 140 – 149mm Hg and/or Diastolic 90 – 99 mmHg
2. **Moderate Hypertension:** Systolic 150- 159mmHg and/or Diastolic 100 – 109mmHg
3. **Severe Hypertension/PET:** Systolic ≥160 mm Hg and/or Diastolic ≥110 mm Hg

(Consider hypertension with ≥5 gm proteinuria in 24 hours Or Protein Creatinine Ratio ≥300mg/mmol as potentially severe disease)

NICE 2023 recommends offering treatment if blood pressure >140/90mmHg. Target BP = 135/85mmHg in all obstetric patients [(2)].

Severe preeclampsia

Severe pre-eclampsia is defined as severe hypertension which can be associated with evidence of end organ damage and biochemical and haematological impairment without seizure activity.

Proteinuria is a common finding but can also be absent in some cases.

It can cause intracranial haemorrhage in the pregnant woman, resulting in death, or survival with a stroke. Severe hypertension which may be a component of severe pre-eclampsia requires treatment in its own right, regardless of other treatments which are in progress (for example, magnesium sulphate).

- In *severe pre-eclampsia* it is more important to **treat severe hypertension first**, before considering magnesium sulphate.
- In *eclampsia* it is more important to **prevent further seizures first**, before considering antihypertensive therapy.

Fulminating severe pre-eclampsia starts suddenly and progresses rapidly, and is dangerous, requiring urgent, intravenous treatment.

This Guideline describes the treatment of severe hypertension which may be a component of severe pre-eclampsia. For the treatment of severe hypertension *without Proteinuria*: Pages 13-15.

Diagnosis

If the systolic blood pressure is ≥**160 mmHg**, OR the diastolic blood pressure ≥ **110 mmHg**, on TWO CONSECUTIVE OCCASIONS, 15 minutes apart, then ***severe hypertension*** is diagnosed, requiring intravenous treatment.

It is the **systolic** blood pressure which is the more important, since the risk of intracranial haemorrhage is associated with the degree of systolic hypertension. It is also associated with a proteinuria (see definitions above). Alternatively, mild to moderate hypertension and proteinuria with any evidence of the following clinical features:

Clinical features of severe pre-eclampsia (in addition to hypertension and proteinuria) are:

- Severe headache
- Visual disturbances such as flashing lights or blurred vision
- Subcostal or Epigastric pain and / or vomiting
- Clonus ≥3 beats
- Platelet count < 100,
- Liver tenderness or abnormal liver enzymes (ALT/ AST above 70 IU/L)
- HELLP Syndrome
- Papilloedema

Management of Severe Hypertension in severe pre-eclampsia

Treatment of sustained severe hypertension in severe pre-eclampsia is a medical emergency and the **Consultant Obstetrician-on-call** must be informed immediately along with the **Consultant Anaesthetist and Unit Coordinator.** **(See page 19 Flowchart)**

- Consider immediate Labetalol 200 mg orally (Nifedipine if asthmatic)
- Move to HDU room (preferably in ward 24)
- Insert wide bore I.V. access and send bloods for FBC, U & E, LFT, urate and G&S. (Coagulation screen if platelets below 100)
- Check B.P every 15 minutes
- Continuous oxygen saturation monitoring with a pulse oximeter (it will often give early signs of pulmonary oedema).
- Check for reflexes/clonus
- Catheterise and check urine dip stick for protein & send MSSU
- Strict fluid input and output chart, with hourly urine volumes
- Restrict overall fluid intake to 85 ml/hour (2L/24hr). Plasma-lyte has now replaced Hartmann's solution. Plasma-lyte contains a very small amount of magnesium (Mg 1.5mmol/L in plasmalyte (0.3g/L), therefore, patients on magnesium sulphate infusions may require additional monitoring for evidence of magnesium toxicity.

- Perform a Cardiotocogram once stable
- Check Bishop score once stable
- USS for foetal assessment if clinically indicated
- Refer to separate guideline on Corticosteroids in the Antenatal period
- Document all medications clearly and promptly
- Intravenous labetalol and hydralazine are equally effective and either can be used. One drug should be used to its maximum dose before changing to the other. Start off with an intravenous bolus injection of labetalol or hydralazine. Care must be taken with IV hydralazine as it can rapidly cause hypotension.

  A&E in HM and MK do now stock IV hydralazine for patients who cannot be prescribed labetalol e.g. severe asthmatics

Intravenous labetalol - <u>Bolus</u> injection (See Algorithm Pages 19 and 20)

CAN BE AN IRRITANT, SO MONITOR FOR EXTRAVASATION

Aim for a target systolic blood pressure of less than **<u>150mmHg</u>** AND a target diastolic blood pressure of 80-100mmHg

(a) Give a bolus injection of **<u>LABETALOL 50 mg intravenously over two minutes</u>**.

(b) Wait for fifteen minutes. If the target blood pressure is not achieved give another bolus injection of **<u>intravenous LABETALOL 50 mg over two minutes</u>**.

(c) Wait for fifteen minutes. If the target blood pressure is not achieved start an intravenous infusion. Consider IV Hydralazine (page 7).

Intravenous labetalol - <u>Infusion</u>

(a) Each ampoule of labetalol contains 100 mg labetalol in 20 mls water. Place three ampoules in a 60 ml syringe – 300mg in 60 mls, i.e. **5 mg/ml**.

(b) Start the syringe driver infusion at 40 mg per hour = **8mls per hour**

(c) Double the infusion rate every 30 minutes to maintain the systolic blood pressure below 150 mmHg, AND the diastolic blood pressure at about 100 mmHg.

(d) Once desirable B.P is maintained, reduce the rate of the infusion by one half.

(e) If the systolic blood pressure is below 140 mmHg, OR the diastolic blood pressure is below 90 mmHg, stop the infusion. Consider oral treatment.

(f) The maximum infusion rate is 160 mg per hour = 32 mls per hour.

Contraindications to labetalol
- Maternal bradycardia < 60 beats/ minute
- Asthma

Avoid rapid reductions in BP as this may result in complications for both mother and foetus

Intravenous Hydralazine – <u>Bolus</u> injection

The main **contraindication** to intravenous hydralazine is maternal tachycardia greater than 120 per minute.

Ensure there is additional venous access in the event of hypotension and consider 500mls crystalloid fluid simultaneously.

Avoid in patients with Systemic Lupus Erythematosus (SLE) and abnormal cardiac function

(a) <u>Reconstitution of **Hydralazine** 20mg amps</u>: reconstitute with 1ml water for injection and then further dilute with 19 ml sodium chloride 0.9%. The resulting solution will contain 1 mg hydralazine per ml

(b) Inject 2 mg of the hydralazine solution every 3-5 minutes. Take the blood pressure every 2 minutes

(c) Administer/withhold dose of hydralazine according to the response of the blood pressure. Stop boluses when desired BP attained.

(d) Aim for a systolic blood pressure less than 150 mm Hg AND a diastolic blood pressure at about 100 mm Hg, then stop the injection. Consider oral medication.

- The dose of hydralazine which you will have to inject will vary from 2 mg to 20 mg for this response to occur.
- Occasionally injection of the whole 20 mg of hydralazine will fail to treat the severe hypertension. In this case, start an intravenous infusion of hydralazine.
- *After you have finished the injection the blood pressure will fall a little further.* This regimen will rarely, if ever, cause maternal hypotension or foetal distress.
- The hydralazine will act for 2-3 hours, after which severe hypertension may reappear. If the maternal heart rate is less than 120 per minute, intravenous hydralazine may be repeated. Significantly prolonged in renal impairment (up to 16h)

Intravenous Hydralazine – <u>Infusion</u>

CAN BE AN IRRITANT, SO MONITOR FOR EXTRAVASATION

a) Hydralazine comes in ampoules of 20 mg in a powder. Reconstitute each ampoule up to 20 mls. See note above regarding reconstitution of Hydralazine

b) Add three reconstituted ampoules =
60 mg in 60 mls to a syringe driver = **1 mg per ml**.

c) Start the infusion at 10 mls per hour = 10 mg per hour.

d) Double the dose every 20 minutes,

e) Aim for the systolic blood pressure less than 150 mmHg AND the diastolic blood pressure to be about 100 mmHg.

f) If the systolic blood pressure is less than 140 mmHg OR the diastolic blood pressure is less than 90 mmHg, stop the infusion.

g) The maximum dose rate is 40 mls = 40mg per hour.

h) Dose is titrated to individual blood pressure but maintenance rate usually within range of 50-150 micrograms/minute (3-9ml/hr) [3]

N.B. The main contraindication to hydralazine is maternal tachycardia. If the maternal heart rate is more than 120 beats per minute, hydralazine cannot be used. Labetalol is preferred; this may reduce the blood pressure, and reduce the heart rate.

Oral Nifedipine

Usually intravenous labetalol alone, or intravenous hydralazine and labetalol, will be enough to treat severe hypertension, such that oral nifedipine will only occasionally be required. Oral nifedipine is also suitable as first line therapy in asthmatics when labetalol is contraindicated.

a) If hydralazine and labetalol fail to control severe hypertension, give oral NIFEDIPINE 10 mg. **In this instance use the immediate release preparation.**

b) Wait for thirty minutes. If the target blood pressure is not achieved give **oral NIFEDIPINE 10 mg once more**.

Note: The immediate release preparation is used only in this scenario. The prolonged released preparation is used for ongoing control of BP

Magnesium Sulphate

Consider treatment with Magnesium Sulphate if there are features of severe pre-eclampsia or if there is severe hypertension or severe pre-eclampsia in a patient who has previously had an eclamptic seizure.

TREATMENT OF ECLAMPSIA

Eclampsia is the occurrence of a seizure(s) usually in a woman who has severe pre-eclampsia. Magnesium Sulphate is used to both treat AND prevent eclampsia.

It can be very harmful to the woman and her infant since the severe maternal hypoxia caused by the seizure may cause maternal and foetal death.

Aims:

- Treat seizures
- Control blood pressure
- Stabilise the mother
- Deliver the infant

Treatment of an Eclamptic Seizure

Inform the **Consultant Obstetrician**, **Anaesthetist** and **Unit Coordinator**

(a) In the Maternity Unit in Wishaw or in the A &E Department in Wishaw dial **2222** – obstetric emergency. State the Ward and Room number.

(b) In Hairmyres Day Assessment, Hairmyres A&E and Monklands A&E – ASK FOR THE CARDIAC ARREST TEAM.

(c) In Airdrie Day Assessment and Lanark Day Assessment – DIAL 999

(d) Place the woman in the left lateral position if safe to do so.

(e) Assess airway; insert oral airway if required. If continued seizure activity or compromised airway the anaesthetist will secure a definitive airway.

(f) Administer oxygen 15 litres a minute by a non-rebreathing trauma mask.

(g) Insert a large-bore intravenous cannula.

(h) Administer bolus dose of **magnesium sulphate 4 grams intravenously diluted to 40 mls with sodium chloride 0.9% over 10 minutes via syringe driver**

- Each vial of magnesium sulphate (50%) contains 5 grams in 10 mls water.
- Dilute one vial magnesium sulphate to 50 mls with sodium chloride 0.9%, **then discard 10 mls**, leaving 40 mls (4 grams magnesium sulphate) of diluents remaining in the syringe
- Infuse this by Agila Syringe Driver at a rate of 240 mls/hour (10 minutes).
- Use the BD Plastipak syringe with this syringe driver

If IV access cannot be achieved give **5grams** (1 vial, 10mls of 50%) magnesium sulphate intramuscularly (IM) into the buttock.

(i) Take blood for FBC, U + E, LFTs, coagulation screen, glucose and G&S.

Prevention of further seizures

a) Start an intravenous infusion of **magnesium sulphate at a rate of 1 gram/hour**.

- Dilute 1 vial (5 g) of magnesium sulphate to 50 mls sodium chloride 0.9% and infuse at 10 mls/hour via an Agila Syringe Driver (takes 5 hours). BD Plastipak syringe.
- Once prescribed by a doctor this can be made up and further infusion continued by any competent health care professional.

In Airdrie Day Assessment and Lanark Day Assessment there are currently no infusion pumps nor is magnesium sulphate currently available.

When available give the bolus dose of magnesium sulphate described above and transfer the woman as quickly as possible by the 999 ambulance ("blue light" ambulance).

b) The magnesium sulphate infusion should be maintained for **24 hours** from last fit.

c) A new syringe should be prepared every 24 hours

d) Measure oxygen saturation and maintain above 94%

e) Measure the respiratory rate every 15 minutes. If the respiratory rate is **< 12 breaths per minute**:-

i. Stop the infusion of magnesium sulphate.
ii. Call the Anaesthetist on page 134.

f) If **respiratory arrest** occurs:-

i. Call **2222** – obstetric emergency.
ii. Assist ventilation with an Ambubag at 12 – 15 breaths per minute using 15 L oxygen/minute, until intubation possible by an anaesthetist
iii. Stop the magnesium sulphate infusion.
iv. Give **calcium gluconate 1 gram intravenously over 5 minutes. (10 mls of 10% Calcium Gluconate (1 gram) IV over 5 minutes)**

g) If **further seizures** occur:-

i. Give **magnesium sulphate 2 grams intravenously over 10 minutes.**
ii. Then increase the rate of infusion of **magnesium sulphate** to **2 grams per hour,** once the clinical assessment including respiratory rate indicates it is safe to do so.
iii. Call the Anaesthetist and Obstetrician on call.

iv. if there are persistent seizures then to consider alternative causes and consider a CT head scan

N.B. There is generally no need to monitor magnesium concentrations, but these should be measured every six hours if -

a) The infusion rate is 2 grams per hour
b) The woman has hepatic or renal impairment or has weight ≤50 kg

General Measures

(a) Measure maternal pulse rate, blood pressure and respiratory rate every 15 minutes. If severe hypertension occurs, treat according to the related Guideline B. In *eclampsia* it is more important to **prevent further seizures first**, before considering antihypertensive therapy.

(b) Insert a Foley catheter and measure hourly urine volumes. If oliguria occurs, see Guideline D.

(c) Perform a cardiotocogram.

(d) Proceed to delivery, usually by Caesarean section, once stable

(e) Avoid the use of Syntometrine or Ergometrine at delivery

(f) The syringe driver typically used is the Agila Syringe Driver. This requires the BD Plastipak syringe

Fluid balance in eclampsia and severe pre-eclampsia

- In eclampsia and severe pre-eclampsia temporary oliguria is common up to **6 hours** after birth. There is widespread arteriolar spasm which also affects the renal arterioles, resulting in reduced glomerular filtration rate.
- Some hours after delivery of the infant the vasospasm subsides and renal function usually returns to normal.
- Persistent renal failure in eclampsia and severe pre-eclampsia is rare.
- Moderate hypovolaemia is always present, and so intravenous fluids should not be too restricted.
- Fluid balance should be carefully monitored and charted

Regimen for Fluid Balance in Pre-Eclampsia & Severe Pre-Eclampsia

1. Indwelling Foleys catheter, with hourly urine volumes.
2. Administer intravenous fluids, **2 litres/24 hours** – Plasma-lyte has now replaced Hartmann's. Remember to include other IV infusions such as magnesium sulphate in total fluid calculations.
3. If the urine volume is > 20mls/ hour, persist with this regimen.
4. If the urine volume is < 20 mls/hour, oliguria is present. In this circumstance, send a specimen of blood and urine to the laboratory and ask for the urine/plasma osmolality ratio.

   (a) A ratio of > 1.5 suggests that the renal tubules are able to concentrate urine and so acute tubular necrosis is unlikely. A diuresis can be expected in a few hours. Carry on with the intravenous fluid regimen described above.

   (b) A ratio of < 1.5 suggests that renal tubular damage may have occurred. In this circumstance contact the Consultant Obstetrician on call, who will then contact the Consultant renal physician on call, for advice.

N.B. **Do not give intravenous furosemide**.

- This may cause a temporary diuresis which may be comforting to the Obstetrician, but will not improve the function of the renal tubules.
- It may be harmful, by depleting the blood volume further and exacerbating the hypovolaemia.

Do not routinely insert a central venous pressure catheter.

- Typically in eclampsia and severe pre-eclampsia the central venous pressure is low, owing to the hypovolaemia, described above.
- Attempts to increase the central venous pressure by administration of intravenous fluids will increase the likelihood of acute pulmonary oedema.
- A central venous pressure catheter should be inserted only after discussion with the Consultant **Anaesthetist on-call**.
- If a central venous pressure catheter is inserted transfer the woman to the Adult Critical Care Unit

Treatment of severe hypertension in pregnancy, without proteinuria

This guideline refers to treatment of severe hypertension in women without proteinuria. If severe hypertension occurs ***with significant proteinuria*** the diagnosis is severe pre-eclampsia. The woman should be treated according to pages 4-7 (Treatment of severe pre-eclampsia).

In the peripartum period absorption of oral drugs from the gastro- intestinal tract is often reduced, therefore they are administered intravenously to every woman with severe hypertension, whether Proteinuria is present or not, as in pages 5-10.
See pages 5-10 for IV management.

The definition of **severe hypertension is a sustained systolic blood pressure ≥ 160 mmHg, OR a sustained diastolic blood pressure ≥ 110 mmHg.**

- Refer the woman to the Day Assessment Unit as soon as possible.
- At the Day Assessment Unit the blood pressure will be measured at least four times. The means of the systolic blood pressures and the mean of the diastolic blood pressures are calculated. If the mean of the systolic blood pressures is > 160 mmHg, OR the mean of the diastolic blood pressures is > 110 mmHg, **sustained** severe hypertension is present, requiring treatment.
- Treatment may be given successfully in the Maternity Day Assessment Units, although it is often quicker if the woman is admitted to the ward or triage.
- Do not take the blood pressure more than four times a day in the ward. Sometimes isolated readings occur which are much greater than 160 mm Hg systolic or 110 mm Hg diastolic, and these may lead to anxiety in the midwifery and medical staff, who will check the blood pressure every few minutes. This will lead to anxiety in the pregnant woman, resulting in worsening of the blood pressure, setting up a vicious circle. In severe hypertension in pregnancy without proteinuria, the risk of stroke caused by isolated episodes of severe hypertension is small, unlike the situation with severe hypertension with proteinuria.

First line is Labetalol now as per NICE guidelines 2023 [2].

Labetalol

a) Start at Labetalol 100 mg 2– 3 times daily
b) Max dose Labetalol 600mg four times daily
c) Max dose 2400 mg in 24 hours
d) Dose as per current BNF

Contraindicated/cautioned in Asthma or previous reaction.

- Consider Nifedipine in these instances
- Labetalol in pregnancy in patients with diabetes, hypo unawareness/ increased hypoglycaemia is not usually a problem, but should be considered.

Methyldopa

This can also be used safely in the first and second trimester in pregnancy. It acts on the central nervous system, to decrease sympathetic tone. It is an effective antihypertensive drug in pregnancy, and it is safe for the infant.

- Can be used as a second agent in asthmatics when Nifedipine alone is insufficient
- The dose should be titrated according to the response.
- The blood pressure should be taken no more than four times a day.
- The dose should be increased every other day, if necessary.
- Don't aim for a normal blood pressure.
- Aim for blood pressure $\leq$135/85mmHg

Dose Titration:

The dose needs to be increased gradually over intervals of at least 2 days [6]:

1) Start by giving METHYLDOPA 250 mg 2-3 times a day.
2) If necessary, increase the dose to METHYLDOPA 500 mg four times a day.
3) If necessary, increase the dose to METHYLDOPA one gram three times a day.

Once the dose is found which controls the blood pressure, the woman may be discharged from the ward.

Side effects:

- Methyldopa can cause depression and nightmares. If these symptoms develop, stop the drug, change to labetalol or nifedipine.

Nifedipine Modified Release (MR) or Slow Release(SR)

- Start at 10 mg MR or SR twice daily
- Max dose is 40 mg MR or SR twice daily

NOTE: This is different to the immediate release which is given 8 hourly

- Ensure prescriptions are for MR or SR preparations

Nifedipine off license use in pregnancy

If patient has chronic hypertension, consider restarting her pre-pregnancy medications postnatally unless contraindicated by Breastfeeding. Contact pharmacy for advice if needed.

Anaesthetic Input – Analgesia & Anaesthesia

The majority of women with severe pre-eclampsia will benefit from neuraxial analgesia in labour, through prevention of the hypertensive response to pain, and the resulting sympathetic block contributing to the overall anti-hypertensive strategy. In addition, an indwelling epidural catheter enables the provision of surgical anaesthesia should operative delivery become necessary. When central neuraxial blockade is contraindicated, I.V. opioids provide an appropriate alternative, with remifentanil patient controlled analgesia gaining popularity. Postpartum analgesia will vary depending on the mode of delivery but may include I.V opioids, abdominal wall nerve blocks or wound infiltration and simple analgesics such as paracetamol.

Central neuraxial blockade is the anaesthetic technique of choice for the majority of pre-eclamptic women requiring operative delivery. Spinal, epidural and CSE (combined spinal and epidural) are all used successfully with no evidence in favour of one particular technique. Invasive monitoring is useful especially if the mother is already requiring magnesium sulphate and I.V. anti-hypertensive. General anaesthesia may be necessary if regional techniques are contraindicated due to clotting abnormalities.

Indications for referral to critical care

Following discussion with the anaesthetic and obstetric consultants on-call and the labour ward sister, it will be decided which patients can be managed in the Ward 24 HDU room and those who should be referred and transferred to the Adult Critical Care Unit (ACCU). Potentially Level 2 patients (Severe pre-eclampsia with any of the following complications e.g. eclampsia, evidence of heart failure, abnormal neurology) could be managed in-situ and Level 3 (Severe pre-eclampsia and needing invasive ventilation) transferred to ACCU.

Timing of birth

Women with **chronic/gestational hypertension**

- If blood pressure is lower than 150/100mm Hg with or without antihypertensive treatment, do not offer birth before 37 weeks.
- For women with refractory severe hypertension, offer birth before 37 weeks after a course of antenatal steroids has been completed.
- Offer birth to women whose diastolic blood pressure is greater than 95 mmHg with or without antihypertensive treatment after 37 + 0 weeks.
- Offer birth to women after 39 + 0 weeks with stable controlled hypertension
- Consider birth at any gestation when there is evidence of impending foetal death.
    - May require a detailed discussion with neonatology input at limits of viability

Women with Pre-eclampsia

- Manage conservatively until 34 weeks
- Consultant Obstetric staff to advise and document biochemical, haematological and clinical thresholds (mother and baby) for birth before 34 weeks
- Offer birth before 34 weeks after discussion with neonatal and anaesthetic teams and a course of antenatal steroids completed if:
    - Severe hypertension develops refractory to treatment.
    - maternal haematological, biochemical or clinical indicators develop (see consultant plan)
    - foetal indications develop
- Advise birth after 34 weeks for severe pre-eclampsia once BP controlled (+ course of antenatal steroids complete if appropriate)
- Offer birth at 34+0 to 36+6 for mild/moderate pre-eclampsia, depending on maternal and foetal condition, risk factors, availability of neonatal care
- Advise birth within 24-48 hours for mild/moderate pre- eclampsia after 37 +0 weeks

Treatment of severe hypertension after 48 hours after delivery

The post-natal hypertension of pre-eclampsia subsides after 7- 10 days. Anti-hypertensive therapy may be required for that time. Aim to keep BP below 150/100 mmHg.
Consider reducing antihypertensive treatment if BP falls below 140/90 mmHg[(2)].

Avoid methyldopa

- Methyldopa in the puerperium may precipitate post-natal depression.
- Stop methyldopa within 2 days of birth and restart antihypertensive the woman was receiving prior to planning pregnancy.

Antihypertensive management of postnatal hypertension [(2)]

a) If pre-pregnancy hypertension, consider restarting previous medication if appropriate.

b) If new hypertension consider Enalapril, except for women of Black African or Black Caribbean family origin where Nifedipine MR (or amlodipine) is preferred first line.
   - Monitor maternal renal function and potassium when on enalapril.

c) If this is ineffective after dose titration, add nifedipine MR (or amlodipine). Add enalapril if nifedipine or amlodipine used first.

d) If dose titration with second agent is not effective:
   - add a beta blocker (labetalol or atenolol) to combination **OR**
   - Change one drug from current regimen for a beta blocker (labetalol or atenolol)

See table below for recommended dose ranges and breastfeeding information.

- Consider daily bloods for 72 hours post delivery
- Consider for discharge only if bloods and BP are normal or improving.
- In women who have pre-eclampsia and remain on antihypertensive treatment 2 weeks after discharge from hospital, perform medical review.
- Refer women who have had pre-eclampsia and who still require antihypertensive treatment at the postnatal visit (6–8 weeks after the birth) for specialist assessment.

NOTE:
Potential interaction between nifedipine and beta blockers: possible severe hypotension and heart failure.

Summary of postnatal drug choices for breastfeeding mothers:
1st step: Enalapril, or nifedipine/amlodipine for women of black African or Caribbean family origin
2nd step: Add nifedipine/amlodipine (or Enalapril if Nifedipine used 1st)
3rd step: Add beta blocker (labetalol preferred in breastfeeding) OR swap 1 of the above for beta-blocker

Postnatal Antihypertensive dosing and breastfeeding guidance

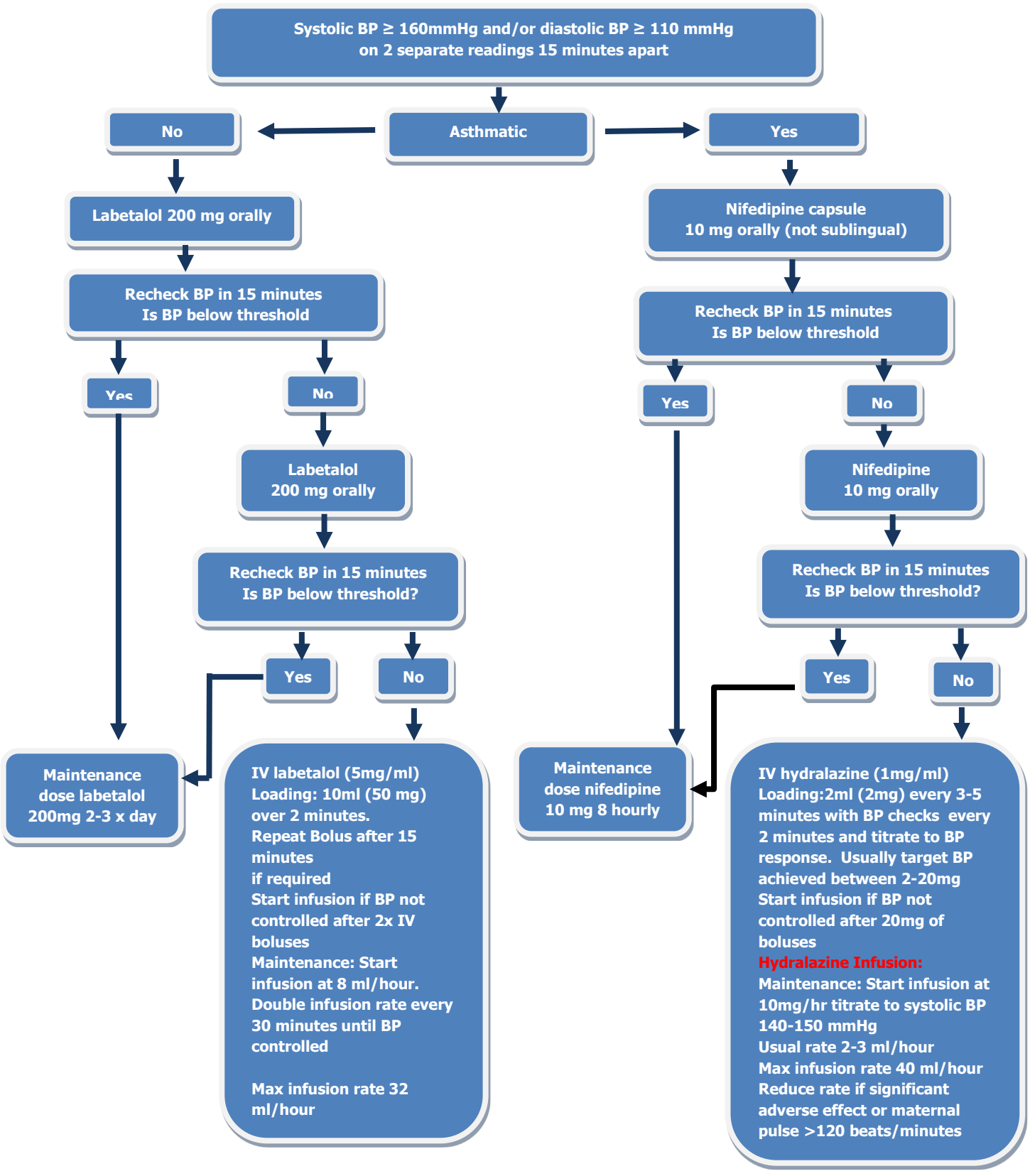
Drug dosing and breastfeeding guidance for postnatal anti-hypertensives [2,6,7]	
Angiotensin converting enzyme (ACE) inhibitors	
Enalapril	
Dose: 5mg once daily. Can increase up to 20mg once daily.	
Preferred ACE inhibitor during breastfeeding due to published evidence about its excretion into breast milk, it has been used therapeutically in infants, and it has the most favourable pharmacokinetics.	
Monitoring: Check renal function and serum potassium	
Other ACE inhibitors	
Enalapril is preferred however most ACE inhibitors can be used during breastfeeding if clinically appropriate. Seek advice from pharmacy on safety in breastfeeding.	
Beta-blockers	
Labetalol	
Dose: 100 mg 2 to 3 times daily (Can be increased up to 2400mg per day)	
Very small amounts detected in breast milk. Labetalol preferred beta-blocker in breastfeeding	
Atenolol	
Dose: 25 – 50mg once daily. Can be increased up to 100mg once daily.	
Small to moderate amounts in breastmilk, labetalol may be preferred while nursing a newborn or preterm infant or with high maternal dosages.	
Other Beta-blockers	
Any beta-blocker may be used during breastfeeding if clinically appropriate, although more careful monitoring may be required, seek advice from pharmacy on safety in breastfeeding.	
Calcium channel blockers (CCBs)	
Nifedipine	
SR or MR (12h release)	**Dose:** 10mg **TWICE** daily. Can increase up to 40mg twice daily
LA or XL (24h release)	**Dose:** 30 mg **ONCE** daily. Can increase up to 90mg once daily
Preferred CCB for hypertension during breastfeeding, as published evidence is available about excretion into breast milk (very small amounts) and there is extensive experience of use during breastfeeding.	
Amlodipine	
Dose: 5 mg once daily. Can be increased up to 10mg once daily	
Amlodipine is excreted into breast milk usually in very small amounts. Can be used with caution during breastfeeding, but nifedipine is the preferred.	
Other CCBs	
Very limited safety information for use in breastfeeding. Seek advice from pharmacy if alternate CCB required.	
Angiotensin II receptor antagonists	
Not recommended	
Diuretics	
Not recommended	

Licensing

Use of the above medicines in breastfeeding is considered off-label but is recommended by NICE.[2]

Treatment of Severe Hypertension (IV Therapy may be used first line)

Also see pages 6-7 Hydralazine Guidelines (may be used as first line in asthmatics)



Aim to keep BP ≤135/85 mmHg

Caution: All three drugs have cumulative effect (peak at 30 minutes) and all three interact with magnesium sulphate.

Nifedipine also increases the muscular blockage of magnesium sulphate.

Suggested Postnatal Care for Hypertensive Patient

DAY 1-2 POST PARTUM: CHRONIC OR GESTATIONAL HYPERTENSION & CRITERIA FOR DISCHARGE MET

Check blood pressure at least daily
Assess for pre-eclampsia

≥160/110 mm Hg → Refer back to general hospital assessment unit within 24 hours

Day 3-5 post partum

Check blood pressure at least once between day 3 and 5.
Assess for pre-eclampsia

≥160/110 mm Hg → Refer back to general hospital assessment unit within 24 hours

Yes → Blood pressure ≥ 150/100 mm Hg or blood pressure ≥140/90 mm Hg and/or symptoms of pre-eclampsia present

Blood Pressure stable

Blood Pressure not stable → Check blood pressure at least alternate days until stable

Blood pressure persistently >150/100 mm Hg

No antihypertensives → Consider starting antihypertensive if blood pressure ≥150/100 mm Hg

Taking antihypertensives → If taking methyldopa consider alternative

<140/90 mm Hg → Reduce treatment

<130/80 mm Hg → Reduce or stop treatment

Check blood pressure as clinically indicated if drugs have changed after delivery. Check weekly until drugs have stopped. Recheck weekly for two weeks after drugs have been stopped.

Repeat platelet count, transaminases or serum creatinine if abnormal as clinically indicated.

NEWLY IDENTIFIED HYPERTENSION

Blood Pressure ≥160/110 mm Hg → Readmit to Hospital

Diastolic blood pressure 90-99 mm Hg and no symptoms of pre-eclampsia: monitor blood pressure daily: if persistent ensure medical review and consider starting antihypertensive.

Inform woman to seek medical advice if she develops symptoms of pre-eclampsia.

Week 2 Post Partum

Check blood Pressure

Taking antihypertensives → Review antihypertensives. If known chronic hypertension consider changing back to pre-pregnancy treatment unless contraindicated in breast feeding.

No antihypertensives

Week 6 Post Partum

Check urinalysis, blood pressure, and repeat blood tests if not previously returned to normal

Still requires antihypertensives
No proteinuria

- Chronic hypertension before pregnancy → Review antihypertensive treatment and monitoring in primary care as per NICE
- Gestational hypertension or antenatal pre-eclampsia

Proteinuria ± requires antihypertensives
± blood tests remain normal

- ≥1+ protein only → Repeat 3months postpartum → ≥ 1 + protein
- ≥ 1 + protein

→ Offer Specialist assessment

Normal blood pressure
No proteinuria

Inform all women of future cardiovascular and future pregnancy risk

REFERENCES

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Appendices

1. **Governance information for Guidance document**

Lead Author	Dr S Maharaj/H Fulton/ A Livingston	**Date approved**	**January 2025**
Version	**6**	**Review Date**	**January 2028**

Lead Author(s):	Dr S Maharaj/H Fulton/ Dr A Livingston
Endorsing Body:	Maternity Clinical Effectiveness Group
Version Number:	6
Approval date	January 2025
Review Date:	January 2028
Responsible Person (if different from lead author)	Dr S Maharaj (Obs) H Fulton (Pharmacist) Dr A Livingston (Anaesthetics**)** .

CONSULTATION AND DISTRIBUTION RECORD	
Contributing Author / Authors	As Above
Consultation Process / Stakeholders:	Maternity CEG Process ADTC review
Distribution	All in Maternity

CHANGE RECORD

Date	**Lead Author**	**Change**	**Version No.**
2006	Dr JM Grant	*Originator*	1

May 2011	Dr S Maharaj	Review	2
December 2016	Dr Surindra Maharaj, Dr Ujwal Jadhav	Review	3
December 2019	Dr S Maharaj (Obs)Dr Adam Livingston (Anaesthetics)	Review	4
July 2024	S Maharaj H Fulton Adam Livingston	Review and Update	5
December 2024	S Maharaj H Fulton Adam Livingston	Reviewed with changes and amendments from ADTC	6

2.You can include additional appendices with complimentary information that doesn't fit into the main text of your guideline, but is crucial and supports its understanding.

e.g. supporting documents for implementation of guideline, patient information, specific monitoring requirements for secondary and primary care clinicians, dosing regimen/considerations according to weight and/or creatinine clearance