Clinical Guideline

HYPERTENSION IN PREGNANCY AND POSTPARTUM

SETTING Maternity and general practice

FOR STAFF Hospital and community midwives and obstetricians

PATIENTS Pregnant women who are at risk of or suffer from Pre-eclampsia

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Hypertension is the most common medical problem encountered in pregnancy and remains an important cause of maternal, and fetal morbidity and mortality. It complicates up to 15% of pregnancies and accounts for approximately a quarter of all antenatal admissions. The hypertensive disorders of pregnancy cover a spectrum of conditions, of which pre-eclampsia poses the greatest potential risk.

Principles of assessment

Measurement of blood pressure

- Use accurate equipment.
- Use sitting or semi-reclining position so that the cuff on the arm is at the level of the heart.
- Do not take the blood pressure in the upper arm with the women on her side, as this will give falsely lower readings.
- Use appropriate size of cuff. There is less error introduced by using too large a cuff than by using too small a cuff.
- Deflate the cuff slowly, at a rate of 2mmHg to 3mmHg per second, taking at least 30 seconds to complete the whole deflation.
- Use Korotkoff V (disappearance of heart sounds) for measurement of diastolic pressure. In the 15% of women whose diastolic pressure falls to zero before the last sound is heard, then both phase IV (muffling of heart sounds) and V readings should be recorded. (e.g. 148/84/0 mmHg).
- Measure to the nearest 2mmHg to avoid digit preference.
- If two readings are necessary, use the average of the readings and not just the lowest reading. This will minimise threshold avoidance (the tendency to repeat a reading until one that is below a known threshold is recorded that requires no action).

Measurement of proteinuria

- Reduce false positive results by following dipstick manufacturer instructions re testing.
- Do not repeat a test on a second sample as this does not improve the predictive value of result for significant proteinuria.
- Quantify urine protein-
    - Do not routinely use 24 hour urine collection to quantify proteinuria
    - Do not use first morning urine void to quantify proteinuria (Urine protein creatinine ratio)
    - When using Urine protein creatinine ratio, use 30mg/mmol as threshold for significant proteinuria
    - If the result is negative in the presence of high clinical suspicion of pre-eclampsia, consider repeating the sample
- Interpret proteinuria measurements for pregnant women in the context of full clinical review of symptoms, signs and investigation findings

Reducing the risk of hypertensive disorders in pregnancy

Symptoms of pre-eclampsia
Advise pregnant women to see a healthcare professional immediately if they experience symptoms of pre-eclampsia:

- severe headache
- problems with vision, such as blurring or flashing before the eyes
- severe pain just below the ribs
- vomiting
- sudden swelling of the face, hands or feet

Antiplatelet agents
Advise pregnant women at **high risk** of pre-eclampsia to take 150 mg of aspirin daily between 12 and 36 weeks (unless contraindicated or otherwise advised). Women who are on the '*Small for Gestational Age*' (SGA) pathway should also be advised Aspirin at the same dose and timing (see Small for Gestational Age guideline).

Women at **high risk** are those with **any** of the following:

- 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
- Multiple pregnancy
- Previous stillbirth over 20/40 *(additional high risk SGA risk factor)*
- Previous fetal growth restriction *(additional high risk SGA risk factor)*
- Previous abruption/histological evidence of placental dysfunction *(additional high risk SGA risk factor)*
- Low PAPP-A <0.4MoM *(additional high risk SGA risk factor)*

Advise pregnant women with **more than 1 moderate risk** factor for pre- eclampsia to take 150 mg of aspirin daily between 12 and 36 weeks (unless contraindicated or otherwise advised).

Moderate risk factors are:

- 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

Community assessment and management

Offer pregnant women with predisposing factors for pre-eclampsia referral early in pregnancy to consultant obstetrician.

Ensure every woman receives written and verbal information on pre-eclampsia.

After 20 weeks

The frequency of antenatal appointments are outlined below.

	24 to 32 weeks gestation	**32 weeks gestation to delivery**
No predisposing factors for hypertensive disease in pregnancy	As per local protocols for low risk multiparous women	As per local protocols for low risk multiparous women
One predisposing factor for hypertensive disease in pregnancy	No more than 3 week interval between assessments, adjusted to individual needs and any changes during pregnancy	No more than 2 week interval between assessments, adjusted to individual needs and any changes during pregnancy

All pregnant women should be aware that after 20 weeks gestation pre-eclampsia may develop between antenatal assessments, and that it is appropriate for them to self-refer at any time.

Referral to hospital after 20 weeks

Description	Definition	Action by midwife/GP
New hypertension without proteinuria after 20 weeks	Diastolic BP 90-99mmHg with No symptoms	Recheck BP in community in 3-5 days
	Diastolic BP 90-99mmHg with significant symptoms	Refer for same day hospital assessment (DAU / CDS)
	Systolic BP ≥150mmHg	Refer for same day hospital assessment (DAU / CDS)
	Diastolic BP ≥ 100mmHg	Refer for same day hospital assessment (DAU / CDS)
New hypertension with proteinuria after 20 weeks	Diastolic BP ≥ 90mmHg and new proteinuria ≥ 1+ on dipstick	Refer for same day hospital assessment (DAU / CDS)
	Diastolic BP ≥ 110mmHg and new proteinuria ≥ + on dipstick	**Arrange immediate admission**
	Systolic BP ≥ 160mmHg and new proteinuria ≥ 1+ on dipstick	**Arrange immediate admission**
	Diastolic BP ≥ 90mmHg and new proteinuria ≥1+ on dipstick and significant symptoms.	**Arrange immediate admission**
New proteinuria without hypertension after 20 weeks	1+ on dipstick	Repeat pre-eclampsia assessment in the community within 1 week If proteinuria noted at the next appointment (last MSU showed no growth), repeat assessment for pre-eclampsia
	2+ or more on dipstick	Refer for hospital assessment within 48 hours
	≥ 1+ on dipstick with significant symptoms	Refer for same day hospital assessment (DAU / CDS)
Maternal symptoms or fetal signs and symptoms without new hypertension or proteinuria	Headache and/or visual disturbances with diastolic blood pressure < 90mmHg and < +1 proteinuria	Consider reducing interval before next assessment. Ensure woman aware of significant symptoms
	Epigastic pain with diastolic BP < 90mmHg and < +1 proteinuria	Refer for same day hospital assessment (DAU / CDS)

DAU management of new proteinuria without hypertension

This guidance does not address the care of women with co-morbidities such as diabetes, renal disease.

Women may have been referred from the community or from ante-natal clinics with persistent proteinuria (first and wash-down sample).

Women with proteinuria in pregnancy in the absence of hypertension are at high risk of developing pre-eclampsia and complications such as placental abruption. Women should be reviewed in consultant clinic, or DAU if already over 35/40 to make an individualised plan which may include earlier delivery.

Before a pregnant woman leaves her initial DAU assessment she should have:

- Information to understand the signs and symptoms of fulminating pre-eclampsia, the rate at which it may develop and the potential seriousness of her situation.
- A mechanism to report and act on any new symptoms that she may notice herself. Encourage her to self- monitor.
- Hand held notes or a DAU summary from her assessment.
- A follow up appointment with community midwife or DAU.
- Allocation to a named consultant where appropriate.
- An agreed mechanism by which she will be informed of her test results and discuss any change to her antenatal care plan within 24 hours.
- An understanding that she can be proactive in following up any results and arranging a follow up appointment if the contact arrangements do not work

NEW PROTEINURIA

(Proteinuria in the absence of evidence of UTI)

Action by DAU midwife (step 1- diagnosis):
No hypertension
New proteinuria on urinalysis (Do not use first morning urine void)
No clinical suspicion of fetal compromise (symphysis fundal height)

Definition	Action by DAU Midwife (step 2)	Action by DAU Midwife (step 3)
Proteinuria 1+ (wash down sample) No symptoms of PET No symptoms of UTI	Urinary Protein Creatinine ratio MSU	**Non significant proteinuria (<30mg/mmol):** Monitor at least weekly for PET in community Consultant appointment after 2nd review in DAU (negative MSU) **Significant proteinuria(≥30mg/mmol) :** Discuss with the registrar (ST3+) on call
Proteinuria 1+ (wash down sample) No symptoms of PET With symptoms of UTI or With Nitrates or white cells on urinalysis	MSU	**SHO review (F2, ST1, ST2)** Consider antibiotics
Proteinuria ≥1+ With PET symptoms **Proteiniuria ≥2+** No symptoms of PET No symptoms of UTI	Urinary PC ratio MSU PET bloods cCTG (-Consider PIGF if ≤ 35 weeks gestation	**Non significant proteinuria(<30mg/mmol) + normal bloods:** Monitor at least weekly for PET in DAU Consultant appointment after 2nd review in DAU (negative MSU) **Significant proteinuria (≥30mg/mmol) and / or abnormal bloods:** Discuss with the registrar (ST3)on call

Management of hypertension in pregnancy in Day Assessment Unit – see Figures 1 & 2

This section of the guideline does not address care of women with co-morbidities such as diabetes, renal disease.

Women may have been referred from the community, from ante-natal clinics or by self-referral. The PRECOG 1and PRECOG 2 guidelines and the NICE guidelines are available in DAU for further reference.

Where obstetric opinion is recommended, the referral will be made directly to the ST3 oncall.

Initial assessment

Blood pressure recordings

- Take three blood pressure recordings at least 10 minutes apart. If the first two readings are both less than 135 mmHg systolic and 85 mmHg diastolic the third reading can be omitted.
- From these multiple readings, calculate the average systolic and diastolic reading.

The guidance for accurate BP measurement is documented on page 4.

Proteinuria

Proteinuria should be checked by urinalysis.

Symptoms of PET

Symptoms include frontal headache, visual disturbances, nausea, epigastric pain, worsening oedema.

Clinical suspicion of fetal compromise

Assess the fetus for size by measurement of symphysis-fundal height and clinical enquiry about fetal movements.

Investigations by the midwife

Placental Growth factor (PIGF)

This test should be done for women between 20 -35 weeks and present with suspected pre-eclampsia.

It should not be carried out for women with confirmed PET.

See Appendix 1 for interpretation of PIGF result.

PET bloods

These include full blood count, urea and electrolytes, liver function tests and urate. The blood test should only be performed where indicated.

Urinary protein estimation

If proteinuria is noted on urinalysis, the following investigations for quantification of proteinuria should be considered:

- A laboratory urinary protein creatinine (*PCR*) ratio from a random sample of less than 30mg/mmol excludes significant proteinuria.

Umbilical artery Doppler

The PRECOG group recommend umbilical artery Dopplers as the best test for predicting an at-risk fetus relating to pre-eclampsia in a women with pre-term new hypertension and no clinical suspicion of fetal compromise. This assessment can be carried out in the unit by a midwife who is an accredited sonographer.

Treatment plan by the midwife

Women who fulfil the criteria for midwife review only can be discharged from DAU with the following:

- **Contact community lead to schedule next community assessment within one week**

  Arrange for a woman to be assessed in the community within a maximum of 7 days of leaving the Day Assessment Unit if she has no hypertension, no new or significant proteinuria, no symptoms and there is no suspicion of fetal compromise. In the subsequent plan of care there should be an interval of no more than 1 week between assessments; these women are no longer within the NICE guideline recommendations for routine antenatal care, and are at higher risk of developing pre-eclampsia.

- **Allocate to a named consultant**

  All women who reach the threshold for a step-up midwifery assessment are at higher risk of pre-eclampsia and poor outcomes associated with it. Make sure that all women who have had midwifery step up assessment have been allocated to a named consultant before they leave the DAU.

Women who after a Step 1 assessment have no hypertension, no proteinuria, no relevant symptoms and a healthy baby, can continue under midwifery care.

Follow up

Arrange another Step 1 assessment no longer than 7 days (minimum standard) after the initial assessment and sooner if appropriate. Frequency of assessment should be determined on an individual basis, depending on blood test/ Doppler results, gestational age, history etc. and following an antenatal care plan determined by the named consultant in consultation with the pregnant woman.

Medical review

Arrange a medical review within the Day Unit by an experienced trainee (ST3 or above). DAU midwife should contact the on-call registrar or senior registrar. Woman may be reviewed by an SHO if arranged by the registrar. A plan of management should be made by the registrar.

Antihypertensive use in pregnancy

1st line
Labetalol
Usually commenced at 200mg BD, up to a maximum of 2.4g in 24 hours in divided doses

2nd line (1st line if labetalol not suitable ie. Asthma, may be more effective in women of Afro-Caribbean origin)
Nifedipine MR
The modified-release preparation should be used to avoid rapid hypotension that could impact uteroplacental perfusion
Usually commenced at 10mg BD, up to a maximum of 80mg in 2 divided doses. When blood pressure control is difficult Nifedipine MR may be prescribed off license to a maximum of 90mg in 3 divided doses.

3rd line
Methyldopa
Usually commenced at 250mg BD. Maximum dose of 3g in 3 divided doses.
Must be converted to alternative antihypertensive postnatally due to increased risk of postnatal depression.

Management of chronic hypertension in pregnancy

Chronic hypertension complicates 3–5% of pregnancies although this figure is increasing with increasing maternal age. The diagnosis of chronic hypertension is based on a known history of hypertension pre-pregnancy or an elevated blood pressure > 140/90 mm Hg before 20 weeks gestation.

Pre-pregnancy advice

Offer women with chronic hypertension referral to a specialist in hypertensive disorders of pregnancy to discuss the risks and benefits of treatment.
Advise women who take angiotensin-converting enzyme (ACE) inhibitors or angiotensin II receptor blockers (ARBs):

- that there is an increased risk of congenital abnormalities if these drugs are taken during pregnancy
- to discuss alternative antihypertensive treatment with the healthcare professional responsible for managing their hypertension, if they are planning pregnancy
- to discuss alternative treatment with the healthcare professional responsible for managing their condition, if ACE inhibitors or ARBs are being taken for other conditions such as renal disease.
- Stop antihypertensive treatment in women taking ACE inhibitors or ARBs if they become pregnant (preferably within 2 working days of notification of pregnancy) and offer alternatives.

Advise women who take thiazide or thiazide-like diuretics:

- that there may be an increased risk of congenital abnormalities and neonatal complications if these drugs are taken during pregnancy
- to discuss alternative antihypertensive treatment with the healthcare professional responsible for managing their hypertension, if they are planning pregnancy.

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.

Treatment of chronic hypertension

Offer pregnant women with chronic hypertension advice on:

- weight management
- exercise
- healthy eating
- lowering the amount of salt in their diet

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
- the woman has 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

When using medicines to treat hypertension in pregnancy, aim for a target blood pressure of 135/85 mmHg

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

Offer pregnant women with chronic hypertension aspirin 150 mg once daily from 12 weeks.
Offer placental growth factor (PlGF)-based testing to help rule out pre- eclampsia between 20 weeks and up to 35 weeks of pregnancy, if women with chronic hypertension are suspected of developing pre-eclampsia (see DAU assessment and PLGF).

Antenatal appointments

In women with chronic hypertension, schedule additional antenatal appointments based on the individual needs of the woman and her baby. This may include:
• at least weekly appointments if hypertension is poorly controlled
• at least appointments every 2 to 4 weeks if hypertension is well-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
- In women with chronic hypertension, only carry out cardiotocography if clinically indicated

Timing of birth in chronic hypertension

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 and magnesium sulphate if indicated (see pre-term birth guideline).

Postnatal investigation, monitoring and treatment

See page 22

Management of gestational hypertension

Assessment and treatment of gestational hypertension

Gestational hypertension occurs in the second half of pregnancy in a previously normotensive woman, without significant proteinuria or other features of pre-eclampsia. It complicates 6–7% of pregnancies and resolves postnatally. The risk of super- imposed pre-eclampsia is 15–26% (10% if diagnosed after 36 weeks).

In women with gestational hypertension, a full assessment should be carried out in a secondary care setting by a healthcare professional who is trained in the management of hypertensive disorders of pregnancy.

	Degree of hypertension	
	Hypertension: blood pressure of **140/90–159/ 109 mmHg**	Severe hypertension: blood pressure 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 above 140/90 mmHg	Offer pharmacological treatment to all women
Target blood pressure once on antihypertensive treatment	**Aim for BP of 135/85 mmHg or less**	**Aim for BP of 135/85 mmHg or less**
Blood pressure measurement	Once or twice a week (depending on BP) until BP is 135/85 mmHg or less	Every 15–30 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
PIGF-based testing	Carry out PIGF-based testing on 1 occasion if there is suspicion of pre-eclampsia	Carry out PIGF-based testing on 1 occasion if there is suspicion of pre-eclampsia
Fetal assessment	Offer fetal heart auscultation at every antenatal appointment Carry out ultrasound assessment of the fetus at diagnosis and, if normal, repeat every 2 to 4 weeks, if clinically indicated Carry out a cCTG only if clinically indicated	Offer fetal heart auscultation at every antenatal appointment Carry out ultrasound assessment of the fetus at diagnosis and, if normal, repeat every 2 weeks, if severe hypertension persists Carry out a cCTG at diagnosis and then only 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.

In women with gestational hypertension, only carry out cardiotocography if clinically indicated.

Timing of birth with gestational hypertension

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 and magnesium sulphate if indicated

Postnatal investigation, monitoring and treatment

See page 23

Pre-eclampsia

Overall pre-eclampsia complicates 5–6% of pregnancies, but up to 25% of pregnancies with pre-existing hypertension. Eclampsia (seizures) complicate ~ 1% of pregnancies complicated with PET in the UK.

Assessment

Assessment of women with pre-eclampsia should be performed by a healthcare professional trained in the management of hypertensive disorders of pregnancy.

Carry out a full clinical assessment at each antenatal appointment for women with pre-eclampsia, 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 blood pressure of 160mmHg or higher
- any maternal biochemical or haematological investigations that cause concern, for example anew and persistent:

  - rise in creatinine (90 micromol/litre or more, 1 mg/100 ml or more) or
  - rise in alanine transaminase (over 70 IU/litre, or twice upper limit of normal range)

  or
  - fall in platelet count (under 150,000/microlitre)

- signs of impending eclampsia
- signs of impending pulmonary oedema
- other signs of severe pre-eclampsia
- suspected fetal compromise
- any other clinical signs that cause concern

Treatment of pre-eclampsia

	Degree of hypertension	
	Hypertension: blood pressure of **140/90–159/ 109 mmHg**	Severe hypertension: blood pressure of **160/ 110 mmHg or more**
Admission to hospital	Yes.	Yes.
Antihypertensive pharmacological treatment	Offer pharmacological treatment if BP remains above 140/90 mmHg	Offer pharmacological treatment to all women
Target blood pressure once on antihypertensive treatment	**Aim for BP of 135/85 mmHg or less**	**Aim for BP of 135/85 mmHg or less**
Blood pressure measurement	At least every 48 hours, and more frequently if the woman is admitted to hospital	Every 15–30 minutes until BP is less than 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 assessment	Offer fetal heart auscultation at every antenatal appointment Carry out ultrasound assessment of the fetus at diagnosis and, if normal, repeat every 2 weeks Carry out a cCTG at diagnosis and then only if clinically indicated	Offer fetal heart auscultation at every antenatal appointment Carry out ultrasound assessment of the fetus at diagnosis and, if normal, repeat every 2 weeks Carry out a cCTG at diagnosis and then at least daily while admitted.

Offer labetalol to treat hypertension in pregnant women with pre-eclampsia. Offer nifedipine MR for women in whom labetalol is not suitable, and methyldopa if labetalol or nifedipine MR 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

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 known features of severe pre-eclampsia:

- inability to control maternal blood pressure 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

Involve a senior obstetrician in any decisions on timing of birth for 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 intravenous magnesium sulphate and a course of antenatal corticosteroids if indicated, if early birth is planned for women with preterm pre-eclampsia

Fetal monitoring in pre-eclampsia or severe gestational hypertension

Carry out cardiotocography at diagnosis of pre-eclampsia or severe gestational hypertension.

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 in women with pre-eclampsia or severe gestational hypertension, do not routinely repeat cardiotocography unless clinically indicated.

In women with pre-eclampsia or severe gestational hypertension, repeat cardiotocography if any of the following occur:

- the woman reports a change in fetal movement
- vaginal bleeding
- abdominal pain
- deterioration in maternal condition.

In women with pre-eclampsia or severe gestational hypertension, 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.

For women with pre-eclampsia or severe gestational hypertension, write a care plan that includes all of the following:

- the timing and nature of future fetal monitoring
- fetal indications for birth and if and when antenatal corticosteroids should be given
- plans for discussion with neonatal paediatricians and obstetric anaesthetists.

Women who need additional fetal monitoring

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.

Timing of delivery in pre-eclampsia

Weeks of pregnancy	Timing of birth
Before 34 weeks	Continue surveillance unless there are indications for planned early birth. Offer intravenous magnesium sulphate and a course of antenatal corticosteroids in line with the preterm birth guideline.
From 34 to 36^{+6} weeks	Continue surveillance unless there are indications for planned early birth. When considering the option of planned early birth, consider the woman's and baby's condition, risk factors (such as maternal comorbidities, multi-fetal pregnancy) and availability of neonatal unit beds.
37 weeks onwards	Initiate birth within 24–48 hours.

Postnatal investigation, monitoring and treatment (including after discharge from critical care)

See page 24

Intrapartum care

Blood pressure

During labour, measure blood pressure:

- hourly, in women with hypertension
- 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.

Haematological and biochemical monitoring

PET bloods should be taken every 6 hours in labour. Bloods within the previous 6 hours are usually required for regional anaesthesia in women with PET.

Care during epidural analgesia

Do not preload women who have severe pre-eclampsia with intravenous fluids before establishing low-dose epidural analgesia or combined spinal epidural analgesia

Management of second stage of labour

Do not routinely limit the duration of the second stage of labour in women with controlled hypertension.

Consider operative or assisted birth in the second stage of labour for women with severe hypertension whose hypertension has not responded to initial treatment.

Medical management of severe hypertension, severe pre-eclampsia or eclampsia

Anticonvulsants

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 sulphate.

Consider giving intravenous magnesium sulphate 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 sulphate 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)

A loading dose of 4 g should be given intravenously over 5 to 15 minutes, followed by an infusion of 1 g/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 2–4 g given intravenously over 5 to 15 minutes.

Do not use diazepam, phenytoin or other anticonvulsants as an alternative to magnesium sulphate in women with eclampsia.

Antihypertensives

Treat women with severe hypertension who are in critical care during pregnancy or after birth immediately with 1 of the following:

- labetalol (oral or intravenous)
- oral nifedipine MR
- intravenous hydralazine.

In women with severe hypertension who are in critical care, monitor their response to treatment:

- to ensure that their blood pressure falls
- to identify adverse effects for both the woman and the baby
- to modify treatment according to response.

Consider using up to 500 ml crystalloid fluid before or at the same time as the first dose of intravenous hydralazine in the antenatal period.

Fluid balance and volume expansion

Do not use volume expansion in women with severe pre-eclampsia unless hydralazine is the antenatal antihypertensive.

In women with severe pre-eclampsia, limit maintenance fluids to 80 ml/hour unless there are other ongoing fluid losses (for example, haemorrhage).

Referral to critical care

Refer women with severe hypertension or severe pre-eclampsia to the appropriate critical care setting using the following criteria:

Level 3 care	Severe pre-eclampsia and needing ventilation
Level 2 care	Step-down from level 3 or severe pre-eclampsia with any of the following complications: • eclampsia • HELLP syndrome • haemorrhage • hyperkalaemia • severe oliguria • coagulation support • intravenous antihypertensive treatment • initial stabilisation of severe hypertension • evidence of cardiac failure • abnormal neurology
Level 1 care	Pre-eclampsia with hypertension Ongoing conservative antenatal management of severe preterm hypertension Step-down treatment after the birth

Antihypertensive use postnatally

If stable on Labetalol and/ or Nifedipine MR continue antenatal dosing and titrate up or down to maintain target blood pressure.

Methydopa must be stopped by 48 hours postnatally due to the increased risk of postnatal depression.

Enalapril can also be used in the postnatal period – commenced at 5mg BD, can be increased to a maximum of 20mg BD. Renal function and potassium levels must be monitored. Can also be used for cardio/renal protection or if women were previously on an ACEi pre-pregnancy. Amount detected in breastmilk too small to be harmful, but premature babies are more at risk of hypotension from the amounts in breastmilk and should be monitored.

Postpartum care plan for women with chronic hypertension

Measure blood pressure (this will usually be continued by the community midwife after hospital discharge):

- Daily for the first 2 days postnatally.
- At least once between days 3–5 postnatally.
- As clinically indicated if the woman's antihypertensive treatment is changed postnatally.

Blood pressure targets unless otherwise specified by the treating team:

- Aim to keep blood pressure lower than 140/90 mmHg.
- If blood pressure rises above 149/99 mmHg antihypertensive treatment should be started, or increased if already on treatment.
- If blood pressure falls below 130/80 mmHg, antihypertensive treatment should be reduced or stopped.

For the first 2 weeks postnatally:

  - Continue the antihypertensive treatment used during pregnancy, unless the woman is taking methyldopa. Methyldopa should ideally be stopped 2 days after birth as it may increase the risk of depression.
  - When methyldopa is stopped, the antihypertensive treatment that the woman took before pregnancy should be restarted unless there are contraindications because the woman is breastfeeding or is planning further pregnancies. Dosage may need to be adjusted until target blood pressure is reached.

- Antihypertensives including labetalol, atenolol, metoprolol, nifedipine MR, enalapril, and captopril are considered to be safe while breastfeeding.

Review antihypertensive treatment 2 weeks postnatally- request GP review :

For women who remain on the antihypertensive used during pregnancy, consider restarting the pre-pregnancy antihypertensive treatment unless there are contraindications because the woman is breastfeeding or planning further pregnancies. Target blood pressures are the same as for non-pregnant women treated for hypertension.

Postpartum care plan for women with gestational hypertension

The women should be given an individual care plan at discharge which outlines:

- Who will provide follow-up care, including medical review if needed.
- Frequency of blood pressure monitoring – at least once between 3-5 days postnatal.
- Thresholds for reducing or stopping treatment as below.
- Advice on self-monitoring for symptoms of pre-eclampsia.

Blood pressure targets unless otherwise specified by the treating team:

- Aim to keep blood pressure lower than 140/90mmHg.
- If blood pressure rises above 149/99mmHg antihypertensive treatment should be started,

  or increased if already on treatment.

- If blood pressure falls below 130/80mmHg, antihypertensive treatment should be

  reduced or stopped.

If antihypertensive treatment has been used during pregnancy:

- The same treatment should be continued, unless the woman has been taking methyldopa which should be stopped 2 days postpartum because of the risk of depression.
- Women remaining on antihypertensive treatment 2 weeks after discharge should be have a medical review in primary care.

Request GP review at 6–8 weeks after birth:

- To review of management of hypertension.
- Women remaining on antihypertensive medication should be offered a specialist referral for assessment and investigation of their hypertension.

Postpartum care plan for women with pre-eclampsia

Blood pressure typically peaks between 3–5 days after birth, and blood pressure should therefore be monitored during this period even if the patient has been discharged to community-based care.

Women with pre-eclampsia should be transferred to primary care only if:

- They have no symptoms of pre-eclampsia.
- Blood pressure with or without treatment is 149/99mmHg or lower.
- Blood test results are stable or improving.

Women should be given an individual care plan on hospital discharge that includes:

- Who will provide follow-up care, including medical review if needed.
- Frequency of blood pressure monitoring.
- Thresholds for reducing or stopping treatment.
- Advice on self-monitoring for symptoms of pre-eclampsia.

All women with pre-eclampsia:

- Should be assessed for symptoms of pre-eclampsia at each consultation.
- Who are discharged to primary care with abnormal blood results should have blood tests to measure platelets, liver transaminases, and serum creatinine as clinically indicated and also at the postnatal check.

Women with pre-eclampsia who did not take antihypertensive treatment:

• Should have their blood pressure measured at least once between days 3–5 after birth. If blood pressure is abnormal, it should then be measured on alternate days until it normalizes.

Blood pressure targets unless otherwise specified by the treating team:

- Aim to keep blood pressure lower than 140/90mmHg.
- If blood pressure rises above 149/99mmHg antihypertensive treatment should be started, or increased if already on treatment.
- If blood pressure falls below 130/80mmHg, antihypertensive treatment should be reduced or stopped.
- Women remaining on antihypertensive treatment 2 weeks after discharge to primary care should be offered a medical review.

At the postnatal review 6–8 weeks postnatal by GP:

- All women who have had pre-eclampsia should undergo medical review in primary care at 6-8 weeks postpartum.
- Women who require to continue on antihypertensive medication should have further investigation into secondary causes of hypertension and be offered a specialist referral for assessment.
- Women who were discharged to primary care with abnormal blood results should have blood tests to measure platelets, liver transaminases, and serum creatinine.
- Dipstick testing of the urine should be performed. Refer women with 2+ protein on a dipstick test to a renal specialist. Women with 1+ protein on a dipstick test should be reviewed 3 months postpartum to assess renal function and specialist advice should then be sought if

necessary.

Postnatal review and subsequent pregnancy advice:

• Should be considered for women who had severe pre-eclampsia or eclampsia by their obstetrician at 6-12 weeks postpartum to facilitate discussion of the events of:

- The pregnancy, birth and post-natal period;
- Discussion of modifiable risk factors; and
- Recommendation of care in subsequent pregnancies including Aspirin prophylaxis and change to pregnancy suitable antihypertensive prior to pregnancy

All women with ongoing hypertension or previous pre-eclampsia should have an early referral to antenatal services to facilitate consideration of commencement of low-dose aspirin before 12 weeks gestation.

Postpartum care plan for women with raised blood pressure with suspected or confirmed COVID needing self- isolation and guidance for use of home blood pressure monitoring (HBPM)

If a woman or family member is symptomatic, the community midwife will postpone the visit unless essential. If a woman is positive on swab but asymptomatic only essential visits should be undertaken using full PPE as per trust guideline.

- Women who have had antenatal raised blood pressure and has Covid swab positive, will continue to use the Home BP monitoring (HBPM) postnatally.
- New onset raised blood pressure in labour or postnatal period prior to discharge from hospital and has Covid swab positive may be offered HBPM before discharge with the following inclusion and exclusion criteria.
- The decision should be made by the consultant caring for the woman or the consultant on call.

Inclusion criteria for DAU women:

- Any woman with mild –moderate hypertension without significant proteinuria (see below)
- Women must have a good understanding of English (written and spoken) so that they can follow the instructions and give informed consent.
- No clinical indication for inpatient monitoring

Exclusion Criteria:

- Unable to give consent or understand the instructions.
- Declines HBPM
- Evidence of non-compliance with attendance or monitoring.
- Arm circumference greater than 42cm
- Severe, uncontrolled hypertension that requires the woman to be admitted for stabilisation (HBPM can be started if she improves clinically and is appropriate for outpatient care).
- Woman with ≥ 2+ protein on dipstick or a positive PCR result (≥30).

Please refer to the 'Home Blood Pressure Monitoring' SOP to get further information on:

- Process of initiating HBPM
- Teaching HBPM technique to a patient
- Registering a patient on the app
- Management of abnormal readings

Postnatal BP checking:

Women should be given a written plan for their blood pressure targets, times of review and contact numbers. The frequency of monitoring and target readings should be set by a member of the obstetric team before the patient is discharged. This will depend on their underlying diagnosis and whether they are on treatment or not. **If HBPM is used after delivery, the community midwife should collect the machine when discharging the woman from maternity care.**

Antihypertensive treatment during the postnatal period, including during breastfeeding

Advise women with hypertension who wish to breastfeed that their treatment can be adapted to accommodate breastfeeding, and that the need to take antihypertensive medication does not prevent them from breastfeeding.

Explain to women with hypertension who wish to breastfeed that:

- antihypertensive medicines can pass into breast milk
- most antihypertensive medicines taken while breastfeeding 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 manufacturer's information are not because of any specific safety concerns or evidence of harm.

Make decisions on treatment together with the woman, based on her preferences

As antihypertensive agents have the potential to transfer into breast milk:

- consider monitoring the blood pressure of babies, especially those born preterm, who have symptoms of low blood pressure for the first few weeks. 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 MR 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 MR (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 1 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 when possible.

Where possible, avoid using diuretics or angiotensin receptor blockers to treat hypertension in women in the postnatal period who are breastfeeding or expressing milk.

Risk of recurrence of hypertensive disorders of pregnancy

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

	Type of hypertension in previous or current pregnancy		
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 28–34 weeks: approximately 33% (1 in 3 women) If birth was at 34–37 weeks: approximately 23% (1 in 4 women)	Approximately 7% (1 in 14 women)
Gestational hypertension	Approximately 9% (1 in 11 women)	Between approximately 6 and 12% (up to 1 in 8 women)	Between approximately 11 and 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)

Long-term risk of 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

	Type of hypertension in current or previous pregnancy			
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 1.5–3 times)	Risk increased (approximately 1.5–3 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 2–3 times)	Risk may be increased	Risk increased (approximately 1.8 times)
Hypertension	Risk increased (approximately 2–4 times)	Risk increased (approximately 2–5 times)	Risk increased (approximately 2–4 times)	(not applicable)

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:

- smoking cessation
- maintaining a healthy lifestyle
- maintaining a healthy weight

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.

Inter-pregnancy interval and recurrence of hypertensive disorders of pregnancy

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

Long-term risk of end-stage kidney disease

Tell women with a history of pre-eclampsia who have no proteinuria and no hypertension at the postnatal review (6–8 weeks after the birth) that although the relative risk of end-stage kidney disease is increased, the absolute risk is low and no further follow-up is necessary.

Thrombophilia and the risk of pre-eclampsia

Do not routinely perform screening for thrombophilia in women who have had pre-eclampsia.

Monitoring statement

- Audit standards will include the current CNST maternity standards
- Audit report will be presented to AN working party and multidisciplinary team
- If areas of deficiency are identified, recommendations and action plans will be developed and changes implemented appropriately.

Version 2.1

October 2021

Combined guideline – Hypertension in pregnancy: inpatient management, Hypertension in pregnancy: management in the community and Hypertension in pregnancy: DAU management

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Version 1.1

September 2011

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Updated by
[redacted] Consultant Obstetrician

Consultation

Antenatal working party

Ratified by
Date: **September 2021**
Review Due: **October 2024**

REFERENCES

- NICE hypertension guidelines

RELATED DOCUMENTS Hypertension (severe) in pregnancy: management of

SAFETY There are no unusual or unexpected safety concerns to staff or patient.

QUERIES Contact [redacted] or the obstetric on call team on Central Delivery Suite. Telephone [redacted] for contact bleep numbers

Figure 1: HYPERTENSION - NO PROTEINURIA (management in Day Assessment Unit)

Action by DAU midwife (step 1- diagnosis):
-Hypertension
-No proteinuria on urinalysis
-No clinical suspicion of fetal compromise

Definitions
Symptoms of PET; headache, visual disturbances, epigastric pain, vomiting
Clinical assessment of fetal wellbeing: SFH, reported fetal movements, auscultation of fetal heart beat
Registrar: ST3 onwards

Definition (BP in mmHg)	Action by DAU midwife (step 2)	Action by DAU midwife (step 3)	Action by obstetrician and inpatient management
Systolic ≥ 160 **Diastolic ≥ 110** **(**either / or**)**	**-TRANSFER TO CDS** **-URGENT MEDICAL REVIEW** if CDS cannot take.	See [redacted]_guideline for assessment and management **PIGF if <35 weeks (consider if delivery not imminent once normotensive)**	
Systolic 140-159 **Diastolic 90-109** **(**either / or**)**	Check PET bloods cCTG only if reports reduced fetal movements or symptomatic or high risk **PIGF if <35 weeks**	**If high risk by PIGF-** • Obstetric review and admit • Treat as above row (BP > 160/110) **If medium risk by PIGF-** • cCTG, AFI, Dopplers • Arrange growth scan • Obstetric review Allocate to named consultant and book a consultant appointment if one not in place If low risk by PIGF- • Outpatient surveillance ○ Weekly if BP normal ○ Twice weekly if BP > 150/100 at presentation or < 32 weeks • Can phone for PET blood results • Review in DAU in 2 weeks if clinically indicated **If 35 weeks or more, not for PIGF. Treat as medium risk if hypertension persists**	Treat BP Target BP: ≤135/85 For bloods weekly or earlier if BP rises or develops proteinuria Plan surveillance according to risk stratification by PIGF testing

Figure 2: HYPERTENSION & PROTEINURIA (management in Day Assessment Unit)

Action by DAU midwife (step 1- diagnosis):
New hypertension
Proteinuria on automated urinalysis
No clinical suspicion of fetal compromise

Definitions
Symptoms of PET; headache, visual disturbances, epigastric pain, vomiting
Clinical assessment of fetal wellbeing: SFH, reported fetal movements, auscultation of fetal heart beat
Registrar: ST3 onwards

Definition (BP in mmHg)	Action by DAU midwife (step 2)	Action by DAU midwife (step 3)	Action by obstetrician & inpatient management
Systolic ≥ 160 **Diastolic ≥ 110** **(either / or)**	**-TRANSFER TO CDS** **-URGENT MEDICAL REVIEW** if CDS cannot take.	See [redacted]_guideline for assessment and management **PIGF if <35 weeks (consider if -delivery not imminent once normotensive & proteinuria not confirmed on UPCR)** **If PIGF test performed** Integrate actions detailed in Table 1 with clinical situation	
Systolic 140-159 **Diastolic 90-109** **(either / or)**	Discuss with registrar on call PET bloods UPCr Growth scan if not within the last 2 weeks cCTG, AFI and Dopplers **PLGF testing if –** <35 weeks Not confirmed raised UPCr (>30)	URGENT REVIEW if symptomatic **If PIGF test performed** Integrate actions detailed in Table 1 with clinical situation	Admit if any clinical concerns for the wellbeing of the woman or baby Treat BP (target BP: ≤135/85) Twice weekly PET bloods **If PIGF test performed** Integrate actions detailed in Table 1 with clinical situation

Appendix 1: Interpretation of PlGF test results

LOW RISK PlGF>100pg/ml (normal)	MEDIUM RISK PlGF 12-100pg/ml (low)	HIGH RISK PlGF<12pg/ml (Very Low)

• No placental dysfunction
• 98% will not need delivery for pre eclampsia within 14 days
• Median Time to delivery:
  • <35 weeks: 62 days
  • 35-37 weeks: 16 days
	• Placental dysfunction likely
	• 95-96% will need delivery for pre eclampsia within 14 days
	• Median Time to delivery:
	  • <35 weeks: 23 days
	  • 35-37 weeks: 9 days
		• Severe placental dysfunction likely
		• For women less than 35 weeks- 94% will deliver preterm
		• Median Time to delivery:
		  • <35 weeks: 9 days
		  • 35-37 weeks: 4 days