Guideline for Management of Hypertensive Disorders in Pregnancy

Document Type:	Clinical Guidelines
Ref:	MM205
Author:	Fran Hodge / Dawn Apsee
Executive Sponsor:	Choose an item.
Approved By:	Clinical Policy Group (Clinical Procedures, Guidelines Only)
Approval / Effective Date:	April 2025
Review Date:	April 2028
Version:	2

Target Audience:

People who need to know about this document in detail	All Obstetric and midwifery staff working within maternity services in CTM UHB
People who need to have a broad understanding of this document	As above
People who need to know that this document exists	As above

Integrated Impact Assessment:

Equality Impact Assessment Date & Outcome	Date: April 2025 Outcome: no negative impact
Welsh Language Standard	Choose an item.
Date of approval by Equality Team:	(00/00/0000)
Aligns to the following Wellbeing of Future Generation Act Objective	Choose an item.

Disclaimer:

If the review date of this document has passed please ensure that the version you are using is the most up to date version either by contacting the author or CTM_Corporate_Governance@wales.nhs.uk

Guidelines Definition

Clinical guidelines are systematically developed statements that assist clinicians and patients in making decisions about appropriate treatments for specific conditions.

They allow deviation from a prescribed pathway according to the individual circumstances and where reasons can be clearly demonstrated and documented.

Minor Amendments

If a minor change is required to the document, which does not require a full review please identify the change below and update the version number.

Type of change	Why change made	Page number	Date of change	Version 1 to 1.1	Name of responsible person
New Guideline under CTMUHB	Updated document	All	07.12.2019		Labour Ward Forum
Update of dosage of aspirin therapy in pregnancy from 75-150mg to 150mg for all pregnancies	In line with NICE Guidance	2	13.03.2021	1 to 1.1	Maternity Guideline Group
Update of existing guideline	Review and update of current guidance		April 2025	1 to 2	Fran Hodge/Dawn Apsee Maternity guideline group

CONTENTS

1. Introduction

Hypertensive disorders during pregnancy affect around 8-10% of all pregnant women and can be associated with substantial complications for the woman and the baby.[1]

Women can have hypertension before pregnancy, or it can be diagnosed in the first 20 weeks (known as chronic hypertension), new onset of hypertension occurring in the second half of pregnancy (pregnancy-induced or gestational hypertension) or new hypertension with features of multi-organ involvement (pre-eclampsia).[1]

2. Definitions

Chronic hypertension: Hypertension that is present at the booking visit, or before 20 weeks, or if the woman is already taking antihypertensive medication when referred to maternity services. It can be primary or secondary in aetiology.

Pregnancy-induced hypertension (PIH) or gestational hypertension: Hypertension of at least 140 systolic or at least 90 diastolic on two separate occasions ≥4 hours apart arising de novo after the 20th week of gestation in a previously normotensive woman and resolving completely by the 6th postpartum week without significant proteinuria.

Pre-eclampsia: New onset hypertension (at least 140 systolic or at least 90 diastolic) after 20 weeks of pregnancy and the coexistence of 1 or both of the following new-onset conditions:

- Proteinuria (urine protein:creatinine ratio ≥30mg/mmol
- Other maternal organ dysfunction including features such as renal or liver involvement, neurological or haematological complications, or uteroplacental dysfunction (such as fetal growth restriction, abnormal umbilical artery Doppler waveform analysis, or stillbirth).

Severe Pre-eclampsia: is pre-eclampsia with severe hypertension (≥ 160/110), +/or symptoms, +/or biochemical impairment, +/or haematological impairment. Signs and symptoms of severe pre-eclampsia:

- Severe headache
- Visual disturbance
- Severe epigastric pain/liver tenderness
- Vomiting

- Clonus ≥ 3 beats
- Platelet count falling to below $100x10^9$/L
- HELLP Syndrome
- Papilloedema
- Abnormal liver enzymes(ALT or AST >70 IU/L)

Eclampsia: Occurrence of tonic clonic convulsions in women with pre-eclampsia.

HELLP syndrome: Haemolysis, elevated liver enzymes and low platelet count.

3. Reducing the Risk of Hypertensive Disorders in Pregnancy

Offer Aspirin 150 mg daily (NICE GUIDELINES STATE 75mg to 150mg) to pregnant women from 12 weeks gestation until the birth of the baby:

a) If she has any of the following *high risk* factors:
- Hypertensive disease during a previous pregnancy
- Chronic kidney disease
- Autoimmune disease such as systemic lupus erythematosus or antiphospholipid syndrome
- Type 1 or type 2 diabetes
- Chronic hypertension.

b) Or, if she has more than 1 *moderate risk factor* of the following factors for pre-eclampsia:
- First pregnancy
- Age 40 years or older
- Pregnancy interval of more than 10 years
- Body mass index (BMI) of 35 kg/m^2 or more at first visit
- Family history of pre-eclampsia
- Multi-fetal pregnancy

ASPRE trial (2017) recommends 150mg Aspirin *at night*.

4. Management of Pregnancy with Chronic Hypertension

Consultations

Schedule additional antenatal appointments (weekly, or every 2 to 4 weeks) based on individual needs and BP control.

Antihypertensive treatment

- Stop ACE inhibitors or ARBs within 2 working days of notification of pregnancy and offer alternatives.
- Start aspirin, 75 mg to 150 mg once daily, from 12 weeks.
- Offer antihypertensive treatment to women with sustained blood pressure of 140/90 mmHg or more.
- Use labetalol, nifedipine or methyldopa. Base the choice on any pre-existing treatment, side-effect profiles, risks (including fetal effects) and the woman's preference.
- Aim for target BP of 135/85 mmHg or less.

Fetal monitoring

At 28, 32 and 36 weeks carry out:

- ultrasound fetal growth and amniotic fluid volume assessment
- umbilical artery doppler velocimetry.

Only carry out cardiotocography if clinically indicated.

Suspected pre-eclampsia

Offer placental growth factor (PlGF)-based testing if suspected pre-eclampsia between 20 weeks of pregnancy and 36 weeks and 6 days of pregnancy.

Mode of birth

Choose mode of birth according to clinical circumstances and a woman's preference.

Timing of birth

- If BP less than 160/110 mmHg with or without antihypertensive treatment:
  - do not offer birth before 37 weeks
  - after 37 weeks, indications for birth and timing should be agreed between woman and senior obstetrician.
- If planned early birth, offer antenatal corticosteroids and magnesium sulfate if indicated, in line with the NICE guideline on preterm labour and birth.

Aspirin: although aspirin use for antihypertensive treatment is common in UK clinical practice, at the time of publication (June 2019), aspirin did not have a UK marketing authorisation for this indication. Community pharmacies cannot legally sell aspirin as a Pharmacy medicine for prevention of pre-eclampsia in pregnancy in England. Aspirin for this indication must be prescribed. The prescriber should see the summary of product characteristics for the manufacturer's advice on use in pregnancy. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the General Medical Council's Prescribing guidance: prescribing unlicensed medicines for further information.

Nifedipine: at the time of publication (June 2019), some brands of nifedipine were specifically contraindicated during pregnancy by the manufacturer in its summary of product characteristics (SPC). Refer to the individual SPCs for each preparation of nifedipine for further details.

NICE National Institute for Health and Care Excellence

- Counsel the patients about the importance of weight management, exercise, healthy eating and reduced salt in diet.
- Stop antihypertensive treatment in women taking ACE inhibitors or ARBs, thiazides or thiazide like diuretics if they become pregnant (preferably within 2 working days of notification of pregnancy) and offer alternatives. The BNF states this is due to increased risk of congenital abnormalities.
- Advise women who take antihypertensive treatments other than ACE inhibitors, ARBs, thiazide or thiazide-like diuretics that the limited evidence available has not shown an increased risk of congenital malformation with such treatments.
- Continue with existing antihypertensive treatment if safe in pregnancy, or switch to an alternative treatment, unless:
    - Sustained systolic blood pressure is less than 110 mmHg or
    - Sustained diastolic blood pressure is less than 70 mmHg or
    - Symptomatic hypotension.
- Offer antihypertensive treatment to pregnant women who have chronic hypertension and who are not already on treatment if they have:
    - Sustained systolic blood pressure of 140 mmHg or higher or
    - Sustained diastolic blood pressure of 90 mmHg or higher.
- Consider labetalol to treat chronic hypertension in pregnant women. Consider nifedipine for women in whom labetalol is not suitable, or methyldopa if both labetalol and nifedipine are not suitable. Please dose as per *BNF (British National Formulary) | NICE*.
- Base the choice on any pre-existing treatment, side-effect profiles, contra-indications, risks (including fetal effects) and the woman's preference.

Aim for a target blood pressure of 135/85 mmHg with medications.

Antenatal appointments

In women with chronic hypertension, schedule additional antenatal appointments based on the individual needs. This may include:

- Weekly appointments if hypertension is poorly controlled
- Appointments every 2 to 4 weeks if hypertension is controlled.

Fetal monitoring in chronic hypertension

- In women with chronic hypertension, carry out an ultrasound for fetal growth and amniotic fluid volume assessment, and umbilical artery Doppler velocimetry at 28 weeks, 32 weeks and 36 weeks.
- Carry out cardiotocography only if clinically indicated.

Timing of birth

- Do not offer planned early birth before 37 weeks to women with chronic hypertension whose blood pressure is lower than

160/110 mmHg, with or without antihypertensive treatment, unless there are other medical indications.

- For women with chronic 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.
- If planned early birth is necessary, offer a course of antenatal corticosteroids (Preterm Labour Guidelines) and magnesium sulfate if indicated.

Postnatal investigation, monitoring and treatment

In women with chronic hypertension who have given birth, measure blood pressure:

- Daily for the first 2 days after birth
- At least once between day 3 and day 5 after birth
- As clinically indicated if treatment is changed after birth.

In women with chronic hypertension who have given birth:

- Aim to keep blood pressure lower than 140/90 mmHg
- Continue antihypertensive treatment, if required
- Offer a review 2 weeks after the birth, with their GP or specialist.

If a woman has taken methyldopa to treat chronic hypertension during pregnancy, stop within 2 days after the birth and change to an alternative antihypertensive treatment.

Offer a medical review 6–8 weeks after the birth with their GP or specialist as appropriate.

5. Management of Gestational Hypertension

(Refer to urgent treatment algorithm appendix 2)

Assessment in secondary care

- Arrange for a healthcare professional trained in the management of hypertensive disorders of pregnancy to assess the woman.
- Take into account previous history of pre-eclampsia or gestational hypertension, pre-existing vascular or kidney disease, risk factors for pre-eclampsia (for example, nulliparity, age 40 years or over, pregnancy interval more than 10 years, family history of pre-eclampsia, multi-fetal pregnancy, BMI 35 kg/m² or more) and gestational age at presentation.

Factor	Hypertension: BP 140/90 to 159/109 mmHg	Severe hypertension: BP of 160/110 mmHg or more
Admission to hospital	Do not routinely admit to hospital	Admit, but if BP falls below 160/110 mmHg then manage as for hypertension
Antihypertensive pharmacological treatment	Offer pharmacological treatment if BP remains over 140/90 mmHg	Offer pharmacological treatment to all women
Target BP on antihypertensive treatment	Aim for BP of 135/85 mmHg or less	Aim for BP of 135/85 mmHg or less
BP measurement	Once or twice a week (depending on BP) until BP is 135/85 mmHg or less	Every 15 to 30 minutes until BP is less than 160/110 mmHg
Dipstick proteinuria testing	Once or twice a week (with BP measurement)	Daily while admitted
Blood tests	Measure full blood count, liver function and renal function at presentation and then weekly	Measure full blood count, liver function and renal function at presentation and then weekly
Placental growth factor (PlGF)-based testing	Carry out PlGF-based testing on 1 occasion (NICE diagnostic guidance DG49) if there is suspicion of pre-eclampsia	Carry out PlGF-based testing on 1 occasion (NICE diagnostic guidance DG49) if there is suspicion of pre-eclampsia
Fetal heart auscultation	Offer fetal heart auscultation at every antenatal appointment	Offer fetal heart auscultation at every antenatal appointment
Fetal ultrasound	Carry out ultrasound assessment of the fetus at diagnosis and, if normal, repeat every 2 to 4 weeks, if clinically indicated	Carry out ultrasound assessment of the fetus at diagnosis and, if normal, repeat every 2 weeks, if severe hypertension persists
Cardiotocography (CTG)	Carry out a CTG only if clinically indicated	Carry out a CTG at diagnosis and then only if clinically indicated

NICE National Institute for Health and Care Excellence

Antihypertensive treatment

Use labetalol, nifedipine or methyldopa. Base the choice on any pre-existing treatment, side-effect profiles, risks (including fetal effects) and the woman's preference.

Mode of birth

Choose mode of birth according to clinical circumstances and a woman's preference.

Timing of birth

- Do not offer planned early birth before 37 weeks unless there are other medical indications.
- After 37 weeks, timing of and maternal and fetal indications for birth should be agreed between woman and senior obstetrician.
- If planned early birth offer antenatal corticosteroids and magnesium sulfate if indicated, in line with the NICE guideline on preterm labour and birth.

Nifedipine: at the time of publication (June 2019), some brands of nifedipine were specifically contraindicated during pregnancy by the manufacturer in its summary of product characteristics (SPC). Refer to the individual SPCs for each preparation of nifedipine for further details.

NICE National Institute for Health and Care Excellence

NB. PLGF testing not currently in use within CTM.

In women with gestational hypertension, take account of the following risk factors that require additional assessment and follow-up:

- Nulliparity
- Age 40 years or older
- Pregnancy interval of more than 10 years
- Family history of pre-eclampsia
- Multi-fetal pregnancy
- BMI of 35 kg/m2 or more
- Gestational age at presentation
- Previous history of pre-eclampsia or gestational hypertension
- Pre-existing vascular disease
- Pre-existing kidney disease.

Consider labetalol to treat gestational hypertension. Consider nifedipine for women in whom labetalol is not suitable, and methyldopa if labetalol or nifedipine are not suitable. Base the choice on side-effect profiles, risk (including fetal effects) and the woman's preferences.

Timing of birth

- Do not offer planned early birth before 37 weeks to women with gestational hypertension whose blood pressure is lower than 160/110 mmHg, unless there are other medical indications.
- For women with gestational hypertension whose blood pressure is lower than 160/110 mmHg after 37 weeks, timing of birth, and maternal and fetal indications for birth should be agreed between the woman and the senior obstetrician.
- If planned early birth is necessary, offer a course of antenatal corticosteroids (Preterm Labour Guidelines) and magnesium sulfate if indicated.

Postnatal investigation, monitoring and treatment

- In women with gestational hypertension who have given birth, measure blood pressure:
    - Daily for the first 2 days after birth
    - At least once between day 3 and day 5 after birth
    - As clinically indicated if treatment is changed after birth.
- In women with gestational hypertension who have given birth:
    - Continue antihypertensive treatment if required
    - Reduce antihypertensive treatment if their blood pressure falls below 130/80 mmHg.
- If a woman has taken methyldopa to treat gestational hypertension, stop within 2 days after the birth and change to an alternative treatment if necessary.
- For women with gestational hypertension who did not take antihypertensive treatment and have given birth, start

antihypertensive treatment if their blood pressure is 150/100 mmHg or higher.

- Offer women who have had gestational hypertension and who remain on antihypertensive treatment, a medical review with their GP or specialist 2 weeks after transfer to community care.
- Offer all women who have had gestational hypertension a medical review with their GP or specialist 6–8 weeks after the birth.

6. Management of Pre-eclampsia

(See appendix 2 for urgent treatment of severe hypertension)

Assessment

Arrange for a healthcare professional trained in management of hypertensive disorders of pregnancy to assess the woman at each consultation.

Place of care

Carry out a full clinical assessment at each antenatal appointment and offer admission to hospital for surveillance and any interventions needed if there are concerns for the wellbeing of the woman or baby.

Concerns could include any of the following:

- Sustained systolic BP of 160 mmHg or more.
- Any maternal biochemical or haematological investigations that cause concern, for example a new and persistent:
  - rise in creatinine (90 micromol/l or more, 1 mg/100 ml or more), or
  - rise in alanine transaminase (over 70 IU/l, or twice upper limit of normal range), or
  - fall in platelet count (less than 150,000/microlitre).
- Signs of impending eclampsia, pulmonary oedema, or other signs of severe pre-eclampsia
- Suspected fetal compromise.
- Any other clinical signs that cause concern.

Use of risk-prediction tools

- Consider using either the fullPIERS or PREP-S validated risk prediction models to help guide decisions about the most appropriate place of care (such as the need for in utero transfer) and thresholds for intervention.
- When using a risk prediction model, take into account:
  - fullPIERS is intended for use at any time during pregnancy
  - PREP-S is intended for use only up to 34 weeks of pregnancy
  - fullPIERS and PREP-S models do not predict outcomes for babies.

NICE National Institute for Health and Care Excellence

Hypertension in pregnancy: pre-eclampsia - antenatal care

Factor	Hypertension: BP 140/90 to 159/109 mmHg	Severe hypertension: BP of 160/110 mmHg or more
Admission to hospital	Admit if clinical concerns for woman or baby or if high risk of adverse events suggested by the fullPIERS or PREP-S risk prediction models	Admit, but if BP falls below 160/110 mmHg then manage as for hypertension
Antihypertensive pharmacological treatment	Offer pharmacological treatment if BP is over 140/90 mmHg	Offer pharmacological treatment to all women
Target BP on antihypertensive treatment	Aim for BP of 135/85 mmHg or less	Aim for BP of 135/85 mmHg or less
BP measurement	At least every 48 hours, and more frequently if the woman is admitted to hospital	Every 15–30 minutes until BP is under 160/110 mmHg, then at least 4 times daily while the woman is an inpatient, depending on clinical circumstances
Dipstick proteinuria testing	Only repeat if clinically indicated, for example if new symptoms and signs develop or if there is uncertainty over diagnosis	Only repeat if clinically indicated, for example if new symptoms and signs develop or if there is uncertainty over diagnosis
Blood tests	Measure full blood count, liver function and renal function twice a week	Measure full blood count, liver function and renal function 3 times a week
Fetal heart auscultation	Offer fetal heart auscultation at every antenatal appointment	Offer fetal heart auscultation at every antenatal appointment
Fetal ultrasound	Carry out ultrasound assessment of the fetus at diagnosis and, if normal, repeat every 2 weeks	Carry out ultrasound assessment of the fetus at diagnosis and, if normal, repeat every 2 weeks
Cardiotocography (CTG)	Carry out a CTG at diagnosis and then only if clinically indicated	Carry out a CTG at diagnosis and then only if clinically indicated

NICE National Institute for Health and Care Excellence

Hypertension in pregnancy: pre-eclampsia - antenatal care

Antihypertensive treatment

Use labetalol, nifedipine or methyldopa. Base the choice on any pre-existing treatment, side-effect profiles, risks (including fetal effects) and the woman's preference.

Mode of birth

Choose mode of birth according to clinical circumstances and a woman's preference.

Timing of birth

- Involve a senior obstetrician in any birth timing decisions.
- Before 37 weeks: consider planned early birth in women with severe pre-eclampsia.
- After 37 weeks: initiate birth within 24 to 48 hours.
- If planned early birth offer antenatal corticosteroids and magnesium sulfate if indicated, in line with the NICE guideline on preterm labour and birth.

Planning birth

Record maternal and fetal thresholds for planned early birth before 37 weeks in women with pre-eclampsia.

Thresholds for considering planned early birth could include (but are not limited to) any of the following:

- inability to control maternal BP despite using 3 or more classes of antihypertensives in appropriate doses
- maternal pulse oximetry less than 90%
- progressive deterioration in liver function, renal function, haemolysis, or platelet count
- ongoing neurological features, such as severe intractable headache, repeated visual scotomata, or eclampsia
- placental abruption
- reversed end-diastolic flow in the umbilical artery Doppler velocimetry, a non-reassuring cardiotocograph, or stillbirth.

Other features not listed may also be considered in the decision to plan early birth.

Nifedipine: at the time of publication (June 2019), some brands of nifedipine were specifically contraindicated during pregnancy by the manufacturer in its summary of product characteristics (SPC). Refer to the individual SPCs for each preparation of nifedipine for further details.

NICE National Institute for Health and Care Excellence

Carry out a full clinical assessment at each antenatal appointment for women with pre-eclampsia.

Offer labetalol to treat hypertension in pregnant women with pre-eclampsia. Offer nifedipine for women in whom labetalol is not suitable, and methyldopa if labetalol or nifedipine are not suitable. Base the choice on any pre-existing treatment, side-effect profiles, risks (including fetal effects) and the woman's preference.

Timing of birth in women with pre-eclampsia

Discuss with the anaesthetic team if birth is planned in a woman with pre-eclampsia.

Discuss with the neonatal team if birth is planned in a woman with pre-eclampsia, and neonatal complications are anticipated.

Offer a course of antenatal corticosteroids (Preterm Labour Guidelines) and magnesium sulfate if indicated, if early birth is planned for women with preterm pre-eclampsia

7. Fetal Monitoring

Fetal monitoring in chronic hypertension

- In women with chronic hypertension, carry out an ultrasound for fetal growth and amniotic fluid volume assessment, and umbilical artery doppler velocimetry at 28 weeks, 32 weeks and 36 weeks.
- In women with chronic hypertension, only carry out cardiotocography if clinically indicated.

Fetal monitoring in gestational hypertension

- In women with gestational hypertension, carry out an ultrasound for fetal growth and amniotic fluid volume assessment and umbilical artery doppler velocimetry at diagnosis and if normal repeat every 2 to 4 weeks, if clinically indicated as per CTMUHB Fetal Growth Assessment guidance.
- In women with gestational hypertension, only carry out cardiotocography if clinically indicated.

Fetal monitoring in pre-eclampsia or severe gestational hypertension

- Carry out CTG at time of diagnosis
- If conservative management of pre-eclampsia or severe gestational hypertension is planned, carry out all the following tests at diagnosis:
    - Ultrasound for fetal growth and amniotic fluid volume assessment
    - Umbilical artery Doppler velocimetry.
- If the results of all fetal monitoring are normal, do not routinely repeat CTG unless clinically indicated i.e. if any of the following occur:
    - The woman reports a change in fetal movement
    - Vaginal bleeding
    - Abdominal pain
    - Deterioration in maternal condition.
- Offer repeat ultrasound for fetal growth and amniotic fluid volume assessment or umbilical artery Doppler velocimetry every 2 weeks, with subsequent surveillance and monitoring determined by the findings of these scans.
- Carry out an ultrasound for fetal growth and amniotic fluid volume assessment and umbilical artery Doppler velocimetry starting at between 28 and 30 weeks (or at least 2 weeks before previous gestational age of onset if earlier than 28 weeks) and repeating 4 weeks later in women with previous:
    - severe pre-eclampsia
    - pre-eclampsia that resulted in birth before 34 weeks

- pre-eclampsia with a baby whose birth weight was less than the 10th centile
- intrauterine death
- placental abruption

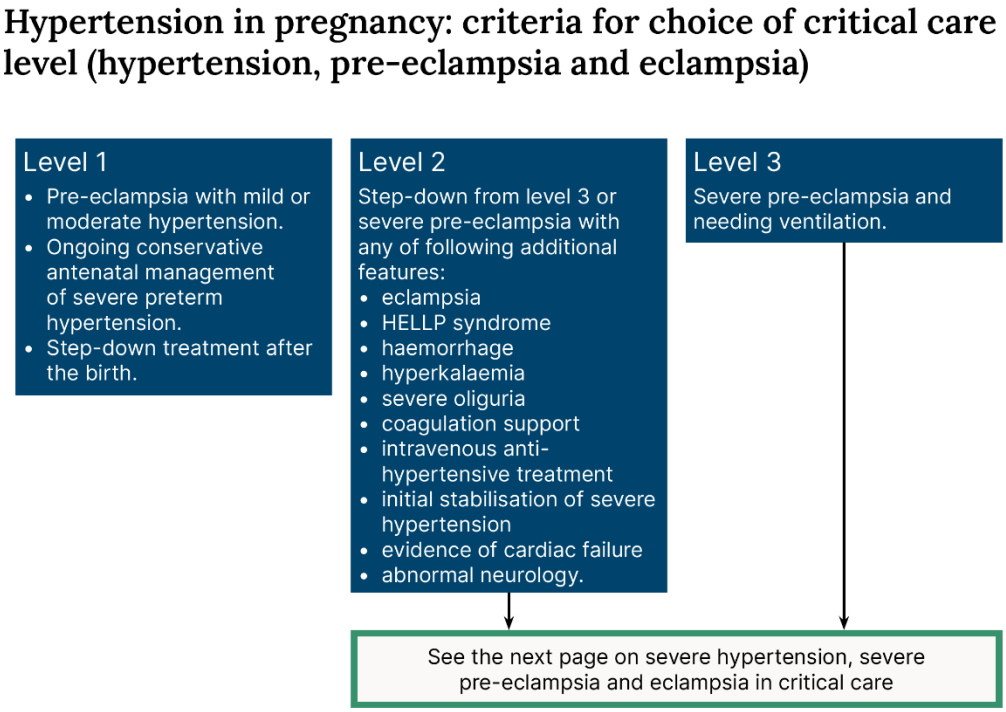
8. Management of Severe Pre-Eclampsia in the Community Setting

(Refer to Appendix 9 for management and documentation of events)

To support the timely management and appropriate escalation for women presenting with Eclampsia in the community please:

- Call for help – pull the emergency bell in the Free-standing Midwifery Led Unit
- Dial 999 paramedic ambulance request
- Initiate transfer - transfer must be to labour ward
- Contact Labour Ward and inform them of the situation and to expect the transfer in order for preparations to made for the arrival
    - Airway – position the woman in left lateral position
    - Maintain airway
    - If available (GP setting or when ambulance in attendance) administer high flow oxygen
    - When available (Paramedic ambulance) gain intravenous access and obtain Preeclampsia blood screening in preparation of arrival in the obstetric labour ward

9. Management of Severe Pre-Eclampsia in Critical Care Setting



Hypertension in pregnancy: severe hypertension, severe pre-eclampsia and eclampsia in critical care

Medical management

- Measure BP hourly in women with hypertension, and every 15 to 30 minutes until BP is less than 160/110 mmHg in women with severe hypertension
- Treat women admitted to critical care during pregnancy or after birth immediately with one of:
  - labetalol (oral or intravenous)
  - oral nifedipine
  - intravenous hydralazine
- Continue appropriate ongoing antihypertensive treatment after initial management
- Monitor response to treatment to:
  - ensure BP falls
  - identify adverse effects for woman and fetus
  - modify treatment according to response
- If BP controlled within target ranges, do not routinely limit duration of second stage of labour
- If BP does not respond to initial treatment, consider operative or assisted birth

Fluid balance and volume expansion

In women with severe pre-clampsia:

- limit maintenance fluids to 80 ml/hour unless there are other ongoing fluid losses (for example, haemorrhage)
- do not preload with intravenous fluids before establishing low-dose epidural analgesia and combined spinal epidural analgesia
- do not use volume expansion unless hydralazine is antenatal antihypertensive; consider using 500 ml or less crystalloid fluid before or at same time as first dose of hydralazine in antenatal period.

Magnesium sulfate

- Give intravenous magnesium sulfate if a woman with severe hypertension or severe preeclampsia is having or has recently had an eclamptic fit.
- Consider giving intravenous magnesium sulfate if birth planned within 24 hours in woman with severe pre-eclampsia.
- Do not use diazepam, phenytoin or other anticonvulsants as alternatives to magnesium sulfate in women with eclampsia.

Regimen for magnesium sulfate

- Loading dose of 4 g given intravenously over 5 to 15 minutes, followed by infusion of 1 g/hour for 24 hours
- Further dose of 2 to 4 g given over 5 to 15 minutes if recurrent seizures

Nifedipine: at the time of publication (June 2019), some brands of nifedipine were specifically contraindicated during pregnancy by the manufacturer in its summary of product characteristics (SPC). Refer to the individual SPCs for each preparation of nifedipine for further details.

Magnesium sulfate regimen: also see The Eclampsia Trial Collaborative Group (1995) Which anticonvulsant for women with eclampsia? Evidence from the Collaborative Eclampsia Trial. Lancet 345:1455–1463.

The MHRA has issued a warning about the risk of skeletal adverse effects in the neonate following prolonged or repeated use of magnesium sulfate in pregnancy. Maternal administration of magnesium sulfate for longer than 5 to 7 days in pregnancy has been associated with skeletal adverse effects and hypocalcaemia and hypermagnesemia in neonates. If use of magnesium sulfate in pregnancy is prolonged or repeated, consider monitoring of neonates for abnormal calcium and magnesium levels and skeletal adverse effects.

NICE National Institute for Health and Care Excellence

Admit the woman to Labour ward – level 2 care requirement. Contact the Senior Obstetrician, Senior Midwife, Anaesthetist, Haematologist (if required) and Neonatal Team (refer to Appendix D and Appendix E).
Essential maternal resuscitation equipment must be immediately available. These women should be admitted immediately to Labour ward.

9.1 Initial Management:

1. Monitor BP every 15 minutes until stabilised then every 30 min for 4 hours then 4 hourly if stable and asymptomatic
2. IV cannula
3. Blood investigations (FBC, U&Es, LFTs, coagulation studies, Group and save)
4. Urometer for hourly urine output monitoring
5. Fluid balance chart (hourly monitoring)
6. Fluid restriction
7. Documentation on HDU Maternal Early Obstetric Warning Score (MEOWS) observation chart
8. Medications (see below)
9. Anti-embolism stockings

9.2 Communication

- Communication is essential between Obstetrician, Anaesthetist, Labour Ward Co-ordinator and also Paediatrician if appropriate (preterm etc.)
- A clear plan for fetal assessment/monitoring and delivery should be documented in the woman's health record.
- Consultant Obstetrician should be informed of admission and should attend all cases of eclampsia.
- Communication with the woman and her partner/family is essential to provide clear information at what will be an anxious time for them.

9.3 Blood Pressure Control

- Start antihypertensive treatment if BP remains above 140/90 mmHg
- In women with other markers of potentially severe disease (significant proteinuria or disordered liver or haematological test results), treatment can be started at lower degrees of hypertension.
- The aim should be to stabilise the BP to 135 /85 mmHg.
- Any woman requiring IV medication to control her blood pressure should be reviewed by an anaesthetist to consider the need for placement of an arterial line.

9.4 Antihypertensives:

- Labetalol (oral or intravenous)
- Nifedipine (oral)
- Hydralazine (intravenous)

9.4.1 Labetalol

First line management for severe hypertension, except in the presence of asthma or Afro-Caribbean women when Hydralazine/Nifedipine should be used.

Dose of labetalol:

Initially orally 200mg before venous access. This should lead to a reduction in BP in about half an hour. Repeat dose after 30 minutes if no response and BP is 160/105 mmHg or higher.

- If BP still above threshold or oral not tolerated:
    - **IV Bolus:**
        - 50mg (10ml of ampoule 5mg/ml) over 2 minutes. Should have effect within 5 min.
        - Repeat at 5 minute intervals to a total maximum of 200mg labetalol until BP is controlled.
    - **Maintenance:**
        - Labetalol (5mg/ml) via a syringe pump.
        - Start infusion at a rate of 4ml/hr (20mg/hr). This should be doubled every 30 min if necessary to maximum of 32 ml/hr (160 mg/hr) until BP has dropped and stabilised at acceptable level.

- There is no need to give a fluid pre-load with labetalol.
- The pulse rate should remain over 60 beats per minute.
- Labetalol has a low pH and may cause venous irritation and tissue damage in cases of extravasation.
- If a central venous access device is unavailable, administer via a large peripheral vein monitoring insertion site closely using a recognised phlebitis scoring tool.
- Resite cannula at first signs of inflammation.

Contraindications for use of labetalol:

- Asthma - use hydralazine
- Hypersensitivity to Labetalol
- Second or third degree AV block,
- cardiogenic shock,

- hypotension,
- bradycardia < 45-50bpm,
- Prinzmetal's angina,
- untreated phaeochromocytoma, metabolic acidosis and severe peripheral circulatory disturbances.
- Uncontrolled , incipient or digitalis refractory heart failure
- Sick sinus syndrome (including sino- atrial block) Low cardiac output following Myocardial Infarction.

Side effects of labetalol:

- Tiredness/weakness
- Headache
- Rashes
- Scalp tingling
- Difficulty in micturition
- Epigastric pain
- Nausea/vomiting
- Postural hypotension

See BNF or SPC for a full list of contraindications and cautions for use.

Ante-natal maternal use of labetalol can cause adverse effects in the neonate. Neonatal monitoring is required for: hypoglycaemia, hypotension, bradycardia, hypothermia and respiratory depression.

9.4.2 Hydralazine

To be used when labetalol is contra-indicated (usually asthma) or as a second line if labetalol fails to control the BP.

Dose of hydralazine:

Initial dose:

- Mix 20mg (1ml) of hydralazine **and make to a final volume of** 20ml **with** sodium chloride 0.9% to result in 1mg/ml of hydralazine.
- Give 5ml (5mg) over 15 minutes and check blood pressure.
- If systolic BP >160mmHg after 20 mins, repeat dose of 5ml (5 mg) over 15 minutes.
- **CONSIDER** using up to 500 ml crystalloid sodium chloride 0.9% before or at the same time as the first dose of intravenous hydralazine in the antenatal period

Maintenance dose:

Using a 50ml syringe, draw up 40mg (2ml) of hydralazine and make

up to a final volume of 40ml with sodium chloride 0.9%, producing a final concentration of 1mg in 1ml.

- Administer via a syringe pump (1mg/ml) with a one way valve.
- Start infusion at 5ml (5 mg) /hour
- Titrate to systolic to BP 140-150mmHg.
- Usual rate is 2-3ml/hr (2-3mg/hour)
- Max. infusion rate 18ml/hour
- Stop increasing dose if diastolic BP <100 is reached or pulse >120 beats/minute, or significant adverse effect
- Reduce by 1 ml/hour every 30 minutes.

Contraindications for Hydralazine

- Known hypersensitivity
- Coronary artery disease
- Mitral valve rheumatic heart disease
- Tachycardia

Side Effects of Hydralazine

- Tachycardia
- Palpitations/Flushing
- Chest pain
- Gastrointestinal disturbances
- Agitation
- Anxiety

See BNF or SPC for a full list of contraindications and cautions.

9.4.3 Nifedipine:

Indications:

- If tachycardic ≥ 120 beats / minute
- Asthmatic
- Women with African or Caribbean family origin:
  - Consider nifedipine 10 mg (immediate release) orally (not sublingual)
  - Recheck BP in 30 minutes
  - Repeat nifedipine 10mg orally if BP not below threshold
  - **Maintenance dose** nifedipine (modified release) 10mg PO QDS.

Contraindications of Nifedipine

- Acute attacks of angina
- Cardiogenic shock
- Significant aortic stenosis

- Unstable angina within 1 month of myocardial infarction

Side effects of nifedipine

- Abdominal pain
- Dizziness
- Drowsiness
- Flushing
- Headache
- Nausea
- Palpitations
- peripheral oedema
- skin reactions
- tachycardia
- vomiting

See BNF or SPC for a full list of contraindications and cautions for use.

9.5 Seizure Prophylaxis

Magnesium sulfate

If a woman in a critical care setting who has severe hypertension or severe pre-eclampsia has or previously had an eclamptic fit, give intravenous magnesium sulfate (APPENDIX 7)

Consider giving intravenous magnesium sulfate to women with severe pre-eclampsia who are in a critical care setting if birth is planned within 24 hours.

Consider the need for magnesium sulfate treatment, if 1 or more of the following features of severe pre-eclampsia is present:

- Ongoing or recurring severe headaches
- Visual scotomata
- Nausea or vomiting
- Epigastric pain
- Oliguria and severe hypertension
- Progressive deterioration in laboratory blood tests (such as rising creatinine or liver transaminases, or falling platelet count).

Dosage (see appendix 7 for administration information)

- **Loading dose by IV injection:** 4g (16mmol magnesium) should be given via intravenous injection over 5 to 15 minutes, followed by:
- **Maintenance dose via IV Infusion**: 1g (4mmol magnesium) per hour maintained for 24 hours. If the woman has had an eclamptic fit, the infusion should be continued for 24 hours after the last fit.
- Recurrent fits should be treated with a further dose of 2g given intravenously over 5 to 15 minutes

Seizure prophylaxis in women who are oliguric from the outset:

- Give 4g magnesium sulfate IV loading dose over 5min. Maintenance dose should be omitted until urine output normalizes.
- **Do not** use diazepam, phenytoin or other anticonvulsants as an alternative to magnesium sulphate in women with eclampsia (NICE 2019)

Monitoring:

- Blood pressure monitoring every fifteen minutes for initial loading dose and then as per Obstetric plan based on blood pressure
- Continuous pulse oximetry
- Hourly urine output

- Hourly respiratory rate
- Deep tendon reflexes 4 hourly

Stop magnesium sulfate if:
- Urine output less than 100 ml in 4 hrs
- Deep reflexes are absent after 5 hrs (not due to regional block)
- Respiratory rate less than 12 breaths per min
- Oxygen saturation less than 90 %

Contraindications:
- Hypersensitivity to magnesium.
- Heart block or myocardial damage.
- Renal failure (Hepatic coma if there is a risk of renal failure).
- Myasthenia gravis.

Cautions:
- Interaction with antihypertensive agents especially calcium channel blockers
- magnesium sulfate is associated with a transient (30 – 40 minutes) and usually mild reduction in BP, but this may be profound if nifedipine is also being given. Therefore, hydralazine given IV is a preferable antihypertensive.
- magnesium sulfate may be associated with reduction in variability of FHR.
- magnesium sulfate acts in synergy with neuromuscular blocking agents (if suxamethonium is given, fasciculations may not be visible).
- Any woman requiring IV magnesium sulfate infusion should be reviewed by an anaesthetist to consider the need for placement of an arterial line

Side effects:
- Nausea
- Blurred vision
- Drowsiness
- Slurred speech
- Respiratory depression
- Muscle weakness

ANTIDOTE: 10ml calcium gluconate 10% slowly IV over 10 minutes.

10. Fluid Management of Severe or Fulminating Pre-eclampsia

(See appendix H for flowchart)

FLUID RESTRICTION IS ADVISABLE TO REDUCE THE RISK OF FLUID OVERLOAD IN THE INTRAPARTUM AND POSTPARTUM PERIODS

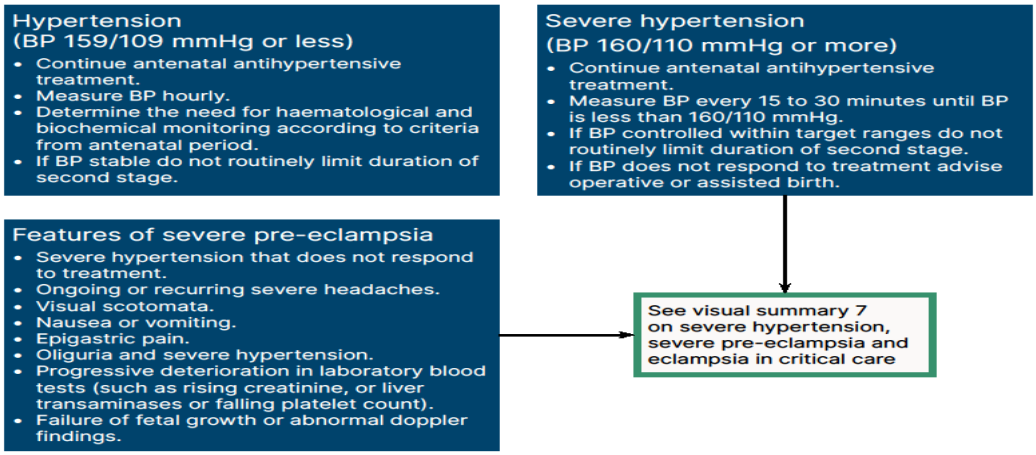
BEWARE*: Over the last 20 years pulmonary oedema has been a significant cause of maternal morbidity and mortality in severe pre-eclampsia/eclampsia. This has often be associated with inappropriate fluid management Mothers and Babies: Reducing Risk through Audit and Confidential Enquires across the UK.*

Women with a booking weight greater than 100kg will require review by senior Anaesthetist for fluid management (consider increased maintenance dose to maximum 1ml/kg).

- Total fluid input (oral and intravenous) should be limited to 80 ml/hour (*unless there are other ongoing losses (e.g. haemorrhage)).*
- Insert a urinary catheter and monitor urine output hourly (hourly bag required), document on a fluid balance chart/HDU chart (this should be a cumulative calculation of fluid balance).
- If <100mls over a 4 hour period inform the Obstetrician.
- Limit oral intake to <30mls of water per hour initially as these women are at high risk of a Caesarean Section
- Oral intake must be included in the hourly total.
- Do not pre-load with intravenous fluids before establishing low-dose epidural analgesia
- Accurate recording of fluid balance hourly including delivery and postpartum blood loss, input and output deficit.
- Selective crystalloids expansion may be necessary prior to pharmacological vasodilation to prevent maternal hypotension and fetal compromise or in oliguria
- Diuretics: only for women with confirmed pulmonary oedema
- Avoid non-steroidal analgesia until fluid recovery.

Note: Plasma volume expansion needs to be cautious, as excessive fluid loading may lead to pulmonary oedema postpartum. Hypovolaemia is not the only cause of a low urine output in pregnancy induced hypertension/gestational hypertension. Direct glomerular damage often occurs as well.

11. Intrapartum Care



NICE National Institute for Health and Care Excellence

First Stage of Labour

- Once stabilized decision should be made regarding time and mode of delivery. Mode of delivery according to clinical circumstances. After 34 weeks, vaginal delivery should be considered. Caesarean section may be preferable under 34 weeks.
- Continuous electronic fetal monitoring is advised (if appropriate for gestation).
- During labour, measure blood pressure hourly in women with hypertension, and every 15–30 minutes until blood pressure is less than 160/110 mmHg in women with severe hypertension.
- Continue use of antenatal antihypertensive treatment during labour.
- Determine the need for haematological and biochemical tests during labour in women with hypertension using the same criteria as in the antenatal period even if regional analgesia is being considered.
- For 'mild' pre-eclampsia check platelet count within 6 hours for regional anaesthesia.
- For 'severe' pre-eclampsia or where the platelets are already less than 100 x 10^9/L or where they are known to be falling quickly check FBC and Coagulation screen immediately before performing a neuraxial procedure (2 hours might be reasonable, with a review of the clinical picture and discussion with the consultant on-call if any results are abnormal).

Second Stage of Labour

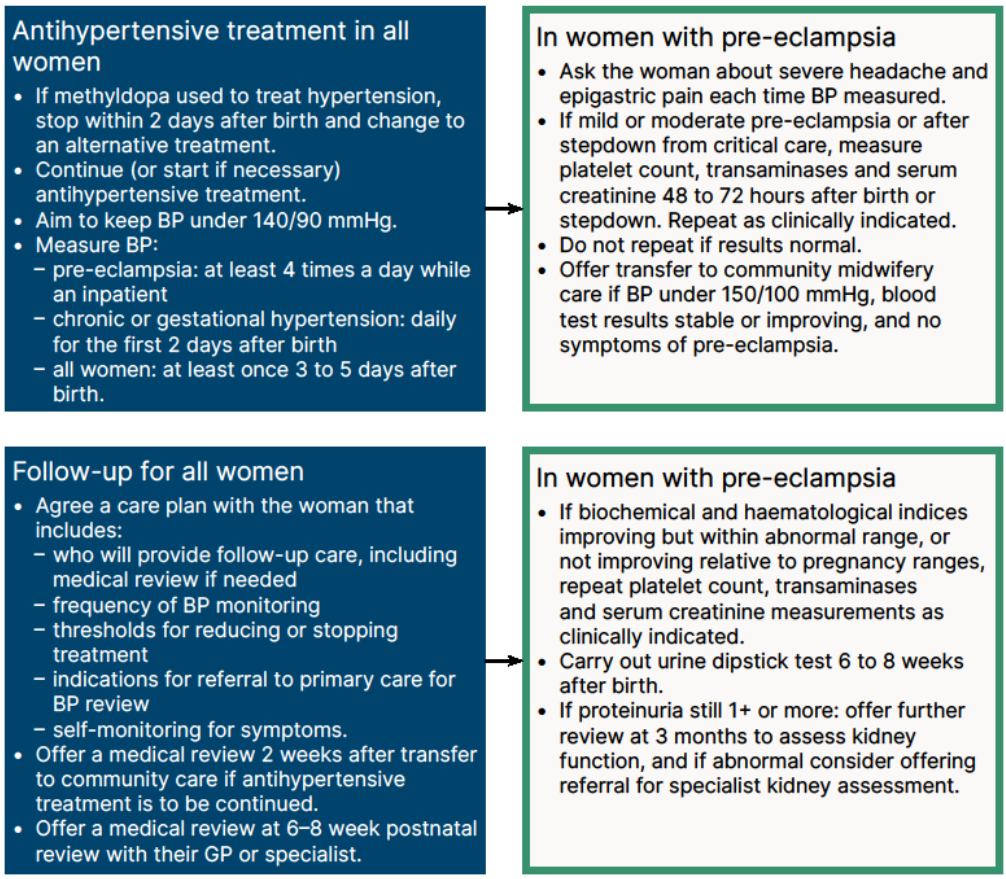
- Don't routinely limit the duration of second stage of labour in women with controlled hypertension
    - Consider operative delivery in severe hypertension where hypertension has not responded to initial treatment
    - If the patient is to have vaginal birth, epidural analgesia is the preferred method of analgesia if full coagulation profile is normal and should be recommended.
    - Do not preload women who have severe pre-eclampsia with intravenous fluids before establishing low-dose epidural analgesia or combined spinal epidural analgesia
    - Check platelet results (platelet count within 4 hours if severe pre-eclampsia):
        - If platelets $\leq$100 x 10^9/L senior Anaesthetist assesses balance of benefits and risks.
        - If abnormal (check values with Consultant Anaesthetist) - IM Pethidine (dosage will be the anaesthetist decision) + Entonox

Third Stage of Labour

- This should be managed with bolus of oxytocin 10 units IM followed by 40 iu via intravenous infusion (40 iu of oxytocin 40 mls of sodium chloride 0.9% @10mls/hour).
- Ergometrine or ergometrine combined with oxytocin (Syntometrine) should NOT be used for the 3rd stage in hypertensive women, as ergometrine is known to increase blood pressure.

Please be aware of NHS England » National Patient Safety Alert – risk of oxytocin overdose during labour and childbirth.

12. Post-Partum Care



- The patient should be kept under observation with Labour Ward level 2 care (on labour ward if appropriate) for at least 24 hours following delivery, with careful monitoring of blood pressure, fluid balance, urine output and symptoms.
- Clinicians should be aware that up to 44% of eclampsia occurs postpartum, especially at term, so women with signs or symptoms compatible with pre-eclampsia should be carefully assessed.
- Continue magnesium sulfate for 24 hours post-delivery as a minimum.

- Limit maintenance fluids to 80mls/hour (*unless there are other ongoing losses (e.g. haemorrhage))*. Once the woman is drinking, the intravenous infusion rate of fluids will need to be altered to ensure the total hourly (oral and intravenous) input is 80 mls per hour.
- Fluids can be increased slowly once stable but should be under the direction of an Obstetrician (Registrar or consultant).
- Continue fluid balance chart and monitor blood pressure 1 - 4 hourly until stable whilst in the Delivery Suite.
- Record urine output hourly and each 4 hour period added up and documented on the HDU/MEWS chart. Inform Obstetrician if <100mls in 4 hours.
- Antihypertensive therapy should be continued after delivery as dictated by the BP. Continued use of antihypertensive may be required with either continuation of the hydralazine infusion and later conversion to oral nifedipine. Pathway for hypoglycaemia will need to be consulted for neonatal observation.
- Advise women with hypertension who wishes to breast feed that their treatment can be adapted to accommodate breastfeeding, and that the need to take antihypertensive medication does not prevent them from breast feeding.
- Explain to women with hypertension who wish to breastfeed that:
    - Antihypertensive medicines can pass into breast milk
    - Most antihypertensive medicines taken while breast feeding only lead to very low levels in breast milk, so the amounts taken in by babies are very small and would be unlikely to have any clinical effect.
    - Most medicines are not tested in pregnant or breastfeeding women so disclaimers in the manufacturers information are not because of any specific safety concerns or evidence of harm.
    - Make decision on treatment together with the woman based on her preferences.
    - When discharged home advise women to monitor their babies for drowsiness, lethargy, pallor, cold peripheries or poor feeding.
    - Offer enalapril to treat hypertension in women during the postnatal period, with appropriate monitoring of maternal renal function and maternal serum potassium
    - For women of black African or Caribbean family origin with hypertension during the postnatal period, consider antihypertensive treatment with: nifedipine or amlodipine if the woman has previously used this to successfully control her blood pressure.

For women with hypertension in the postnatal period, if blood pressure is not controlled with a single medicine, consider a combination of nifedipine (or amlodipine) and enalapril. If this combination is not tolerated or is ineffective consider either: adding atenolol or labetalol to the combination treatment, or swapping one of the medicines already being used for atenolol or labetalol.

When treating women with antihypertensive medication during the postnatal period use medicines that are taken once daily where possible. Where possible avoid using diuretics or angiotensin receptor blockers to treat hypertension in women in the post-natal period who are breastfeeding or expressing milk.

Treat women with hypertension in the postnatal period who are not breastfeeding and who are not planning to breastfeed in line with the NICE guidance on hypertension in adults (Hypertension in adults: diagnosis and management).

- Avoid any precipitous fall in blood pressure during antihypertensive regime and watch for signs of worsening pre-eclampsia.
- Reduction in antihypertensive therapy should be made in a stepwise fashion.
- Maintain post-delivery analgesia if required. NSAID may only be administered after review of post-delivery FBC and U&E by Obstetrician or Anaesthetist
- Assess the woman's thromboembolism risk and prescribe LMWH as required.
- Repeat all pre-eclampsia biochemical and haematological investigations at least daily for the first 48 hours, and then repeat as indicated.
- Encourage mobility when safe to do so and consider referral for physiotherapy.
- On transfer to the postnatal ward from Delivery Suite, ensure diagnosis and treatments required are handed over to ward employees including the management and follow up care plan which should be documented in the woman's health record and include :
    - Frequency of BP.
    - Whether the fluid balance charting is to be continued or discontinued.
    - A plan for any blood tests.
- It is good practice for an Obstetrician to review the woman's care at least daily whilst in hospital.
- On discharge from the maternity unit a plan should be recommended for the Community Midwife and GP to follow up to monitor BP and use of continued anti-hypertensive therapy.

- All women who have had severe pre-eclampsia (requiring the magnesium sulfate regime) or eclampsia should be offered a Consultant clinic review at approximately 8 weeks.
- DATIX form should be completed for all woman who have an eclamptic seizure or who have severe pre-eclampsia requiring magnesium sulfate regime

Criteria for discharge to community care

Offer women with postpartum hypertension transfer to community care if all the following criteria have been met:

- there are no symptoms of pre-eclampsia.
- blood pressure, with or without treatment, is 150/100 mmHg or less.
- blood test results are stable or improving.
- With written care plan that includes **all** the following:
  a) Who will provide follow-up care, including medical review at 2weeks for those remaining on antihypertensive agents to tail off or stop or continue medication and routine GP/Specialist review at 6-8 weeks.
  b) Frequency of blood pressure monitoring in community
  c) Thresholds for reducing or stopping treatment
  d) Indications for referral to primary care for blood pressure review
  e) Self-monitoring for symptoms.

Oral Antihypertensives- Dose, Side-effects and Contraindications

**Please consult BNF (British National Formulary) | NICE or Home - electronic medicines compendium (emc) for full details.*

Drug	Dose	Contraindication*	Side effects*
Amlodipine	5-10mg once daily	Cardiogenic shock, significant aortic stenosis, unstable angina	Headache, flushing, Palpitation, peripheral oedema
Atenolol	25-100mg once daily	Asthma, Bradycardia, 2nd or 3-degree AV block	Rashes, bradycardia, dizziness, headache
Enalapril	5-40mg OD	Avoid in AKI	Hypotension, cough, renal impairment
Labetalol	100mg BD -200mg QDS Max daily dose 2400mg	Asthma, cardiac failure, bradycardia,2nd or 3-degree AV block	Rashes, Postural hypotension, headache, urinary hesitancy, fatigue
Methyldopa	250mg two to three times daily. Max daily dose 3g	Acute porphyrias, depression, paraganglioma, phaeochromocytoma	Abdominal distension, angina pectoris, angioedema, bradycardia, constipation, depression, headache, dry mouth.
Nifedipine SR	10-80mg daily, in two to four divided doses.	Advanced Aortic stenosis	Headache, tachycardia, palpitation, flushing

Hypertension in pregnancy: risk of recurrence of hypertensive disorders of pregnancy

Advise women with antihypertensive disorders of pregnancy that the overall risk of recurrence in future pregnancies is approximately 1 in 5

Prevalence of hypertensive disorder in a future pregnancy	Any hypertension in pregnancy	Pre-eclampsia	Gestational hypertension
Any hypertension	Approximately 21% (1 in 5 women)	Approximately 20% (1 in 5 women)	Approximately 22% (1 in 5 women)
Pre-eclampsia	Approximately 14% (1 in 7 women)	Up to approximately 16% (1 in 6 women) If birth was at 28 to 34 weeks: approximately 33% (1 in 3 women) If birth was at 34 to 37 weeks: approximately 23% (1 in 4 women)	Approximately 7% (1 in 14 women)
Gestational hypertension	Approximately 9% (1 in 11 women)	Approximately 6% to 12% (up to 1 in 8 women)	Approximately 11% to 15% (up to 1 in 7 women)
Chronic hypertension	Not applicable	Approximately 2% (up to 1 in 50 women)	Approximately 3% (up to 1 in 34 women)

For pre-eclampsia, no evidence was identified for women who gave birth at less than 28 weeks, but the committee for the 2010 guideline (NICE guideline CG107) agreed that the risk was likely to be at least as high, if not higher, than that for women who gave birth between 28 and 34 weeks.

NICE National Institute for Health and Care Excellence

Hypertension in pregnancy: risk of long-term cardiovascular disease

Advise women who have had a hypertensive disorder of pregnancy that this is associated with an increased risk of hypertension and cardiovascular disease in later life

Risk of future cardiovascular disease	Any hypertension in pregnancy	Pre-eclampsia	Gestational hypertension	Chronic hypertension
Major adverse cardiovascular event	Risk increased (up to approximately 2 times)	Risk increased (approximately 1.5 to 3 times)	Risk increased (approximately 1.5 to 3 times)	Risk increased (approximately 1.7 times)
Cardiovascular mortality	Risk increased (up to approximately 2 times)	Risk increased (approximately 2 times)	No data	No data
Stroke	Risk increased (up to approximately 1.5 times)	Risk increased (approximately 2 to 3 times)	Risk may be increased	Risk increased (approximately 1.8 times)
Hypertension	Risk increased (approximately 2 to 4 times)	Risk increased (approximately 2 to 5 times)	Risk increased (approximately 2 to 4 times)	Not applicable

Risks described are overall estimates, summarised from risk ratios, odds ratios and hazard ratios. Increased risk is compared to the background risk in women who did not have hypertensive disorders during pregnancy. Absolute risks are not reported, as these will vary considerably, depending on the follow up time (range from 1 to 40 years postpartum).

NICE National Institute for Health and Care Excellence

- Advise women who have had a hypertensive disorder of pregnancy to discuss how to reduce their risk of cardiovascular disease, including hypertensive disorders, with their GP or specialist. This may include:
- avoiding smoking as recommended in NICE guideline on tobacco

- maintaining a healthy lifestyle as recommended in the NICE guideline on cardiovascular disease maintaining a healthy weight as recommended in the NICE guideline on obesity.
- In women who have had pre-eclampsia or hypertension with early birth before 34 weeks, consider pre-pregnancy counselling to discuss possible risks of recurrent hypertensive disorders of pregnancy, and how to lower them for any future pregnancies.

Body mass index and recurrence of hypertensive disorders of pregnancy

Advise women who have had pre-eclampsia to achieve and keep a BMI within the healthy range before their next pregnancy (18.5-24.9) See also NICE guidance on obesity.

Inter-pregnancy interval and reoccurrence of hypertensive disorders of pregnancy

Advise women who have had pre-eclampsia that the likelihood of recurrence increases with an inter-pregnancy interval >10years.

13. HELLP Syndrome

HELLP syndrome is one of several possible crises that may develop as a variant of severe pre-eclampsia.

The incidence in pre-eclampsia pregnancies is approximately 5% to 20%, although many more women with pre-eclampsia, perhaps 20% to 50%, have mild abnormalities of hepatic enzymes without full blown HELLP syndrome.

There is increased maternal (1%) and perinatal mortality (reported rates vary from approximately 10% to 60%).

Clinical features

- Epigastric or right upper quadrant pain (65%)
- Nausea and vomiting (35%)
- Tenderness in the right upper quadrant
- Hypotension with or without proteinuria
- Other features of pre-eclampsia
- Acute kidney injury AKI (7%)
- Placental abruption (16%). This may be the presenting feature and should always prompt investigation for HELLP syndrome or pre-eclampsia as underlying causes

Diagnosis

- Low grade haemolysis evident on peripheral blood smear, rarely enough to cause severe anaemia.
- Low (usually $<100 \times 10^9$/L) or falling platelets.
- Elevated transaminases.
- Elevated lactate dehydrogenase (LDH) (indicative of haemolysis).
- Raised bilirubin (unconjugated, reflecting the extent of haemolysis)

The platelet count may fall below 30×10^9/ L in severe cases and some women develop Disseminated intravascular coagulopathy (DIC).

HELLP syndrome – points to remember

- This is one of the potential crises that may develop in pre-eclampsia
- Other features of pre-eclampsia including hypertension and proteinuria may be only mild.
- The typical features are right upper quadrant pain, abnormal liver function, low platelets and mild haemolysis.
- There is a risk of DIC, abruption, liver haematoma and liver rupture.
- Delivery of the fetus is the correct treatment once any hypertension has been controlled. Platelet transfusion is usually required.
- Women may present or deteriorate postpartum and renal impairment is uncommon.
- Women are at a greatly increased risk of developing pre-eclampsia in future pregnancies.
- The risk of recurrent HELLP syndrome is low.

14. Management of Eclampsia

All women who have a seizure or convulsion for the first time in pregnancy, labour or post-partum should initially be **managed as eclampsia until proven otherwise.**

ECLAMPSIA IS AN OBSTETRIC EMERGENCY

- **Call for help using 2222 stating obstetric emergency and identify where this is occurring**
- **Ensure resuscitation equipment is in the room- emergency eclampsia tray and resuscitation trolley.**
- **Basic resuscitation using ABC approach**
    1. Maintain airway – oral suction if necessary.
    2. Left lateral position.
    3. Facial oxygen at 10L/minute.
    4. Oxygen saturation monitor (pulse oximeter).
- **Obtain IV access and** take blood for Full Blood Count, coagulation screen, Liver Function Tests, Urea & Electrolytes, Group and save
- **Control fit and reduce risk of further fits with magnesium sulfate** (see appendix 7).
- Treat convulsions (eclamptic fits are usually self-limiting), control BP, stabilize the mother, monitor fetal wellbeing and plan to deliver the infant safely
- **Initial treatment:** Loading dose of 4g (20ml) of 20% Magnesium Sulfate IV over 5 minutes
- A further 2g IV may be given over 5 minutes for recurrent seizures
- **Maintenance Dose:** An infusion of 1g/hour of magnesium sulfate via a syringe pump should be given until 24 hours after the last seizure.
- Monitoring for toxicity as described in magnesium sulfate section.

If repeated seizures occur despite magnesium sulfate:

- Check serum magnesium levels – may be sub-therapeutic and warrant increasing the dose of magnesium sulfate.
- Consider diazepam 10 mg IV over 5 minutes as a slow bolus.
- The Anaesthetist may choose to use thiopentone (50 mg IV).
- Intubation may become necessary to protect airway and ensure adequate oxygenation. Further seizures must be managed by intermittent positive pressure ventilation and muscle relaxation.
- **Note: Persistent convulsions may be the sign of serious intracranial lesions and an indication for emergency Computed Tomography (CT) scan or Magnetic Resonance Imaging (MRI) of the brain.**

  Once seizure is under control management as per "Severe Pre-eclampsia" although delivery will usually be expedited (decision on

mode of delivery should be made by a senior Obstetrician, usually a Consultant).

15. References

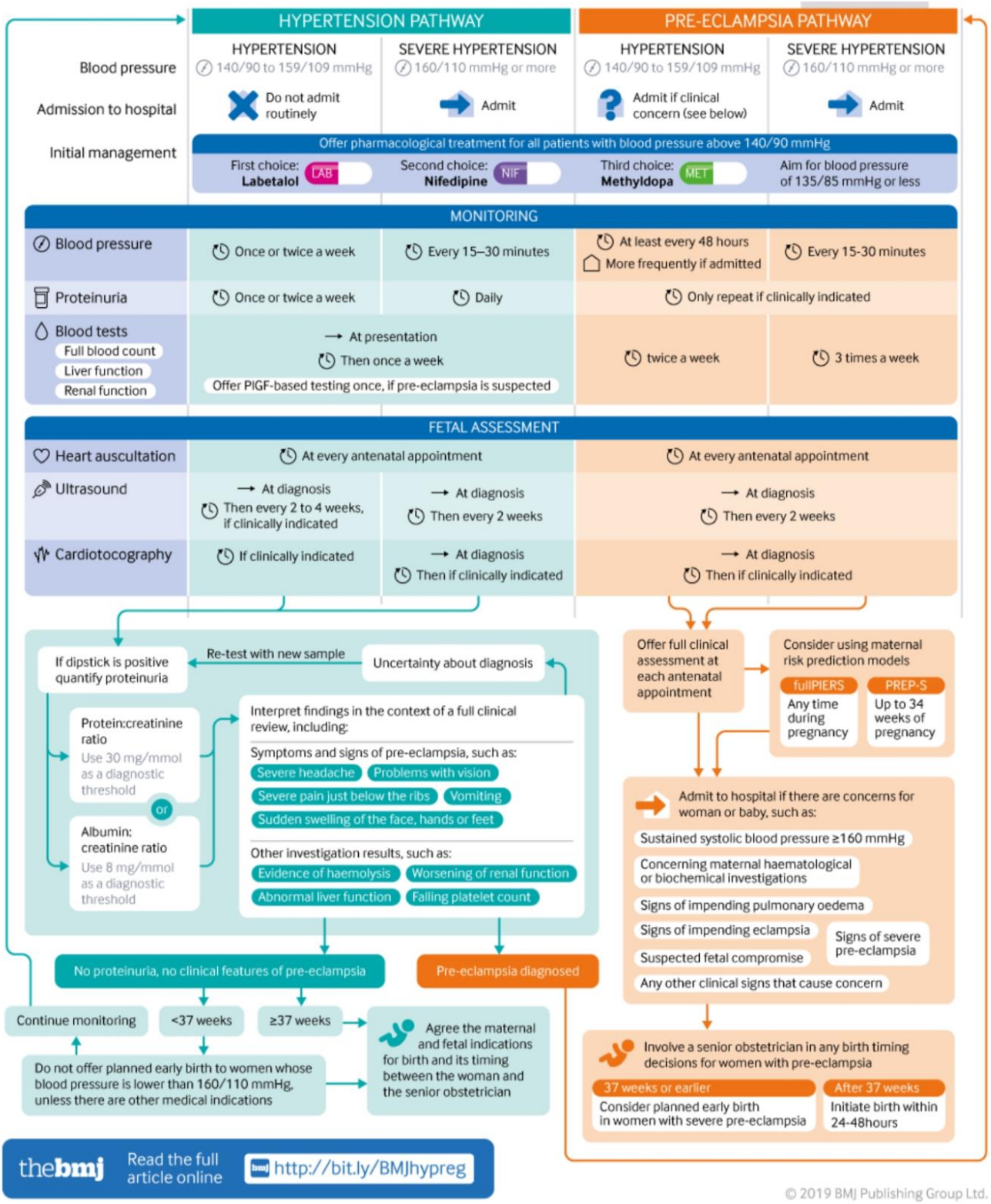
1. National Institute for Clinical Excellence (2019) Hypertension in pregnancy: diagnosis and management NICE guideline [NG133] Published date: 25 June 2019 https://www.nice.org.uk/guidance/ng133/chapter/Recommendations
2. Cathy Winter, Timothy Draycott, Neil Muchatuta, Jo Crofts. Practical Obstetric Multi Professional Training PROMPT Training Manual – Version 3 (2017)
3. Laura A Magee, Chris Cham, ElizabethJ Watermann, Arne Ohlsson, peter Von Dadelszen:vol 327, number7421>BMJ 2003;327;955 Hydralazine for treatment of severe hypertension in pregnancy: meta-analysis. BMJ. 2003;327(7421):955
4. Labetalol. In: Intravenous. In: Injectable Medicines Guide. Date of revision of text 03.12.2019. Cited July 23rd 2020. Available from http://medusa.wales.nhs.uk/
5. Rolnik DL, Wright D, Poon LCY, Syngelaki A, O'Gorman N, de Paco Matallana C, Akolekar R, Cicero S, Janga D, Singh M, Molina FS, Persico N, Jani JC, Plasencia W, Papaioannou G, Tenenbaum-Gavish K, Nicolaides KH. ASPRE trial: performance of screening for preterm pre-eclampsia. Ultrasound Obstet Gynecol. 2017 Oct;50(4):492-495. doi: 10.1002/uog.18816. Epub 2017 Aug 24. Erratum in: Ultrasound Obstet Gynecol. 2017 Dec;50(6):807. doi: 10.1002/uog.18950. PMID: 28741785.NICE (2025). *BNF*. Available via BNF (British National Formulary) | NICE (Accessed: March 2025).
6. eMC (2025). *The Electronic Medicines Compendium*. Available at: Home - electronic medicines compendium (emc) (Accessed: March 2025).
7. NICE (2023). *Hypertension in adults: diagnosis and management*. Available at Overview | Hypertension in adults: diagnosis and management | Guidance | NICE (Accessed March 25).
8. PHW (2016). *Obs Cymru Postpartum Haemorrhage Risk Management Checklist.* Available at phw.nhs.wales/services-and-teams/improvement-cymru/our-work1/maternity-cymru/obs-cymru/obstetric-bleeding-strategy-cymru/4-stage-approach-to-pph-management-protocol-checklist/. (Accessed 17th April 2025).
9. Also, add reference into reference section:
10. thebmj (2019). *Managing Hypertension in Pregnancy: BMJ Visual Summary*. Available at: Managing hypertension in pregnancy | The BMJ (Accessed March 25).
11. MBRRACE (2024). *Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2020-22.* Available at: MBRRACE-UK Maternal MAIN Report 2024 V2.0 ONLINE.pdf (Accessed: April 25).

16. Annual Auditable Standards

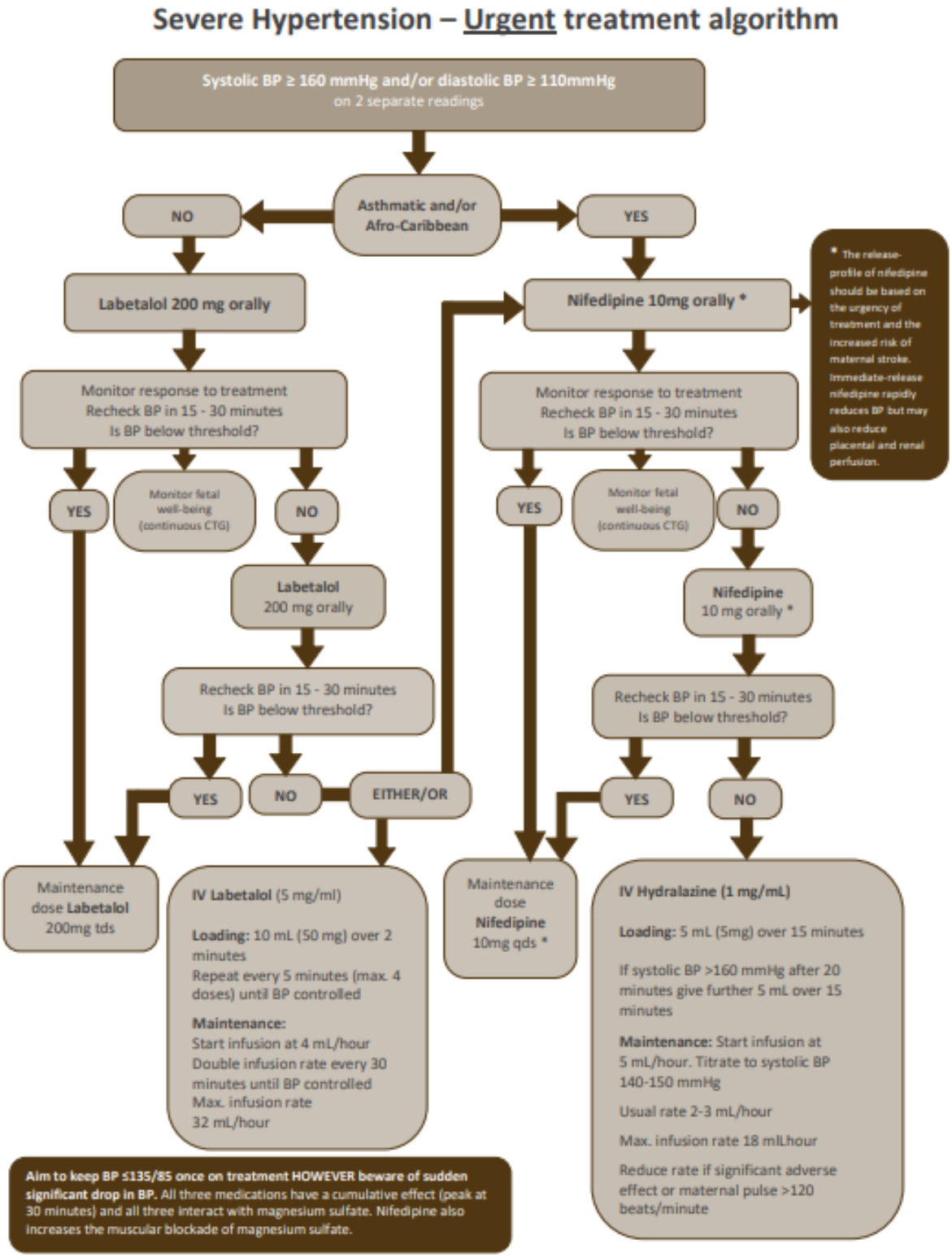
The following standards will inform the annual record keeping audit plan:-

1. Evidence of MEOWS chart commenced
2. Evidence of magnesium sulfate administered with severe pre-eclampsia
3. Evidence of aspirin given antenatally from 12 weeks gestation to patients at risk of pre-eclampsia (PGD proforma for evidence)
4. Evidence of serial ultrasound growth scans from 28 weeks where risk of severe pre-eclampsia has been diagnosed or suspected

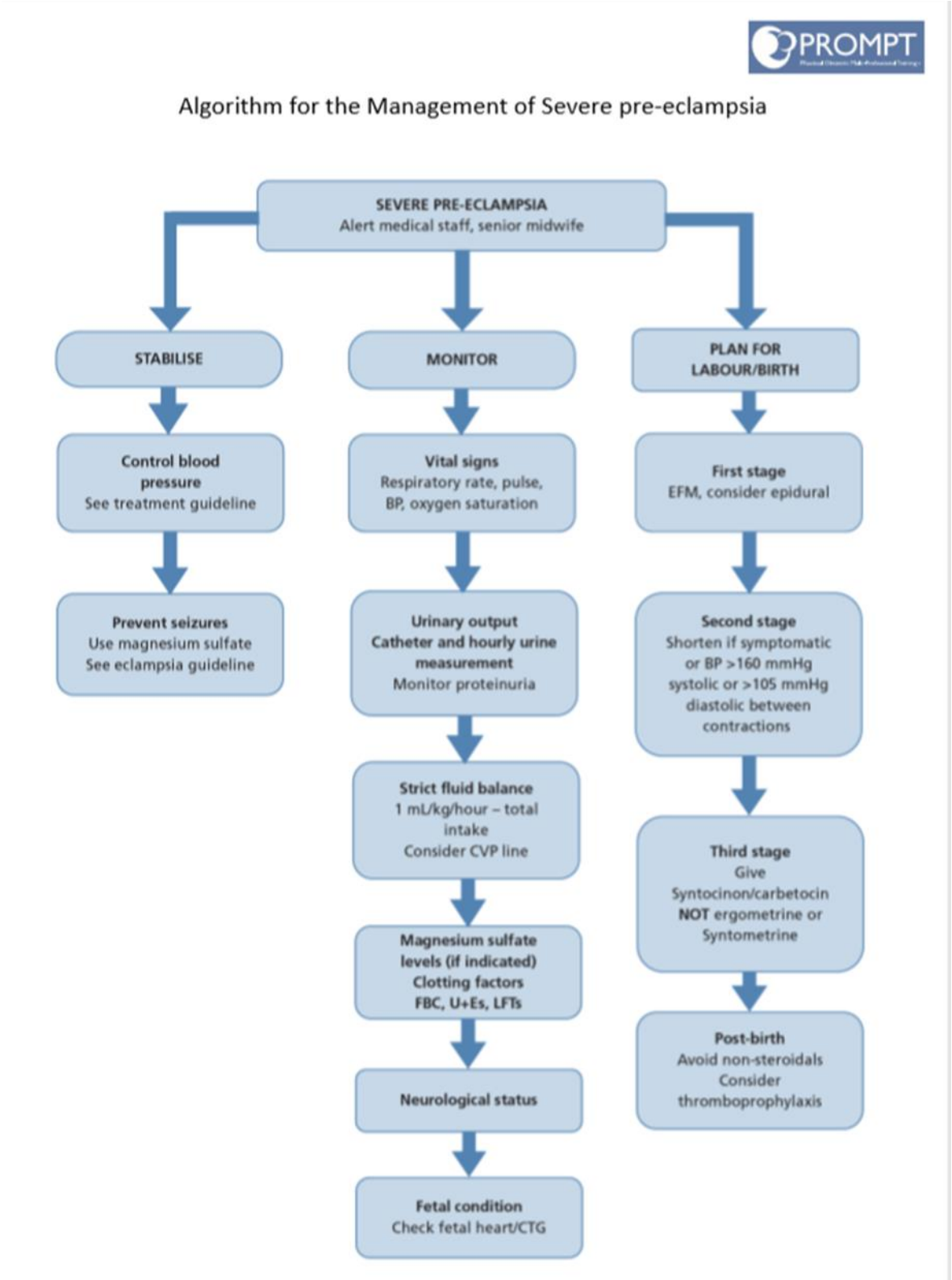
17. Appendix 1: BMJ Managing Hypertension in Pregnancy Summary



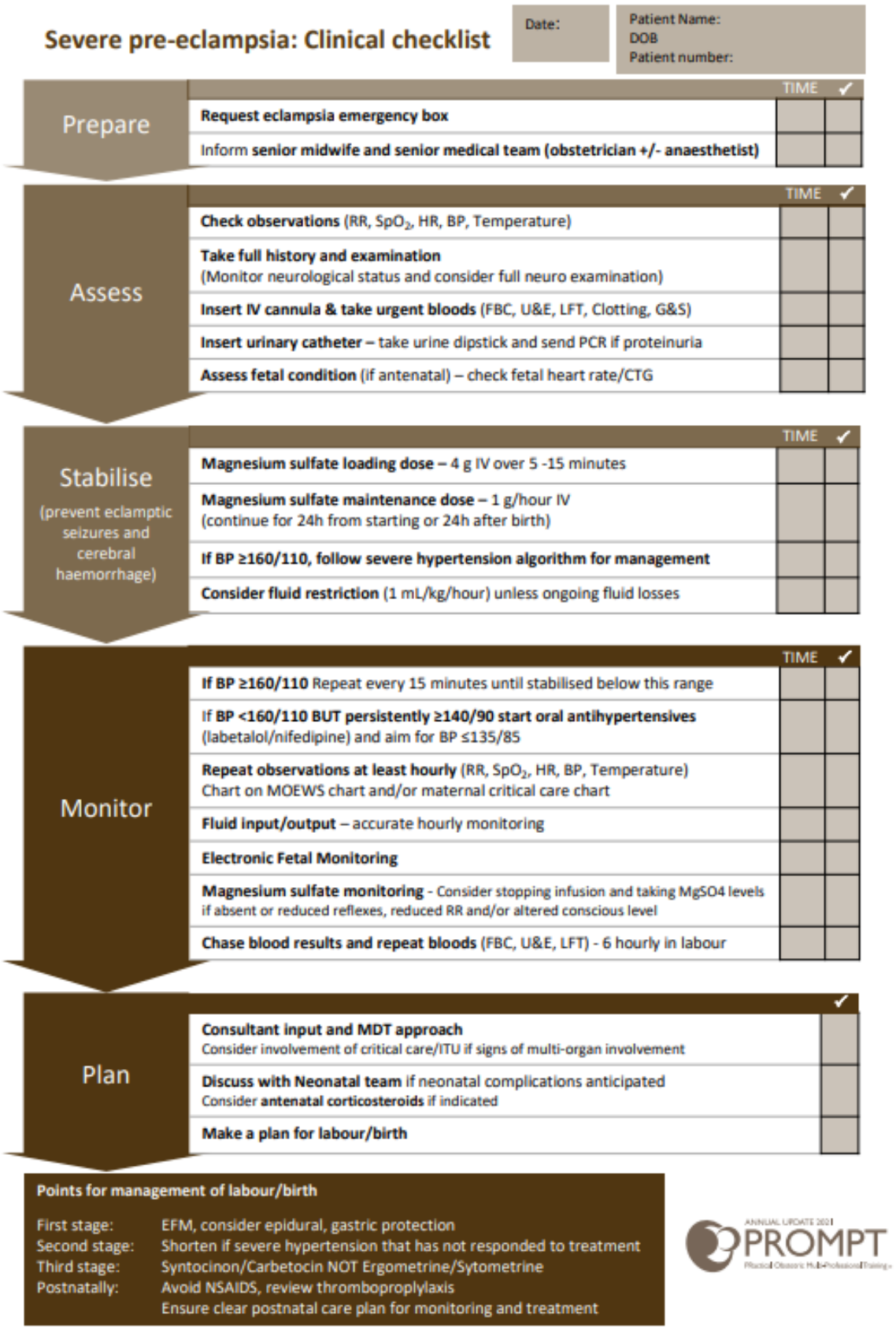
18. Appendix 2: Urgent Treatment of Severe Hypertension Algorithm



19. Appendix 3: Management of Severe Pre-eclampsia Algorithm



20. Appendix 4: Management of Severe Pre-eclampsia Clinical Checklist



Severe pre-eclampsia: Clinical checklist

Date:

Patient Name:
DOB
Patient number:

Prepare

	TIME	✓
Request eclampsia emergency box		
Inform **senior midwife and senior medical team (obstetrician +/- anaesthetist)**		

Assess

	TIME	✓
Check observations (RR, SpO_2, HR, BP, Temperature)		
Take full history and examination (Monitor neurological status and consider full neuro examination)		
Insert IV cannula & take urgent bloods (FBC, U&E, LFT, Clotting, G&S)		
Insert urinary catheter – take urine dipstick and send PCR if proteinuria		
Assess fetal condition (if antenatal) – check fetal heart rate/CTG		

Stabilise

(prevent eclamptic seizures and cerebral haemorrhage)

	TIME	✓
Magnesium sulfate loading dose – 4 g IV over 5 -15 minutes		
Magnesium sulfate maintenance dose – 1 g/hour IV (continue for 24h from starting or 24h after birth)		
If BP ≥160/110, follow severe hypertension algorithm for management		
Consider fluid restriction (1 mL/kg/hour) unless ongoing fluid losses		

Monitor

	TIME	✓
If BP ≥160/110 Repeat every 15 minutes until stabilised below this range		
If **BP <160/110 BUT persistently ≥140/90 start oral antihypertensives** (labetalol/nifedipine) and aim for BP ≤135/85		
Repeat observations at least hourly (RR, SpO_2, HR, BP, Temperature) Chart on MOEWS chart and/or maternal critical care chart		
Fluid input/output – accurate hourly monitoring		
Electronic Fetal Monitoring		
Magnesium sulfate monitoring - Consider stopping infusion and taking MgSO4 levels if absent or reduced reflexes, reduced RR and/or altered conscious level		
Chase blood results and repeat bloods (FBC, U&E, LFT) - 6 hourly in labour		

Plan

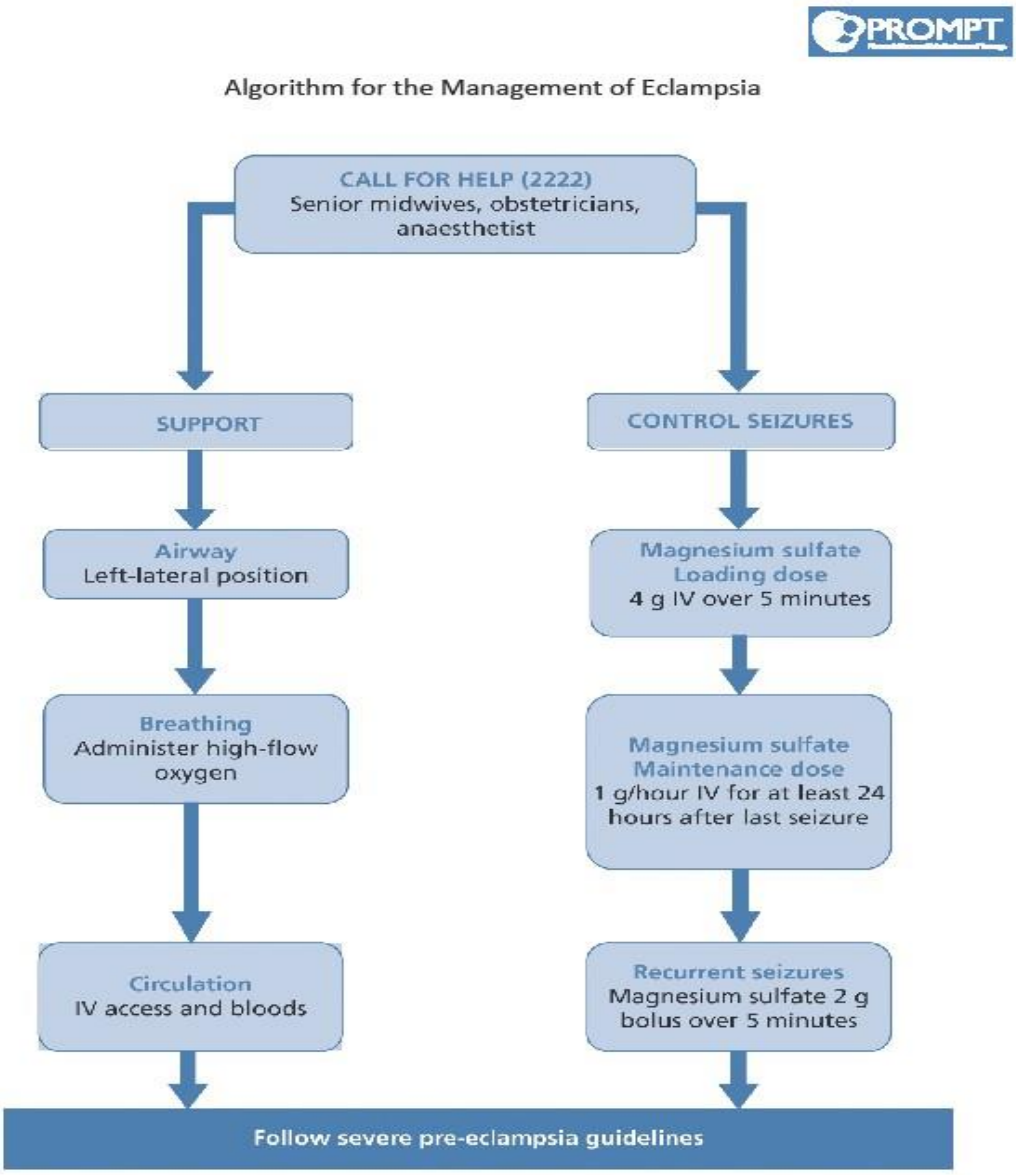
	✓
Consultant input and MDT approach Consider involvement of critical care/ITU if signs of multi-organ involvement	
Discuss with Neonatal team if neonatal complications anticipated Consider **antenatal corticosteroids** if indicated	
Make a plan for labour/birth	

Points for management of labour/birth

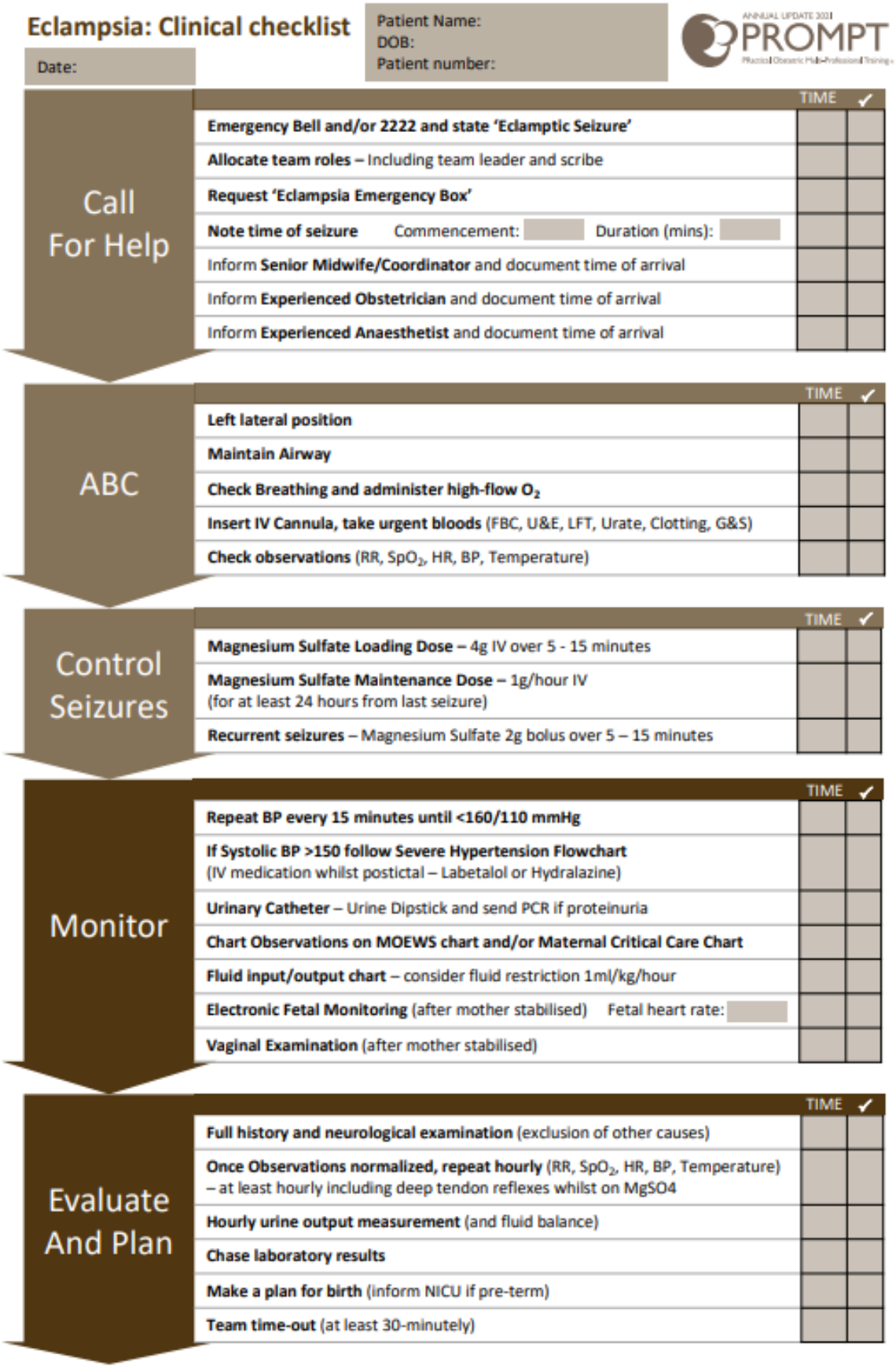
First stage:	EFM, consider epidural, gastric protection
Second stage:	Shorten if severe hypertension that has not responded to treatment
Third stage:	Syntocinon/Carbetocin NOT Ergometrine/Sytometrine
Postnatally:	Avoid NSAIDS, review thromboproplylaxis
	Ensure clear postnatal care plan for monitoring and treatment

PROMPT

21. Appendix 5: Management of Eclampsia Algorithm



22. Appendix 6: Management of Eclampsia Clinical Checklist



Eclampsia: Clinical checklist

Date:

Patient Name:
DOB:
Patient number:

PROMPT

		TIME	✓
Call For Help	**Emergency Bell and/or 2222 and state 'Eclamptic Seizure'**		
	Allocate team roles – Including team leader and scribe		
	Request 'Eclampsia Emergency Box'		
	Note time of seizure Commencement: Duration (mins):		
	Inform **Senior Midwife/Coordinator** and document time of arrival		
	Inform **Experienced Obstetrician** and document time of arrival		
	Inform **Experienced Anaesthetist** and document time of arrival		
ABC	**Left lateral position**		
	Maintain Airway		
	Check Breathing and administer high-flow O_2		
	Insert IV Cannula, take urgent bloods (FBC, U&E, LFT, Urate, Clotting, G&S)		
	Check observations (RR, SpO_2, HR, BP, Temperature)		
Control Seizures	**Magnesium Sulfate Loading Dose** – 4g IV over 5 - 15 minutes		
	Magnesium Sulfate Maintenance Dose – 1g/hour IV (for at least 24 hours from last seizure)		
	Recurrent seizures – Magnesium Sulfate 2g bolus over 5 – 15 minutes		
Monitor	**Repeat BP every 15 minutes until <160/110 mmHg**		
	If Systolic BP >150 follow Severe Hypertension Flowchart (IV medication whilst postictal – Labetalol or Hydralazine)		
	Urinary Catheter – Urine Dipstick and send PCR if proteinuria		
	Chart Observations on MOEWS chart and/or Maternal Critical Care Chart		
	Fluid input/output chart – consider fluid restriction 1ml/kg/hour		
	Electronic Fetal Monitoring (after mother stabilised) Fetal heart rate:		
	Vaginal Examination (after mother stabilised)		
Evaluate And Plan	**Full history and neurological examination** (exclusion of other causes)		
	Once Observations normalized, repeat hourly (RR, SpO_2, HR, BP, Temperature) – at least hourly including deep tendon reflexes whilst on MgSO4		
	Hourly urine output measurement (and fluid balance)		
	Chase laboratory results		
	Make a plan for birth (inform NICU if pre-term)		
	Team time-out (at least 30-minutely)		

23. Appendix 7: Magnesium Sulfate– Grab Box preparation support

Magnesium Sulfate Dosage

Loading dose: 4 g IV over 5 min:

a) Prefilled syringe, if available: wisdom.nhs.wales/a-z-guidelines/m/mm251-procedure-for-ready-made-iv-magnesium-sulfate-prefilled-syringes-maternity-final-pdf/

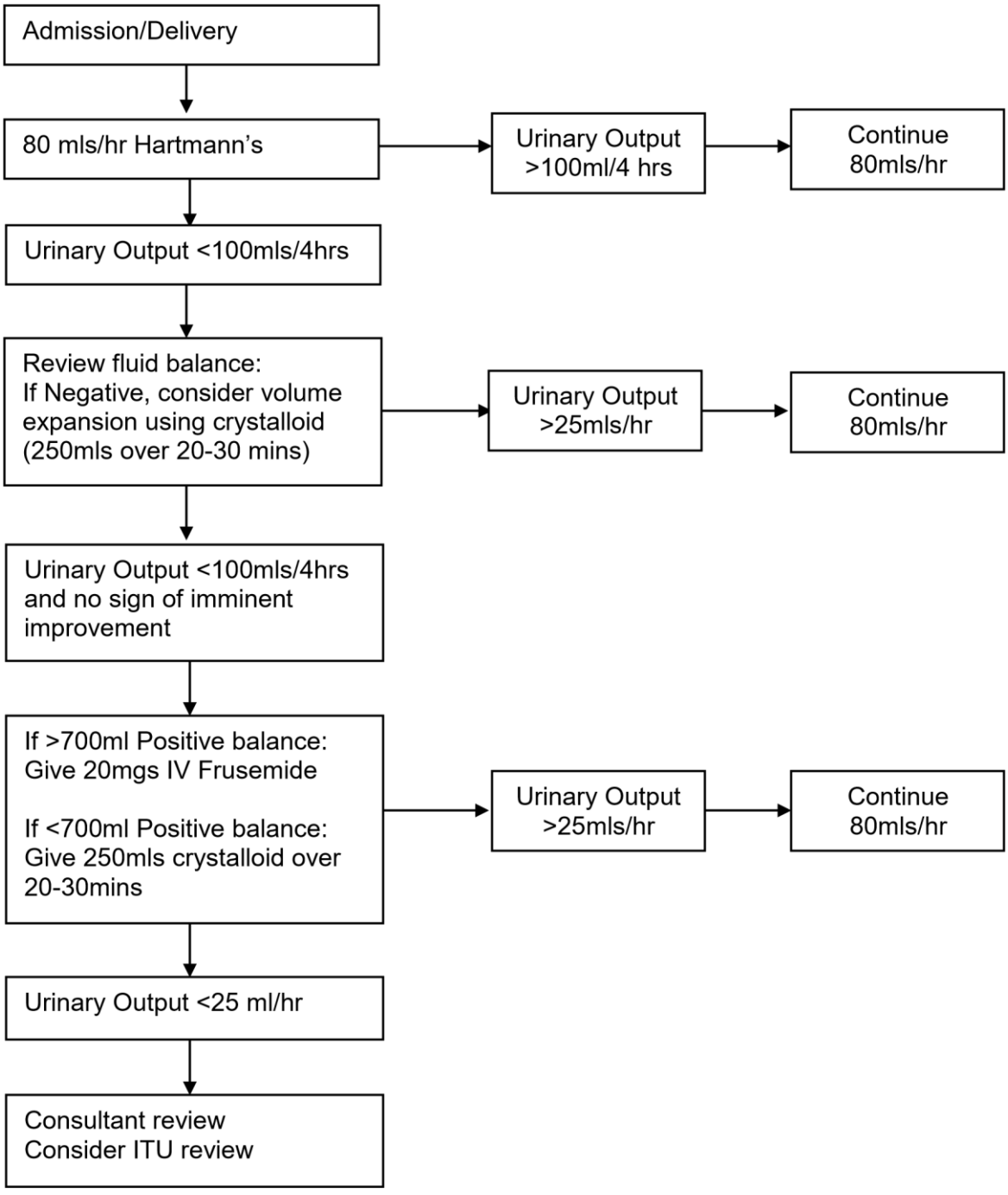
b) If prefilled syringe not available draw up two 2g/10mls ampoules of 20% magnesium sulfate to make 4g/20mls for loading dose.

Maintenance dose: 1g/hr IV for 24 hrs:

a) Prefilled syringe, if available: wisdom.nhs.wales/a-z-guidelines/m/mm251-procedure-for-ready-made-iv-magnesium-sulfate-prefilled-syringes-maternity-final-pdf/

b) If prefilled syringe not available draw up five ampoules of 2g/10mls 20% magnesium sulfate for maintenance dose of 10g/50mls to be run at 1g/hr for 24hrs.

24. Appendix 8: Severe/Fulminating Pre-eclampsia Fluid Management Flowchart



25. Appendix 9: Community PET Proforma

Attach Patient ID:

ECLAMPSIA PROFORMA (COMMUNITY)

DATE: ..... TIME OF SEIZURE:..... DURATION .....

EMERGENCY BELL ACTIVATED (FMU) YES / NO TIME.....

AMBULANCE CALLED YES / NO TIME.....

LABOUR WARD INFORMED YES / NO TIME.....

STAFF PRESENT	NAME	ALREADY PRESENT(✓)	TIME INFORMED	TIME ARRIVED

TREATMENT

LEFT LATERAL POSITION	YES / NO	TIME.....	If no, other position .....
HIGH FLOW O_2	YES / NO	TIME.....	If no, give reason .....
IV ACCESS	YES / NO	TIME.....	If no, give reason .....
BLOODS – GROUP + SAVE FBC, CLOTTING, U+E's, LFT's URATE	YES / NO	TIME.....	If no, give reason .....

INITIAL POST SEIZURE OBSERVATIONS TIME.....

RESP RATE ..... PULSE RATE ..... BP .....mm/Hg TEMP .....°C

FH.....

URINARY CATHETER INSERTED YES / NO TIME.....

TIME PARAMEDIC ARRIVED AT .....

TIME ARRIVED AT LABOUR WARD ..... OBSTETRIC UNIT .....

Community Algorithm for Management of Eclampsia