

**WOMEN'S HEALTH AND PAEDIATRICS
MATERNITY UNIT**

Hypertension in Pregnancy: Diagnosis and Management

Amendments			
Version	Date	Comments	Approved by
2	October 2012	Merging of all current ASPH hypertension guidelines into one document incorporating NICE (2010) recommendations	Women's Health Guidelines Group
3	December 2012	Amendments to In-patients care pathways to include postnatal quick reference guide	Women's Health Guidelines Group
3.1	August 2014	Magnesium levels added	Women's Health Guidelines Group Chairs action
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Hypertension in Pregnancy

1.0 Antenatal Inpatient Hypertension Quick Reference Guide

Care pathway for all women requiring inpatient care for antenatal hypertension (GH, chronic Htn and PET) based on NICE NG133	
VTE prevention.	Complete VTE risk assessment on BadgerNet on admission If Enoxaparin indicated prescribe at 18.00hrs (Most women with PET and inpatient care will need VTE prophylaxis)
Blood pressure management	Treat if BP>140/90 Target BP 135/85 Use appropriate cuff size (if ≥35cms use a large cuff) Record BP 4hrly on VitalPac (On waking, 10.00, 14.00, 18.00 and 22.00hrs) If BP>150/100 inform SHO, review within 1 hour.
Urinalysis	Pre-eclampsia - Repeat urine dip or urine PCR not required (unless uncertainty about diagnosis) Gestational or Chronic Hypertension – Daily whilst inpatient
PET bloods	Day of admission and day after admission Repeat: <ul style="list-style-type: none"> • 2x weekly (usually Mondays and Thursdays) • (If severe hypertension BP>160/110 repeat 3x weekly)

Fetal Monitoring If <26 weeks daily auscultation
Daily computerised CTG if >26 weeks
 Follow antenatal CTG guideline
Growth scan and Fetal Doppler on diagnosis
 Growth and Doppler Normal:
 PET ongoing inpatient care - repeat weekly
 Gestational and Chronic hypertension – repeat in 4 weeks

 Not normal:
 Concerns re fetal growth /abnormal Doppler findings for Consultant to Consultant discussion with local Fetal medicine (or tertiary at St George's) and individual plan for ongoing fetal surveillance

Timing of birth Individual Consultant plan with maternal and fetal thresholds for early planned birth (document in management box on BadgerNet)
 Consider steroids if delivery in next 7 days anticipated
 PET deliver at 37 weeks (earlier if indicated)
 Chronic and Gestational Hypertension deliver at 39-40 weeks (unless severe hypertension not controlled with treatment)

- QUICK REFERENCE GUIDE**
- **Complete VTE assessment and give enoxaparin at 18.00hrs if indicated**
 - **4 hourly blood pressure measurement**
 - **If chronic hypertension or Gestational hypertension daily urinalysis**
 - **If preeclampsia urinalysis or repeat PCR not required**
 - **PET bloods on admission, then repeat:**
 - **Twice weekly (usually Mondays and Thursdays)**
 - **(Three times weekly if severe hypertension)**
 - **Daily computerised CTG if >26 weeks**
 - **Escalate for Doctor review and repeat CTG, BP and bloods if clinical concerns about PET symptoms, BP>150/100, RFM, abdominal pain or bleeding**

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2.0 Intrapartum Care Hypertension Quick Reference Guide

Intrapartum Care pathway women with hypertension in pregnancy based on NICE NG133

Inclusion Criteria:

- on antihypertensive treatment
- or BP>140/90 on 2 occasions 30mins apart
- all pre-eclampsia (regardless of blood pressure)

Place of Birth Advise birth on delivery suite
 Support active, mobile birth where wished (consider telemetry)

Blood pressure management Continue oral antihypertensives in labour
 Record BP hourly in labour on VitalPac
 If BP>150/100 inform doctor – adjust medication
 If BP>160/110 follow severe hypertension protocol

Urinalysis Pre-eclampsia - not required (unless uncertainty about diagnosis)

 Gestational or Chronic Hypertension – on admission, send PCR if 1+ or more
 If PCR>30 – consider diagnosis pre-eclampsia

Bloods IV access in labour
 Send PET bloods and G+S on admission

Fetal Monitoring Continuous CTG in established labour

Fluid balance Follow bladder care and labour guidelines
 Offer clear fluids and isotonic sports drinks
 In pre-eclampsia maintain fluid balance chart on BadgerNet

Analgesia in labour Offer all usual methods including epidural
 Consider early epidural in preeclampsia
 (Epidural contraindicated if platelets <75)

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Second stage	Manage as usual unless severe hypertension (BP 160/110)
Third stage	Active management with oxytocin 10 units IM (or 5 units IV) Avoid Ergometrine and Syntometrine Consider 40IU oxytocin infusion
Immediate Postnatal care	
VTE prevention.	Complete VTE risk assessment on BadgerNet after delivery Give enoxaparin 6hrs after birth if indicated (ensure 4hrs after epidural removed)
Analgesia	Avoid NSAIDs in preeclampsia
BP management	Continue oral antihypertensives Stop methyldopa and prescribe alternative if indicated
QUICK REFERENCE GUIDE	
<ul style="list-style-type: none"> ▪ Advise delivery suite birth ▪ Hourly BP in labour on VitalPac ▪ IV access, PET bloods and G+S on admission ▪ Continuous CTG if >26 weeks ▪ If pre-eclampsia complete fluid balance chart on BadgerNet ▪ Active third stage and avoid Ergometrine ▪ Complete VTE assessment and give enoxaparin if indicated ▪ Escalate care if severe hypertension 	

3.0 Postnatal Care Hypertension Quick Reference Guide

Postnatal Care pathway women with hypertension in pregnancy based on NICE NG133	
Inpatient Care	
Blood pressure management	Measure BP 4x daily Continue oral antihypertensives Stop methyldopa and prescribe alternative if indicated Treat if BP>150/100 if not previously on treatment If on antihypertensive treatment continue <ul style="list-style-type: none"> • If BP <140/90 consider reduction • If BP <130/80 reduce dose / discontinue 1 agent
PET Bloods	Pre-eclampsia: Send PET bloods day 2-3 <ul style="list-style-type: none"> • if normal – do not repeat unless clinical concern • if results deteriorating, senior obstetric review and individual plan Chronic and gestational hypertension <ul style="list-style-type: none"> • Do not send bloods unless clinical concern
Fluid balance	Not needed Follow postnatal bladder care guidelines
Analgesia	Avoid NSAIDs in preeclampsia (if Cr>80, AKI, oliguria or BP poorly controlled)
VTE prevention.	Complete VTE risk assessment on BadgerNet after delivery Give enoxaparin 6hrs after birth if indicated (ensure 4hrs after epidural removed)
Transfer to Community Postnatal Care	
Pre-eclampsia:	
Discharge home	Advise inpatient care for 48hrs Discharge once: <ul style="list-style-type: none"> • no symptoms of pre-eclampsia • BP <150/100 mmHg

	<ul style="list-style-type: none"> • blood results stable or improving • no other medical reason for inpatient care
Community BP checks	<p>Preeclampsia not requiring antenatal antihypertensives:</p> <ul style="list-style-type: none"> • at least once between day 3 and day 5 after birth • if blood pressure >140/90 continue to measure BP on alternate days until normal <p>Pre-eclampsia requiring antihypertensive treatment:</p> <ul style="list-style-type: none"> • Every 1–2 days for up to 2 weeks (unless the woman is off treatment and has no hypertension) • GP review at 2 weeks if remains on treatment
Chronic and gestational hypertension	
Discharge Home	<p>Discharge once BP<150/100</p> <p>No other medical reason for inpatient care</p>
BP measurement	<p>Measure BP:</p> <ul style="list-style-type: none"> • daily for the first 2 days after birth • at least once between day 3 and day 5 after birth • as clinically indicated if antihypertensive treatment is changed after birth <p>GP review at 2 and 6 weeks if still on treatment</p>
<p>QUICK REFERENCE GUIDE</p> <ul style="list-style-type: none"> ▪ Measure BP 4x daily ▪ Continue oral antihypertensives ▪ Stop methyldopa ▪ In PET repeat bloods 48-72hrs after birth ▪ Complete VTE assessment and give enoxaparin if indicated ▪ Discharge home once BP<150/100 and clinically well ▪ PET advise inpatient care for 48hrs 	

4.0 Introduction

Hypertension is the most frequent medical complication of pregnancy, occurring in up to 10% of pregnancies.

Pre-eclampsia remains a leading cause of maternal and perinatal mortality and morbidity. It is an important cause of iatrogenic preterm delivery accounting for 8-10% of all preterm deliveries and fetal growth restriction (FGR).

In view of the seriousness of the disease and the impact on women and their families, clinical teams have a high degree of suspicion for preeclampsia and a low threshold to admit pregnant women with suspected preeclampsia, although only a relatively small proportion go on to develop the disease. Placental Growth factor (PIGF) based testing reduces the time taken to diagnose preeclampsia, reduces adverse outcomes and is cost effective. NICE guidelines NG133 (2019) and DG23 (2016) recommend PIGF testing for suspected preeclampsia in pregnant women.

PIGF based testing does not replace existing local or national guidance in the assessment and management of hypertension in preeclampsia and suspected preeclampsia. Testing is integrated alongside standard management of suspected preeclampsia and in particular hypertension should be managed as per local guidance.

The main role for PIGF testing is at present a 'rule out' test for preterm preeclampsia

All forms of pregnancy hypertension, but particularly preterm pre-eclampsia, are associated with an increased risk of long-term hypertension and cardiovascular disease in later life.

5.0 Definitions / Terms used in this guideline

Hypertension – Blood pressure of 140mmHg systolic or higher, or 90mmHg diastolic or higher.

Severe hypertension – Blood pressure \geq 160/110 mmHg

Chronic hypertension – Hypertension that is present 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.

Gestational hypertension – New hypertension presenting after 20 weeks of pregnancy without significant proteinuria

Pre-eclampsia – New onset hypertension after 20 weeks of pregnancy with: proteinuria (PCR \geq 30mg/mmol / 2+ on urinalysis or other maternal organ dysfunction (defined by NICE 2019 - see section 8.1)

Severe pre-eclampsia – Pre-eclampsia with severe hypertension that does not respond to treatment or is associated with ongoing or recurring severe headaches, visual scotomata, nausea or vomiting, epigastric pain, oliguria and severe hypertension, as well as progressive deterioration in laboratory blood tests such as rising creatinine or liver transaminases or falling platelet count, or failure of fetal growth or abnormal Doppler findings

Eclampsia – A convulsive condition associated with pre-eclampsia.

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6.0 Blood Pressure measurement and Assessment of Proteinuria

6.1 Blood pressure

- Use cuff of appropriate size if patient overweight (large cuff if arm circumference >35cm).
- Automated devices for BP recordings should be validated for use in pregnancy.
- Care providers should compare automated readings for each woman with a manual BP once every 4 readings.
- Use Korotkoff phase V (i.e. point at which all sounds disappear) for the diastolic recording.

6.2 Proteinuria

- Use an automated reagent-strip reading device for urinalysis screening in hospital
- Send a Protein:Creatinine ratio (PCR) if urinalysis screening is positive for protein (1+ or more)
- >30 mg/mmol is the threshold for significant proteinuria
- Do not use 24-hour urine collection to quantify proteinuria

7.0 Reducing the risk of hypertensive disorders of pregnancy

7.1 At Booking:

- Measure blood pressure, perform urinalysis and document results
- Complete the 'Pre-eclampsia Risk Assessment' on BadgerNet
- Advise women at high risk (1 factor) or with 2 moderate risk factors to take aspirin 150mg OD at night from 12-36 weeks gestation. Signpost to leaflet on BadgerNet.

NICE 2019 assessment for aspirin (Risk assess at booking in BadgerNet)

High Risk – 1 factor	Moderate Risk – more than 1 factor
Hypertensive disease in a previous pregnancy Type1 or Type 2 Diabetes Chronic kidney disease Autoimmune disease such as SLE or antiphospholipid syndrome Chronic hypertension	First pregnancy Age 40 years or older Pregnancy interval of more than 10 years BMI \geq 35 kg/m ² at booking Multi-fetal pregnancy Family history of pre-eclampsia

8.0 Chronic Hypertension

8.1 Antenatal care

- Refer to the obstetric medicine clinic for Consultant led care (follow indications for obstetric review guideline)

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- Aspirin 150mg od at night 12-36 weeks gestation
- Review every 2-4 weeks if hypertension well controlled
- May need weekly review if poorly controlled
- Follow chronic hypertension in pregnancy care pathway
- Offer home blood pressure monitoring in pregnancy

8.2 Secondary causes of chronic hypertension

Consider need for investigation of underlying secondary causes (see Table below)

Secondary Causes of Hypertension	Possible Investigations
Undiagnosed renal disease	Urinalysis for blood and protein Electrolytes Renal Ultrasound
Aortic coarctation	Examine for radiofemoral delay ECHO
Renal artery stenosis	Listen for renal bruit Reno-vascular imaging
Hyperparathyroidism	Serum calcium (hypercalcaemia)
Hyperaldosteronism / Conn's syndrome	Electrolytes (hypokalaemia)
Phaeochromocytoma	Clinical history – labile BP, palpitations, headache Plasma metanephrines

8.3 Blood pressure management

Continue with existing antihypertensive treatment if safe in pregnancy, or switch to an alternative treatment

- See section 14.0 for antenatal antihypertensive guidance
- Stop ACE (angiotensin converting enzyme) inhibitors, Angiotensin receptor blockers (ARBs) and diuretics prior to pregnancy. If not - stop once pregnancy is confirmed

Aim for target BP 135/85mmHg

Start antihypertensive treatment if sustained BP >140/90

Reduce or stop antihypertensive if:

- sustained systolic blood pressure is less than 110mmHg or
- sustained diastolic blood pressure is less than 70mmHg or
- the woman has symptomatic hypotension

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8.4 Fetal monitoring in chronic hypertension

- Follow fetal growth surveillance pathway
- Intermediate pathway (if Uterine Doppler normal) 32, 36 and 40 weeks
- Increased pathway (if Uterine artery Doppler PI>2.5) 28, 32, 36 and 40 weeks
- CTG only if clinically indicated

8.5 Timing of birth

- Offer birth at 39- 40 weeks
- Not before 37 weeks unless severe hypertension (BP>160/110) or other medical indication
- Poorly controlled hypertension, superimposed pre-eclampsia or other clinical concerns will require individualised timing of reviews and delivery

8.6 Intrapartum care

- Advise birth on delivery suite with continuous CTG in established labour
- Continue oral antihypertensives
- Hourly BP in established labour
- Consider early epidural as an aid to effective blood pressure management

Women with chronic hypertension requiring antihypertensives who wish to birth in the Abbey Birth Centre should have an individual discussion and plan including indications for transfer in labour and CTG.

8.7 Postnatal care

Measure BP:

- daily for the first 2 days after birth
- at least once between day 3 and day 5 after birth
- as clinically indicated if antihypertensive treatment is changed after birth

Aim to keep blood pressure lower than 140/90 mmHg

Continue antihypertensive treatment, if required see section 16.0

GP (or specialist) review at 2 weeks and 6-8 weeks postnatally

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9.0 Detection of Hypertensive disorders in pregnancy

9.1 Management in the Community

As part of routine antenatal care all women in their first ongoing pregnancy should be seen at least every 4 weeks from 24 weeks gestation and every 2 weeks from 32 weeks

Follow NICE guidance 'Routine antenatal care' for each antenatal assessment

Community monitoring: thresholds for further action (PRECOG guidelines 2004)

Suspected PET	Definition	Action by midwife	Evidence Grade
Based on hypertension (without proteinuria)	Systolic BP \geq 160 mmHg	Refer to MAC on same day for step-up assessment	C
	Diastolic BP \geq 100mmHg		
	Systolic BP \geq 140mmHg or diastolic BP 90-99mmHg with significant symptoms*		
	Systolic BP 140-149mmHg	Refer to MAC within 48hr for step-up assessment	C
	Diastolic BP 90-99mmHg		
Based on maternal symptoms (without hypertension or proteinuria)	Headache or visual disturbances	Refer to MAC on same day for step-up assessment. Consider reducing interval before next antenatal assessment	C
	Epigastric pain	Refer to MAC on same day for step-up assessment	C
	Reduced fetal movements	Refer to MAC on same day	C
	Suspected Small for gestational age infant	Follow fetal growth pathway.	C
Based on proteinuria (without hypertension)	Any proteinuria \geq 1+ with maternal symptoms	Refer to MAC on same day for step-up assessment	
	1+ on urinalysis and asymptomatic	Repeat PET assessment in community within 1 week.	C
	\geq 2+ or more on urinalysis (regardless of symptoms)	Refer to MAC within 48hr for step-up assessment	C
	Systolic BP \geq 160mmHg	Arrange for immediate admission	A
PET	Follow NICE 2019 for management		

For grading of recommendations see 'PRECOG' Guidelines 2004

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9.2 Management on referral to the Maternity assessment Centre (MAC)

Follow the Flowchart suspected pre-eclampsia MAC.

10.0 Gestational Hypertension

10.1 Diagnosis

Diagnose gestational hypertension on the basis of new hypertension presenting after 20 weeks of pregnancy without significant proteinuria.

10.2 Management

Follow Flowchart ongoing management gestational hypertension

Management of pregnancy with Gestational Hypertension based on NICE 2019

Degree of hypertension	Hypertension: BP of 140/90–159/109mmHg	Severe hypertension: BP of 160/110mmHg or more
Admit to hospital	No	Admit, but if BP falls below 160/110 mmHg then manage as for hypertension
Antihypertensive pharmacological treatment (a)	Offer treatment if BP remains above 140/90 mmHg	Yes - all
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
Measure BP	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, 4 hrly whilst an in-patient Once controlled manage as for hypertension
Urinalysis proteinuria testing (b)	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
Fetal assessment	Offer fetal heart auscultation at every antenatal appointment Ultrasound (c) at diagnosis repeat every 4 weeks if normal CTG only if clinically indicated	Offer fetal heart auscultation at every antenatal appointment Ultrasound (c) at diagnosis repeat every 2 weeks if normal Daily computerised CTG whilst admitted (if >26 weeks)

(a) See “pharmacological management” for details on treatment Antenatal Oral Antihypertensive Agents

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- (b) Use automated reagent reader for urinalysis urine testing in secondary care
- (c) See fetal growth surveillance guideline for details of ultrasound assessment

10.3 Timing of Birth

- Do not offer birth before 37 weeks if BP <160/110 with or without treatment.
- After 37 weeks, timing of and maternal and fetal indications for birth should be agreed and between the woman and a senior obstetrician and documented.
- Advise birth by 40 weeks
- If refractory severe gestational hypertension, offer birth after course of corticosteroids (if required) is completed.

10.4 Intrapartum care

- Advise birth on delivery suite with continuous CTG in established labour
- Continue oral antihypertensives
- Hourly BP in established labour
- Consider early epidural as an aid to effective blood pressure management

Women with gestational hypertension requiring antihypertensives who wish to birth in the Abbey Birth Centre should have an individual discussion and plan including indications for transfer in labour and CTG.

10.5 Postnatal care

- Measure blood pressure 4x daily whilst an in-patient
- Transfer to community care once BP <150/100 and no other maternal or neonatal concerns

10.5.1 Antihypertensive treatment

- Continue antihypertensive treatment
- Reduce treatment if BP <130/80
- Stop methyldopa within 48hrs, (see section 20 Postnatal oral antihypertensive agents)
- Advise women this will usually be needed for the same duration as their antenatal treatment but may be longer.
- Start treatment (if previously not needed or had stopped) if BP >150/100

10.5.2 Timing of postnatal reviews

Measure BP:

- daily for the first 2 days after birth
- at least once between day 3 and day 5 after birth
- as clinically indicated if antihypertensive treatment is changed after birth

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GP review at 2 weeks if still on treatment

GP review at 6-8 weeks for all women with gestational hypertension

11.0 Pre-eclampsia

11.1 Diagnosis of pre-eclampsia

Diagnose pre-eclampsia by the criteria defined in NICE NG133.

New onset hypertension after 20 weeks of pregnancy with:

- proteinuria (PCR \geq 30mg/mmol / 2+ on urinalysis testing)
- or other maternal organ dysfunction

NICE define organ dysfunction as:

- renal insufficiency (creatinine 90 micromol/litre or more)
- liver involvement (ALT over 40 IU/litre with or without right upper quadrant or epigastric abdominal pain)
- neurological complications such as eclampsia, altered mental status, blindness, stroke, clonus, severe headaches or persistent visual scotomata
- haematological complications such as thrombocytopenia (platelet count below 150,000/microlitre), DIC or haemolysis
- uteroplacental dysfunction: fetal growth restriction, abnormal umbilical artery doppler waveform analysis, or stillbirth

In the absence of sustained hypertension with a raised PCR (usually values 30-70mg/mmol), consider retesting a new sample. Rule out urinary tract infection, sample contamination and consider an alternate diagnosis of gestational proteinuria.

Initial Management of suspected preeclampsia

Diagnose preeclampsia on the basis of the criteria according to NICE 2019 (detailed in the Hypertension in pregnancy guideline).

See women with suspected PE in Triage (MAC) or DAU for full clinical assessment including:

- Blood pressure
- assessment of proteinuria automated reader dipstick
- abdominal palpation and auscultation and confirmation of normal fetal movements
- assessment of symptoms
- Additional tests may include CTG, fetal USS, quantification of proteinuria and maternal PET bloods (FBC, UE, LFT)

11.2 **PIGF based testing**

- Offer PIGF testing to women with a singleton pregnancy at 20-36+6 weeks gestation with suspected preeclampsia / clinical uncertainty about the diagnosis.

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- Take an additional EDTA tube along with maternal PET bloods (standard venepuncture technique)
- Label the EDTA sample with patient name and hospital number and time
- Order the blood test via ICE 'PET screen' and 'Placental Growth Factor'
- Send the sample to the lab within 1 hour of venepuncture (The sample MUST be processed or frozen within 4 hrs)
- The result will be reported on ICE in line with the PET screen

Further management

- Manage hypertension as per the hypertension in pregnancy guideline.
- Follow the flow chart (Appendix 1)

PIGF >100pg/ml - Normal level

- Do not admit to hospital
- Consider alternative diagnoses for symptoms
- Community midwife BP and urine check in 1 week
- NB if new diagnosis gestational hypertension follow up and fetal USS as per local guideline

PIGF <100pg/ml but >12pg/ml – low level

- Do not admit to hospital
- Arrange fetal USS for growth and Dopplers unless done within the past two weeks
- Continue to check BP twice weekly in DAU
- If no proteinuria or PCR <30, for dipstick check at each visit

PIGF < 12pg/ml – Very Low

- Placental dysfunction (PET / small baby or both)
- Arrange fetal USS for growth and Dopplers unless done within the past two weeks
- Senior obstetric Review (Reg or Consultant)
- Consider admission
- Do not deliver on the basis of PIGF result alone

Additional guidance for women at gestation 35-36+6 weeks

The PARROT study (Duhig et al Lancet 2019) included women with suspected preeclampsia up to 36+6 weeks gestation. In women with a PIGF level >100pg/ml there was a 97.1% negative predictive value for preeclampsia requiring delivery before 37 weeks in this group (35-36+6 weeks). If the level is >100 97.1% of women do NOT develop preeclampsia needing delivery

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before 37 weeks. In comparison the negative predictive value for the test up to 34+6 is 98% (PELICAN study).

The test performance appears to be satisfactory to allow its use at these gestations and there is some evidence that its use may improve the timely detection of PE.

Repeat testing

- There is no available data on the role of serial PIGF measurements.
- PIGf testing can be offered again if there is a new 'episode of care' and new clinical uncertainty about the diagnosis of pre-eclampsia.
- If the woman presents again >14 days after a previous test then follow the flow chart and guideline
- If less than 14 days have elapsed manage the woman according to the Hypertension guideline. If it is felt PIGF testing may be of value then seek Consultant advice given the limited evidence available.

Recommended cut-off values for the Triage PIGF test

Adapted from Duhig et al Lancet 2019 and NICE 2016

Result	Classification	Interpretation
PIGF ≥100 pg/ml	Normal	Normal -unlikely to progress to delivery within 14 days of the test
PIGF ≥12 pg/ml and <100 pg/ml	Low	Abnormal - increased risk for preterm delivery Increased surveillance
PIGF <12 pg/ml	Very Low	Highly abnormal - suggestive of patients with severe placental dysfunction and at increased risk for preterm delivery Assume / manage as preeclampsia
Abbreviations: PIGF, placental growth factor; pg/ml, picograms per millilitre.		

11.3 Management of pre-eclampsia

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

Indications for admission and in-patient care:

- sustained systolic blood pressure of 160 mmHg or higher

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- biochemical or haematological investigations that cause concern e.g. new and persistent rise in creatinine (90micromol/litre)
- rise in ALT (over 70 iu/litre, or twice upper limit of normal range)
- fall in platelet count (under 150)
- 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

Management of pre-eclampsia NICE 2019

Degree of hypertension	Hypertension: BP of 140/90–159/109mmHg	Severe hypertension: BP of >160/110mmHg
Admit to hospital	Admit if any clinical concerns for the wellbeing of the woman or baby	Admit, but if BP falls below 160/110 mmHg then manage as for hypertension
Antihypertensive pharmacological treatment	Yes – if BP remains above 140/90 mmHg	Yes - all
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
Measure BP	At least every 48 hours If in-patient 4hrly as a minimum	Every 15–30 minutes until BP is less than 160/110 mmHg Then if in-patient 4hrly as a minimum
Urinalysis 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	PET (a) bloods 2x a week PIGF not to be repeated unless new presentation/episode of care	PET (a) bloods 3x a week PIGF not to be repeated unless new presentation/episode of care
Fetal assessment	<ul style="list-style-type: none"> • Fetal heart auscultation at every antenatal appointment 	In-patient care Ultrasound at diagnosis

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	<ul style="list-style-type: none"> • Ultrasound at diagnosis. Repeat every 2 weeks if normal • Computerised CTG at diagnosis (if >26 weeks) • Daily computerised CTG whilst admitted (if >26 weeks) • Outpatient care – repeat CTG only if clinically indicated 	Repeat weekly if ongoing severe hypertension or inpatient care If >26 weeks <ul style="list-style-type: none"> • Computerised CTG at diagnosis • Daily c CTG whilst admitted Less than 26 weeks <ul style="list-style-type: none"> • Fetal heart auscultation at diagnosis and daily
VTE risk assessment	Complete risk assessment on BadgerNet at diagnosis and with any admission. Most women requiring inpatient care will need LMWH prophylaxis	

(a) PET bloods full blood count, liver function and renal function

11.4 Timing of birth

Weeks of pregnancy	Timing of birth
Before 34 weeks	Continue surveillance unless there are indications (see below) for planned early birth. Offer intravenous Magnesium sulphate (MgSO ₄) and a course of antenatal corticosteroids in line with the NICE guideline on preterm labour and birth.
From 34+0-36+6 weeks	Continue surveillance unless there are indications (see below) for planned early birth. When considering the option of planned early birth, take into account the woman's and baby's condition, risk factors (such as maternal comorbidities, multifetal pregnancy) and availability of neonatal unit beds. Consider a course of antenatal corticosteroids in line with the NICE guideline on preterm labour and birth.
37 weeks onwards	Initiate birth within 24–48 hours.

11.5 Steroids and Magnesium sulphate for fetal neuroprotection

Consider corticosteroids once pre-eclampsia is diagnosed

- if gestation is <35 weeks
- or delivery planned by no labour CS and <37+6 weeks

Advise MgSO₄ as per PreCept (see preterm birth guideline) if gestation <34 weeks and delivery planned

11.6 Expectant management of Preterm pre-eclampsia

Follow section 8.2 Table to guide frequency of assessment

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All women need an individual Consultant plan of care

11.6.1 Consultant individualised plan of care:

- This should be documented in the management box on BadgerNet and updated in line with advancing gestation
- Involve the woman and her family in decisions about inpatient versus outpatient care and document the discussion.
- Record maternal and fetal thresholds for planned early birth before 37 weeks in all women with pre-eclampsia.

11.6.2 Indications for planned early birth

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
- Eclampsia
- Abruption
- Fetal indications: Doppler abnormalities dependent on gestation (*seek fetal medicine opinion*) or abnormal computerised CTG),
- Stillbirth.
- Other features not listed above may also be considered in the decision to plan early birth.

The threshold and indications for delivery will require review as gestation advances and the clinical situation changes.

11.7 Intrapartum care

Do not rush into delivery. The mode of delivery should be decided at a senior level and take into account gestation, maternal condition and fetal wellbeing.

Pre-eclampsia may deteriorate further and close observations should be kept on blood pressure, fluid balance and symptoms.

- Inform the registrar if the BP $\geq 160/110$ mmHg or there is oliguria (<80ml/4hr)
- Intravenous access is required for all women with pre-eclampsia during labour and delivery.
- Send PET bloods on admission to delivery suite

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- Beware fluid overload and pulmonary oedema (especially with oxytocin use). Maintain a fluid balance chart on BadgerNet and do not administer a total fluid volume of more than 85mL/hr.
- Oral antihypertensive treatment should continue through labour. Stabilisation of BP with oral treatment before induction or caesarean section (CS) makes hypertension in labour, delivery and the postpartum period easier to manage, and may avoid the need for parenteral therapy.
- Continuous CTG in labour.
- PET is not a contra-indication to epidural providing platelets $>75 \times 10^9/L$ (discuss with anaesthetist).

After delivery:

- Third stage: oxytocin should be given intramuscular (IM) or intravenously (IV) 5 units, **NOT** Syntometrine or Ergometrine.
 - If 40 units oxytocin required then consider volume concentration via a syringe driver.
- Non-steroidal anti-inflammatory drugs (NSAIDs) e.g. ibuprofen or diclofenac should not be given postpartum if hypertension is difficult to control, if there is oliguria or an elevated creatinine (> 80) or low platelets ($<100 \times 10^9/L$).
- VTE assessment and appropriate action - within 6 hours of delivery or change in clinical condition.

11.8 Postnatal care

11.8.1 In-patient care

Most women with pre-eclampsia will require inpatient care for 48hrs after birth.

Ask about severe headache and epigastric pain each time blood pressure is measured.

11.8.1.1 Blood pressure management

Measure blood pressure:

- At least 4 times a day while the woman is an inpatient

Start antihypertensive treatment if BP $>150/100$ if not previously on treatment

If on antihypertensive treatment continue (stop methyldopa within 48hrs)

- If BP $<140/90$ consider reduction
- If BP $<130/80$ reduce dose / discontinue 1 agent

11.8.1.2 Blood tests

Send PET bloods 48-72hrs after birth

If clinically well these can be checked on Day 2 (even if less than 48hrs)

- If results are normal – do not repeat unless clinical concern

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- If outside normal range - arrange repeat measurements as clinically indicated until normal, this can be done as an outpatient
- If results deteriorating, senior obstetric review and individual plan

11.8.2 Discharge home to community care

Transfer to community care if all of 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
- no other medical reason for inpatient care

Discharge women with a care plan that includes all of the following:

- who will provide follow-up care, including medical review if needed
- frequency of blood pressure monitoring
- thresholds for reducing or stopping treatment
- indications for referral to primary care for blood pressure review
- self-monitoring for symptoms

Women with pre-eclampsia requiring delivery before 34 weeks (Preterm PET) should have follow up with the Maternal Fetal medicine team arranged prior to discharge home

11.8.3 Frequency of community midwifery review and BP measurement

Pre-eclampsia not requiring antenatal antihypertensives:

- at least once between day 3 and day 5 after birth
- if blood pressure >140/90 continue to measure BP on alternate days until normal

Pre-eclampsia requiring antihypertensive treatment:

- Every 1–2 days for up to 2 weeks unless the woman is off treatment and has no hypertension
- GP review at 2 weeks if remains on treatment

All women with pre-eclampsia should have a medical review with their GP at 6-8 weeks after birth with urinary reagent urinalysis test for proteinuria and a BP assessment.

If there is proteinuria 1+ or more repeat at three months and assess kidney function

Consider referring women with an abnormal kidney function assessment at three months for a specialist kidney assessment in line with the NICE guideline on chronic kidney disease in adults.

12.0 Severe Pre-eclampsia Protocol

12.1 Criteria for Inclusion

Sustained systolic BP >160/110mmHg and significant proteinuria

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or

Eclampsia

or

Any woman with pre-eclampsia and at least one of the following:

- Severe symptoms: ongoing severe headache, epigastric pain, nausea and vomiting, visual scotomata (partial loss vision / blind spot).
- Pulmonary oedema or sats<90%
- Oliguria (<500 mls in 24 hours). +/- abnormal renal function tests
- Combination of progressively deteriorating haematological or biochemical parameters

Ultimately, as many clinical criteria are subjective, women should be managed according to a careful clinical assessment rather than relying on overly precise criteria.

Severe hypertension that responds to treatment in the absence of other features does not necessitate the severe PET protocol but senior advice should be sought.

12.2 Initial assessment

All women with suspected severe pre-eclampsia should have;

- Review of obstetric notes
- Symptom enquiry: ongoing severe headache, epigastric pain, nausea and vomiting, visual scotomata (partial loss vision / blind spot).
- Serial BP measurement every 15 minutes
- Abdominal palpation and check reflexes / clonus
- Computerised CTG if ≥ 26 weeks or auscultation if < 26 weeks
- Urinalysis
- Send PET bloods, G+S and clotting (add fibrinogen if platelet count $<100 \times 10^9/l$).
- Blood film and LDH if HELLP syndrome suspected.

If severe pre-eclampsia is diagnosed then the Severe PET protocol should be commenced.

This must involve the on call Consultant Obstetrician and carries with it a decision to expedite delivery.

Inform all of the following staff:

- Registrar obstetrics
- Consultant Obstetrician
- Anaesthetic registrar **AND** Consultant Anaesthetist
- Labour ward team leader
- Neonatal team (if ≤ 37 weeks)

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12.3 Immediate care

Admit to labour ward observation bay for Enhanced Maternal Care:

- Designate one to one midwifery care
- IV access
- TEDS
- Keep NBM unless instructed otherwise
- Hourly observations (minimum) including AVPU on VitalPac
- Control blood pressure
- MgSO₄ protocol to reduce the risk of seizures
- Oral omeprazole 20mg 12 hrly
- Repeat PET bloods every 6 hours
- No need to repeat clotting if platelet count is over 100 x10⁹/l and ALT normal
- Involve haematology if clotting/platelets abnormal
- If <37 weeks - Consider need for steroids and inform NICU

12.4 Control of severe hypertension BP>160/110mmHg

Aim – to steadily reduce blood pressure to <150/100 mmHg (see Severe Hypertension Treatment Flowchart)

Check blood pressure with the correct sized cuff

- Check a manual blood pressure every fourth reading
- Check blood pressure every 15 minutes until controlled

Use oral Nifedipine 10mg modified release (preferred choice)

OR Labetalol 200mg oral (if Nifedipine contraindicated)

- Repeat oral dose (10mg Nifedipine or 100mg Labetalol) after 15 min if BP>150/100
- Measure blood pressure every 15 minutes until the woman is stabilised, then every 30-60 minutes

80% of cases will achieve control with oral treatment by 60 minutes

If BP> 160/110mmHg after 2 hours consider intravenous antihypertensives;

- Intravenous Labetalol (preferred option)
- Intravenous hydralazine (second option if Labetalol contraindicated eg asthma)
- Invasive blood pressure monitoring may aid intravenous antihypertensive therapy. An intra- arterial pressure monitor may be indicated if:
 - The woman is unstable
 - The blood pressure is very high
 - The woman is obese and non-invasive measurements not reliable

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- There is a haemorrhage of >1000 mls

12.5 Fluid Balance Management (including oliguria)

12.5.1 Monitoring

- Insert urinary catheter with a urometer
- Document all fluid intake and urinary output hourly on BadgerNet
- Keep NBM until otherwise instructed
- Fluid restrict to 85mls/hr (to include all intravenous and oral fluids)
- Pulse oximetry hourly
- Respirations hourly
- Always involve the anaesthetist
- Infusion pumps for the administration of all fluids

Reduced urine output is common in severe pre-eclampsia both antenatally and post-delivery and especially in the context of prolonged oxytocin use. As long as urine output is >20ml/hr await resolution of PET. Avoid the temptation to treat oliguria unless there are signs of hypovolaemia or blood loss.

12.5.1.1 Oliguria (less than 80ml in 4 hours)

This requires senior obstetric and anaesthetic review of fluid balance and renal function. A clinical assessment of the fluid balance is required

- Bloods should be taken to check creatinine, urea and potassium
- If renal function is normal, renal failure is not the cause of oliguria.
- Central venous access is not routinely recommended as a tool for fluid volume status, due to the poor correlation between CVP and PCWP in pre-eclampsia
- If CVP line is inserted it should be used to monitor trends and not absolute values. Repeated fluid challenges against the CVP should be avoided unless there are supporting clinical signs

NB: Women with pre-eclampsia are at increased risk of pulmonary oedema.

- If antenatal – Senior obstetric review and consider need for delivery
- If postnatal – Clinical assessment of volume status by the anaesthetist and obstetrician
 - If normovolaemic wait for up to 8 hours for a diuresis
 - If hypovolaemic (blood loss etc.) – then consider a fluid challenge of 250mls Plasmalyte over 20 minutes via an infusion pump. Avoid repeated fluid challenges.

12.5.1.2 Oliguria persists:

- Requires another review by senior obstetrician and anaesthetist
- Repeat bloods for renal function (creatinine, urea and potassium)
- Maintenance fluid (Plasmalyte) per hour = previous hour's urine output + 30ml

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- If there is a rapidly increasing creatinine or potassium > 5.5mmol/L involve the renal team.
- Consider transfer to ITU for level 3 care

12.6 Assessment of Fetal Wellbeing

Commence continuous CTG monitoring if ≥ 26 weeks

If <26 weeks then intermittent monitoring with a handheld sonicaid is advised unless a decision is made by the consultant obstetrician

12.7 Prevention of Eclampsia

Magnesium sulphate should be considered for women with pre-eclampsia for whom there is a concern about the risk of eclampsia / eclamptic seizures

Use inclusion criteria as per the severe pre-eclampsia protocol

Follow the MgSO₄ protocol (section 26.0)

12.8 Delivery Planning

Decision for timing and mode of delivery must be taken at consultant level

Involve MDT and document discussions

Remember that initial stabilisation of the maternal condition leads to a safer delivery by whatever route

Timing and mode of delivery will depend on gestation, clinical condition and investigation results

Severe pre-eclampsia is not a contraindication for induction of labour – this would take place on delivery suite.

12.9 Intrapartum Care

A long labour is contraindicated if there is evidence of fetal/maternal compromise. Caesarean section should be expedited in these circumstances.

Observations should be recorded on VitalPac and BadgerNet - close watch on blood pressure, pulse, fluid balance and symptoms

Do not routinely limit the second stage of labour unless there is severe hypertension that does not respond to treatment.

12.9.1 Analgesia during Labour

Severe pre-eclampsia is not a contraindication to epidural analgesia providing clotting is normal and platelets $>75 \times 10^9/L$

All women with PET should have platelets (and clotting if platelet count is $<100 \times 10^9 /L$) checked on admission to Delivery Suite and within 2 hours prior to epidural insertion.

- No epidural if platelets $<75 \times 10^9/L$.
- If platelets $75 -100 \times 10^9/L$, epidural only if clotting normal.

12.9.2 Third Stage

Active management advised

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- Give oxytocin 10units IM or 5units IV slowly
- Syntometrine and Ergometrine should be avoided
- Avoid IM injections in the presence of coagulopathy
- Consider oxytocin 40 units in 40mls normal saline to run over 4hours

12.10 Post Delivery Management of Severe PET

Women with pre-eclampsia may deteriorate after delivery. There is an ongoing risk of eclampsia and pulmonary oedema

- Continue strict fluid balance and fluid restriction until step down from protocol
- Monitor urine output hourly
- Enhanced Maternal Care on Delivery Suite for at least 24 hours
- Bloods 6 hourly until step down from severe PET protocol
- No NSAIDs - withhold Enoxaparin if creatinine clearance <30ml/min / 1.73m² or platelet count <50x10⁹/L

12.10.1 Step down from the Severe PET Protocol

Stepdown can occur with resolution of symptoms, a diuresis and improving biochemical / haematological parameters

- Stepdown usually 24-48hrs after delivery
- Follow postnatal care in pre-eclampsia (section 8.7) for ongoing care
- Do not measure fluid balance if creatinine is normal

12.10.2 Prior to discharge to postnatal ward

All women should have a clear documented plan for:

- Thromboprophylaxis
- Antihypertensive therapy, BP goal and frequency of observations (usually 4hrly)
- Midwife to inform postnatal ward of diagnosis of severe pre-eclampsia/eclampsia (SBAR handover to be documented in BadgerNet)
- Follow postnatal management of PET

13.0 Eclampsia management

FOLLOW SECTION 27.0 'ECLAMPSIA EMERGENCY MANAGEMENT'

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13.1 Immediate management

Fitting in pregnancy in a woman not known to have fits for another reason should be assumed to be eclampsia in the first instance

- Eclampsia is an obstetric emergency and an 'Obstetric Priority' call should be made via switchboard ext. 2222.
- Contact switchboard to contact the consultant obstetrician and consultant anaesthetist
- The consultant obstetrician must attend
- Eclamptic convulsions should be treated with Magnesium (See Magnesium Protocol Appendix 6).
- All cases of Eclampsia should be managed with the severe PET protocol

13.2 Delivery planning

The mother must be stabilised before delivery.

Decision for exact timing and mode of delivery (usually operative birth) must be taken at consultant level.

Involve MDT and document discussions.

Ongoing monitoring and postnatal management, as per Severe Pre-eclampsia protocol

13.3 Recurrent seizures

Inform Anaesthetist and consultant obstetrician

Treat recurrent seizures with a further dose of Magnesium 2g over 5minutes

Decision should be made by a consultant obstetrician or anaesthetist

If possible take blood for Magnesium level prior to additional bolus (and repeat urgent PET bloods & VBG) so that a significant differential diagnosis of hyponatraemia can be rapidly eliminated.

If further seizures occur despite above consider:

- Critical Care input / outreach
- Diazemuls 10mg IV bolus
- Thiopentone infusion (on ITU)
- Paralysis and ventilation
- Low threshold for neuroimaging once stable

14.0 Other Complications of Pre-eclampsia

14.1 Pulmonary Oedema

If SpO2 ≤95% (on air), exclude pulmonary oedema

If pulmonary oedema diagnosed:

- Stop maintenance fluid

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- Call anaesthetist/obstetrician
- Give oxygen 15litres via reservoir non re-breathe face mask
- Give Furosemide 40mg IV
- Arrange urgent CXR

14.2 Disseminated Intravascular Coagulation

Disseminated Intravascular Coagulation (DIC) is uncommon unless there is also abruption, although mild coagulation disturbances are common.

DIC should be managed in association with haematology.

Once delivered, resolution is usually rapid (3-12 hours) with supportive care

14.3 HELLP syndrome

Haemolysis, Elevated Liver enzymes and Low Platelets is an important variant of severe pre-eclampsia and may complicate the course of a patient with PET, either antenatally or postnatally.

Epigastric pain/RUQ pain is a classic sign of HELLP.

Do not use dexamethasone or betamethasone to treat HELLP syndrome

A full set of bloods including Blood film and LDH levels should be requested as urgent

Seek haematology advice if clinical concern

Consider imaging (USS / CT) if severe RUQ and possible liver capsule haematoma / rupture

Follow the Severe Pre-eclampsia Protocol

15.0 Antihypertensive treatment during the postnatal period including whilst breastfeeding

Blood pressure tends to fall in the first 24 hours and then subsequently rises with a peak at day 3-6 postpartum.

Timely and effective management of hypertension reduces episodes of severe hypertension and the need for postnatal readmission.

Use single agent and once daily regimes where possible. See [section 16](#) for guidance on choice of agent

Advise women that they can safely breastfeed whilst taking antihypertensive medication.

Explain that:

- antihypertensive medicines can pass into breast milk at very low levels
- 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.

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- when discharged home, advise women to monitor their babies for drowsiness, lethargy, pallor, cold peripheries or poor feeding
- consider monitoring the blood pressure of babies, especially those born preterm, who have symptoms of low blood pressure for the first few weeks (seek advice from NICU or TC)
- 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 assess and monitor baby in accordance with neonatal guidelines

Treat women with hypertension in the postnatal period who are not breastfeeding and who are not planning to breastfeed in line with the NICE guideline on hypertension in adults.

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16.0 Advice and follow up for women with hypertension in pregnancy

16.1 Risk of recurrence

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

Use the following table (as per NICE NG133) to give individual risks of recurrence

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)

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16.2 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.

These risks can be modified by:

- Avoiding smoking
- Maintaining a healthy lifestyle
- Maintaining a healthy weight

Use the following table (as per NICE NG133) to give more individualised information:

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)

17.0 Home Blood Pressure Monitoring (HBPM)

17.1 Background

- Home Blood Pressure Monitoring (HBPM) allows a woman to self-monitor her blood pressure at home. Home readings may provide a more frequent or accurate picture of a woman's BP than intermittent DAU or clinic readings.
- Service evaluations in over 3000 women demonstrate a reduction in unnecessary hospital visits and women report a positive experience. No safety concerns have been raised to date.
- HBPM is not intended to replace necessary clinical reviews and monitoring of proteinuria, maternal blood tests or fetal wellbeing.

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- The following guidance is in line with RCOG Self Monitoring of BP in pregnancy 2020

17.2 Criteria for HBPM

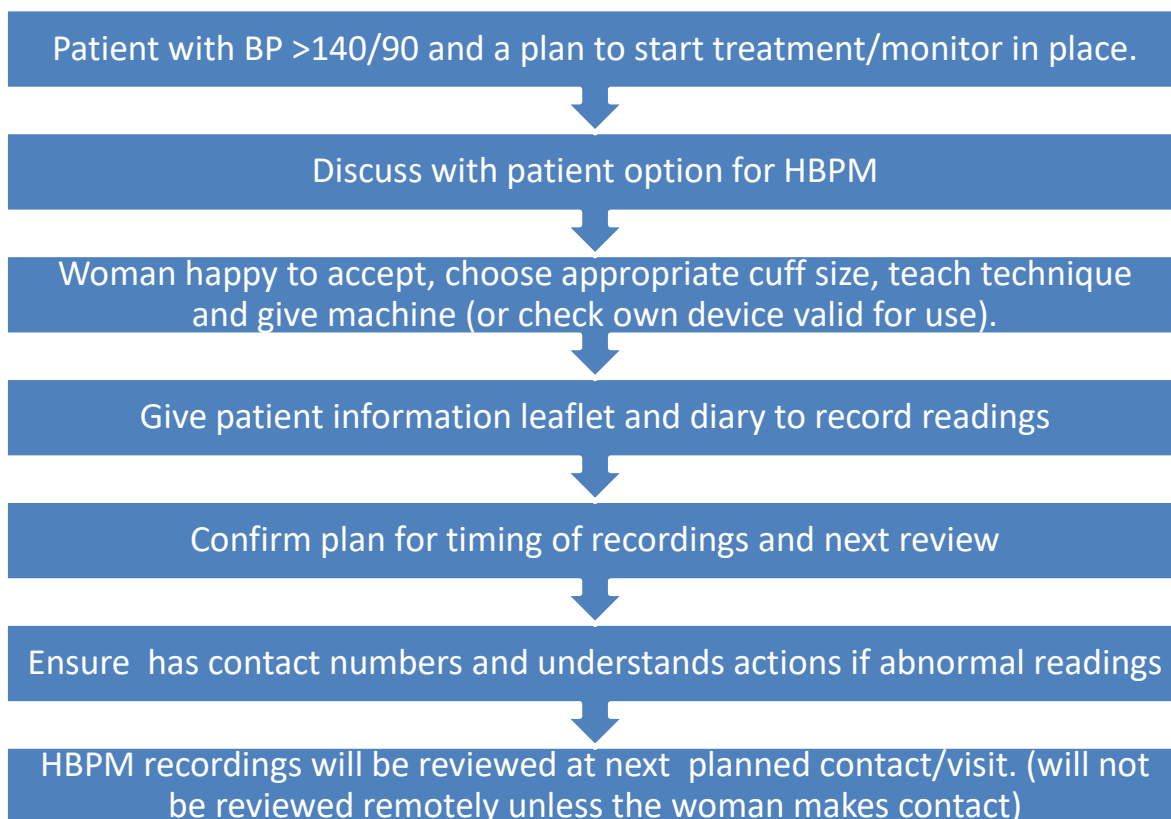
Inclusion criteria:

- Any woman with hypertension in pregnancy
 - Gestational Hypertension (GH)
 - Chronic Hypertension
 - White Coat Hypertension / 'borderline BP profiles'
- Women who have a confirmed diagnosis of Pre-eclampsia (PET) suitable for outpatient management may have HBPM initiated as part of an individualised plan of care by a Consultant.
- Women at increased risk of hypertensive disease in pregnancy who require more frequent monitoring (eg autoimmune disease, pre-existing diabetes, previous PET etc)

Exclusion Criteria:

- Declines HBPM
- Severe, uncontrolled hypertension or preeclampsia with adverse features that requires inpatient care (HBPM can be offered the woman improves clinically and is appropriate for outpatient care).

17.3 Initiating HBPM:



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Provision of a monitor:

Blood pressure monitors should be validated for use in pregnancy, in pregnancy hypertension and preeclampsia, or be considered to have full equivalency with a device that is validated.

See Home BP monitoring devices suitable in pregnancy section 19

If the woman already has her own device, check the monitor is on the list of approved devices, if not arrange for the loan of a home BPM

The machines provided to patients are Microlife® automatic machines

Each patient will be loaned their own machine for the duration of monitoring in pregnancy.

An appropriate cuff size should be provided for the patient (see table)

Cuff size selection (Microlife)

Cuff size	for circumference of upper arm
S	17 - 22 cm (6.75 - 8.75 inches)
M	22 - 32 cm (8.75 - 12.5 inches)
L	32 - 42 cm (12.5 - 16.5 inches)

Teaching technique:

- Advise the patient to take their BP when they are relaxed and have been sitting down for 5 minutes. They should take their BP from the same arm each time.
- Demonstrate to the patient how and where to site the cuff. The bottom edge of the cuff should sit 2cm above the antecubital fossa (elbow fold) and the artery mark on the cuff should line up with the brachial artery (the inside front of the arm). The cuff should be done up so that it stays on, but not too tightly.
- Demonstrate to the patient how to start the machine to record the BP (Press the 'POWER' button once and it will automatically start recording).
- Once recorded, show them which numbers to record as systolic and diastolic BP. Demonstrate the re-call function to obtain the last recorded BP.
- If the patient is to perform urinalysis at home, show them how to use the dipsticks.

Signpost the patient to the Patient Information leaflet or give a written copy

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17.4 Antenatal Home Blood pressure readings and actions:

Blood Pressure	Level	Action
SYS 160 or more OR DIA 110 or more	Very High	Your blood pressure is very high. Sit quietly for 5 min and repeat blood pressure reading. If this is a repeat reading: Contact the Advice line immediately and arrange urgent assessment.
SYS 150-159 OR DIA 100-109	High	Your blood pressure is high. Sit quietly for 5 min and repeat blood pressure reading. If this is a repeat reading: Contact the Advice line and arrange assessment within 24hrs.
SYS 140-149 OR DIA 90-99	Raised	Your blood pressure is raised. Sit quietly for 5 min and repeat blood pressure reading. If this is a repeat reading: Contact Advice line and your Maternity Unit will contact you with advice within 24hrs. Please measure and record daily
SYS 135-139 OR DIA 84-89	High Normal	Your blood pressure is normal but moving towards the raised threshold. Sit quietly and repeat the reading in 5 minutes. If still high normal then please measure and record daily.
SYS 110-134 AND DIA 70-84	Normal	Your blood pressure is normal Continue with blood pressure monitoring and your current care.
SYS 109 or less AND DIA 69 or less	Low	If you are not taking blood pressure medication: Your blood pressure is normal. If you feel well this does not need any action. If you are taking blood pressure medication: Repeat your reading and if still low contact the Advice line and your Maternity Unit will contact you within 24hrs – we may need to reduce your medication. If you feel unwell (dizzy, faint etc) omit your dose and call the Advice line.

Surrey Heartlands Pregnancy Advice Line: 0300 123 5473

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17.5 Ongoing management HBPM

Follow-up:

Patients must be given a clear plan for how often to check their BP (+/- urine) and the timing of their next appointment.

- When patients return for follow-up in MAC / DAU, their HBPM recordings should be reviewed by the midwife/doctor
- Patients should be asked about symptoms of pre-eclampsia and fetal movements.

Patients on HBPM who are admitted to hospital:

- Unless specified by a Consultant, patients who have been using HBPM should have their blood pressure recorded by a healthcare professional whilst an inpatient. Standard BP machines should be used and the results should be documented on VitalPac

Timing of delivery:

The optimal timing of delivery should be discussed on an individual basis as per the Hypertension guideline.

17.6 Postnatal Home BP monitoring:

- If HBPM is to continue after delivery, arrangements must be made to return the BP machine to Maternity in due course.
- 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.

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17.7 Home BP monitoring devices suitable in pregnancy

A list of validated blood pressure monitors is maintained on the STRIDE BP website, an international scientific non-profit organization operating in affiliation with the European Society of Hypertension, the International Society of Hypertension and the World Hypertension League.

<https://stridebp.org/bp-monitors>

Blood pressure monitors should be validated for use in pregnancy, in pregnancy hypertension and preeclampsia, or be considered to have full equivalency with a device that is validated

(see 'Criteria for equivalent blood pressure measurement function of new devices compared to previously validated ones')

<https://www.stridebp.org/about-us/principles-for-device-listing>

The following information is taken from the STRIDE BP website:1

Preferred devices: are upper-arm cuff devices with at least one STRIDE BP approved validation study published within the last 10 years. Preferred devices for home use should also allow automated storage of multiple readings, or mobile phone, PC or internet link connectivity enabling data transfer.

Validated devices: have passed established validation procedures that have been checked and approved by the STRIDE BP Scientific Advisory Board.

Validated devices (2020 – check website above):

- Andon iHealth Track
- Microlife 3AS1-2
- Microlife WatchBP Home
- Microlife WatchBP Home A
- Microlife BP 3BTO-A Omron MIT
- Omron Evolv (HEM-7600T-E)
- Omron HEM-9210T
- Omron M3 Comfort (HEM-7134-E)
- Omron M6 Comfort (HEM-7321-E)
- Omron M7 Intelli IT (HEM-7322T-E)
- Omron M7 (HEM-780-E)

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18.0 Antenatal Oral Antihypertensive Agents

Suitable for women with chronic hypertension, gestational hypertension and chronic hypertension

Drugs for the treatment of antenatal hypertension in pregnancy

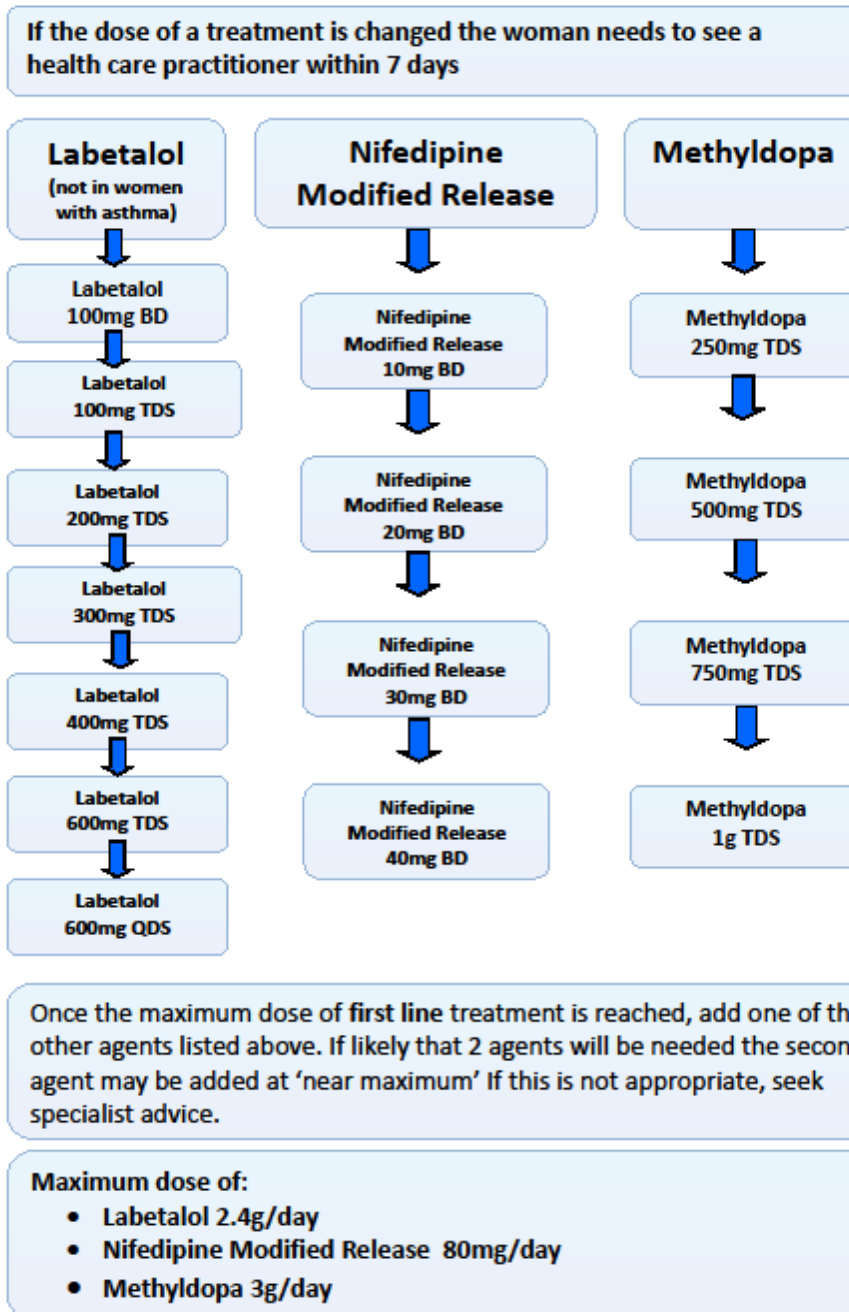
Preferred agents	Dose (see incremental regime)	Comments
Labetalol	Start at 100mg bd	Contraindicated in current asthma. Less effective in Afro-Caribbean.
Nifedipine MR	Start at 10mg bd	May cause headache, flushing, peripheral oedema (at doses above 90mg/d)
Methyldopa	Start at 250 mg tds	May cause lethargy and dizziness or rarely depression There is no evidence to support a loading dose
Doxazocin	1mg od – 8 mg bd	Alternative therapy if the other drugs are already being used or are contraindicated or not tolerated.
Contraindicated:		
ACE inhibitors and ARB	Stop before pregnancy	Contraindicated antenatally because of fetotoxicity (i.e., renal failure, oligohydramnios, and stillbirth). See UKTIS for detailed guidance

ACE (angiotensin converting enzyme), ARB (angiotensin receptor blockers)

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19.0 Incremental Dosing Regime antihypertensives during pregnancy

Suggested incremental dosing regimen for community and hospital prescribers
Target blood pressure on treatment is 135 / 85 (NICE 2019)



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20.0 Postnatal oral antihypertensive agents

Suggested drugs and regimes for the treatment of hypertension in the post-partum period:

Agent	Dose	Comments
Single agent -Short term use likely or woman prefers to continue with antenatal medication		
Labetalol	Continue antenatal dose Or start at 100mg bd	Contra-indicated if ASTHMA
Nifedipine MR	Continue antenatal dose Or start at 10mg bd	Use as first line in Afro-Caribbean May cause headache
Single agent – longer term use likely or woman prefers switch to once daily regime		
Enalapril	Start at 5mg Dose 5-20mg	Preferred agent for long term, once daily regime Check K ⁺ and renal function May cause syncope
Amlodipine	5mg - 10mg od	May cause headache, flushing, nausea
Suggested order if 2 or 3 agents required to control BP		
Enalapril	start at 2.5mg if already on treatment increase to 5mg and above as tolerated	Check K ⁺ and renal function May cause syncope
Amlodipine -if already on beta blocker	5-10mg	May cause headache, flushing, nausea
Atenolol – if on Calcium channel antagonist	25-50mg od	Contra-indicated if ASTHMA

21.0 Postnatal Care Plan: Chronic Hypertension

Dear General Practitioner and Community Midwife,

___/___/20__

Re:

<p>Affix Sticker here</p> <p>Name: _____</p> <p>MRN/Hospital No: _____</p>

Date of delivery: ___/___/___

Date of discharge: ___/___/___

Most women with chronic hypertension will be discharged home on medication suitable for long term use. These will be reviewed by the GP at 2 weeks and adjusted if needed. If additional agents have been needed for control in late pregnancy then specify below if a reducing regime approach is required.

The antihypertensive regime prior to pregnancy was:

Drug	Dose	Frequency

The discharge antihypertensives are:

Drug	Dose	Frequency	Does this dose require reducing after discharge?

Discharge home with a 2 week supply of medication

If symptoms of postpartum pre-eclampsia develop such as severe headache or epigastric pain please contact the Surrey Heartlands Pregnancy Advice line on 0300 123 5473

Blood pressure should be monitored:

- Daily Day 1 and 2.
- At least once between Day 3 and Day 5
- 2 days after any change of antihypertension medication
- On day of discharge from community midwife care

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Follow management plan below:

Blood Pressure	Level	Action
≥160/110 mmHg OR symptoms:	Very High	Arrange same-day urgent hospital review
150-159/100-109 (no symptoms)	High	Increase medication GP or hospital review within 24 hrs
140-149/90-99	Raised	Arrange repeat in 48hrs If repeated reading - increase medication
130-139/80-89	Normal	Continue with current regime
BP less than 130/80	Low	Reduce medication Repeat in 48 hrs

Medication Reducing Regimes (if needed):

Labetalol reducing regime:		Nifedipine reducing regime:	
Current dose	Reduce to	Current dose	Reduce to
600mg tds	400mg tds	40mg bd	30mg bd
400mg tds	300mg tds	30mg bd	20mg bd
300mg tds	200mg tds	20mg bd	10mg bd
200mg tds	100mg tds	10mg bd	STOP
100mg tds	100mg bd		
100mg bd	STOP		

If dose change arrange repeat BP check in 48hrs

If a medication dose increase is needed advise the woman to increase to the previous dose and arrange review within 48hrs as per the table above

Please arrange GP review if still on medication 2 weeks post delivery

Women with hypertension in pregnancy are at increased risk of recurrence in future pregnancies, as well as hypertension and cardiovascular disease (such as stroke) in later life. Therefore, these women require long term surveillance. Please advise women regarding weight loss and diet where appropriate and consider performing NHS Health Checks according to the recommended schedule.

22.0 Postnatal Care Plan: Gestational Hypertension

Dear General Practitioner and Community Midwife,

___/___/20__

Re:

Affix Sticker here
Name: _____
MRN/Hospital No: _____

Date of delivery: ___/___/___

Date of discharge: ___/___/___

The discharge antihypertensives are:

Drug	Dose	Frequency

Discharge home with a 2 week supply of medication

If symptoms of postpartum pre-eclampsia develop such as severe headache or epigastric pain please contact the Surrey Heartlands Pregnancy Advice line on 0300 123 5473

Blood pressure should be monitored:

- Daily Day 1 and 2.
- At least once between Day 3 and Day 5
- 2 days after any change of antihypertension medication
- On day of discharge from community midwife care

Follow management plan below:

Blood Pressure	Level	Action
≥160/110 mmHg OR symptoms:	Very High	Arrange same-day urgent hospital review
150-159/100-109 (no symptoms)	High	Increase medication GP or hospital review within 24 hrs
140-149/90-99	Raised	Arrange repeat in 48hrs If repeated reading - increase medication
130-139/80-89	Normal	Continue with current regime

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BP less than 130/80	Low	Reduce medication Repeat in 48 hrs
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Medication Reducing Regimes:

If on more than one drug reduce and stop one first and then reduce the other, order does not clinically matter.

Most women will require treatment for the same duration postnatally as they needed treatment before delivery.

Labetalol reducing regime:		Nifedipine reducing regime:	
Current dose	Reduce to	Current dose	Reduce to
600mg tds	400mg tds	40mg bd	30mg bd
400mg tds	300mg tds	30mg bd	20mg bd
300mg tds	200mg tds	20mg bd	10mg bd
200mg tds	100mg tds	10mg bd	STOP
100mg tds	100mg bd		
100mg bd	STOP		

If dose change arrange repeat BP check in 48hrs

If a medication dose increase is needed advise the woman to increase to the previous dose and arrange review within 48hrs as per the table above

Please arrange GP review if still on medication 2 weeks post delivery

Women with hypertension in pregnancy are at increased risk of recurrence in future pregnancies, as well as hypertension and cardiovascular disease (such as stroke) in later life. Therefore, these women require long term surveillance. Please advise women regarding weight loss and diet where appropriate and consider performing NHS Health Checks according to the recommended schedule.

23.0 Postnatal Care Plan: Pre-eclampsia

Dear General Practitioner and Community Midwife,

___/___/20__

Re:

Affix Sticker here
Name: _____
MRN/Hospital No: _____

Date of delivery: ___/___/___

Date of discharge: ___/___/___

The discharge antihypertensives are:

Name	Signature	Date
Drug	Dose	Frequency

Discharge home with a 2 week supply of medication

If symptoms of postpartum pre-eclampsia develop such as severe headache or epigastric pain please contact the Surrey Heartlands Pregnancy Advice line on 0300 123 5473

Blood pressure should be monitored:

- Daily Day 1 and 2.
- At least once between Day 3 and Day 5
- On alternate days until BP normal and off medication
- 2 days after any change of antihypertension medication

Follow management plan below:

Blood Pressure	Level	Action
≥160/110 mmHg OR symptoms:	Very High	Arrange same-day urgent hospital review
150-159/100-109 (no symptoms)	High	Increase medication GP or hospital review within 24 hrs

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140-149/90-99	Raised	Arrange repeat in 48hrs If repeated reading - increase medication
130-139/80-89	Normal	Continue with current regime
BP less than 130/80	Low	Reduce medication Repeat in 48 hrs

Medication Reducing Regimes:

If on more than one drug reduce and stop one first and then reduce the other, order does not clinically matter.

Labetalol reducing regime:		Nifedipine reducing regime:	
Current dose	Reduce to	Current dose	Reduce to
600mg tds	400mg tds	40mg bd	30mg bd
400mg tds	300mg tds	30mg bd	20mg bd
300mg tds	200mg tds	20mg bd	10mg bd
200mg tds	100mg tds	10mg bd	STOP
100mg tds	100mg bd		
100mg bd	STOP		

If dose change arrange repeat BP check in 48hrs

If a medication dose increase is needed advise the woman to increase to the previous dose and arrange review by GP or hospital within 48hrs

Please arrange GP review if still on medication 2 weeks post delivery

Women with hypertension in pregnancy are at increased risk of recurrence in future pregnancies, as well as hypertension and cardiovascular disease (such as stroke) in later life. Therefore, these women require long term surveillance. Please advise women regarding weight loss and diet where appropriate and consider performing NHS Health Checks according to the recommended schedule.

If the pre-eclampsia led to delivery before 34 weeks or was complicated by HELLP syndrome or eclampsia arrange postnatal follow up with the Maternal Fetal Medicine Team

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24.0 Chronic Hypertension Care Pathway

Note: Poorly controlled hypertension, superimposed pre-eclampsia or other clinical concerns will require individualised timing of reviews and delivery

Gestation	Who	Plan
Booking	Community Midwife or Complex care team	<ul style="list-style-type: none"> Baseline investigations: FBC, U+E, LFT, PCR, MSU Signpost / give aspirin information leaflet Refer to Complex Care Team Schedule scans for Tues morning Check medication suitable in pregnancy
12-16/40	Obstetric Medicine ANC	<ul style="list-style-type: none"> Discuss risks in pregnancy Start aspirin 150mg once daily at night at 12/40 Offer Home Blood Pressure Monitoring Review anti-hypertensives and set target BP Consider Ix for secondary causes Signpost / give patient information leaflet
22/40	Obstetric Medicine ANC	<ul style="list-style-type: none"> Anomaly and Uterine Artery Doppler Consultant review in Obs medicine ANC Review Ix, target BP and control
24/40	MW	<ul style="list-style-type: none"> BP review Review BP frequency plan
28/40	MW	<ul style="list-style-type: none"> (Growth USS if ↑UtAd) 28/40 bloods, +/- anti D Whooping cough vaccine (may be given 16 to 32 weeks)
30/40	MW	<ul style="list-style-type: none"> BP check
32/40	MW	<ul style="list-style-type: none"> Growth scan
34/40	MW	<ul style="list-style-type: none"> BP review

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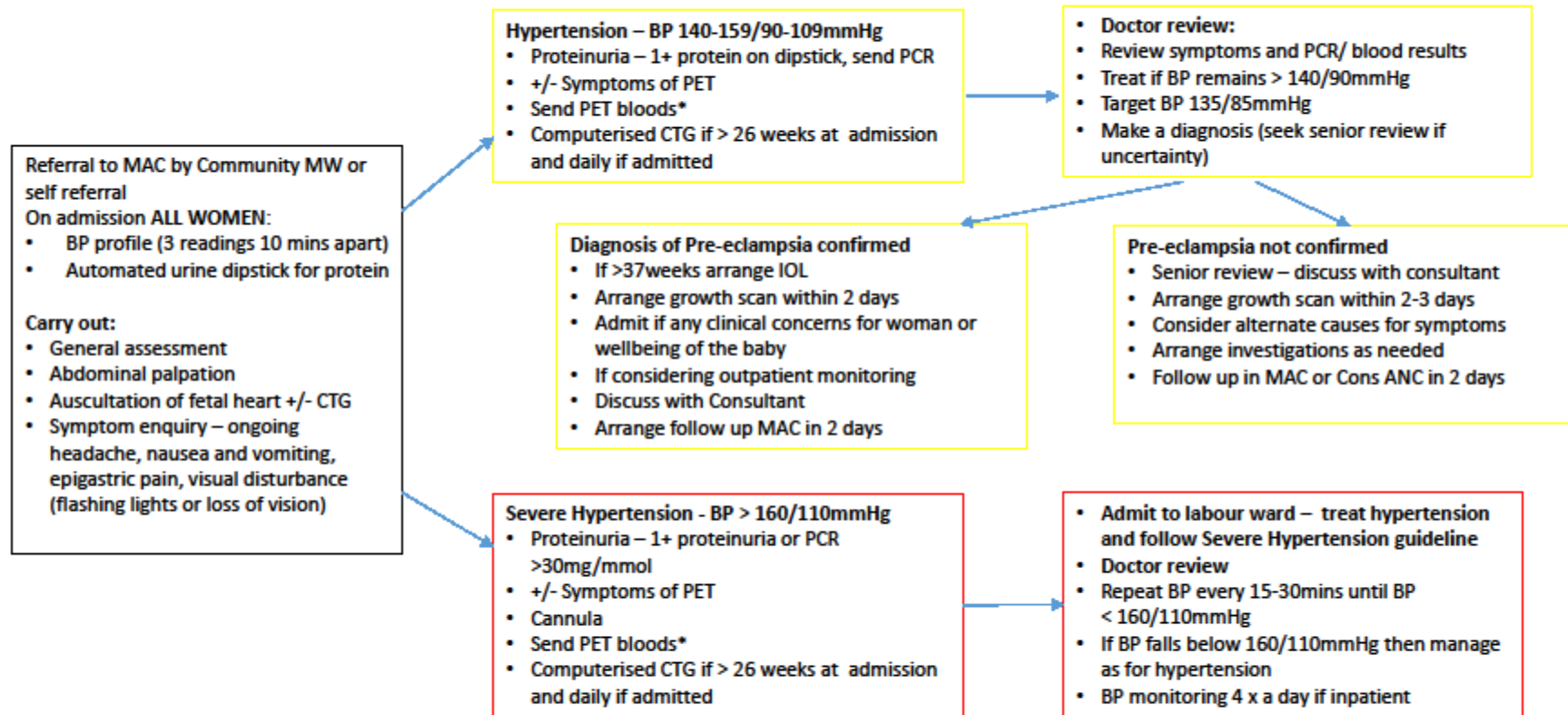
		<ul style="list-style-type: none"> Schedule more frequent follow up if BP targets not met or any clinical concern
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Gestation	Who	Plan
36/40	Obstetric medicine ANC	<ul style="list-style-type: none"> Growth USS Discuss timing of delivery at 39-40 weeks unless clinical concerns (offer IOL / planned birth)
38/40	M/W	<ul style="list-style-type: none"> BP check Offer sweep if IOL planned at 39 weeks
40-41/40	Obstetric medicine ANC	<ul style="list-style-type: none"> Obstetric review if delivery by 39-40 weeks declined
Postnatal	MW / GP	<ul style="list-style-type: none"> Midwife daily BP day 1 and 2, then 1x day3-5 GP 2weeks and 6 weeks Obstetric medicine clinic if complex

Note: Poorly controlled hypertension, superimposed pre-eclampsia or other clinical concerns will require individualised timing of reviews and delivery.

25.0 Flowchart suspected pre-eclampsia MAC

MAC – Immediate Management of Pregnancy with Suspected Pre-eclampsia



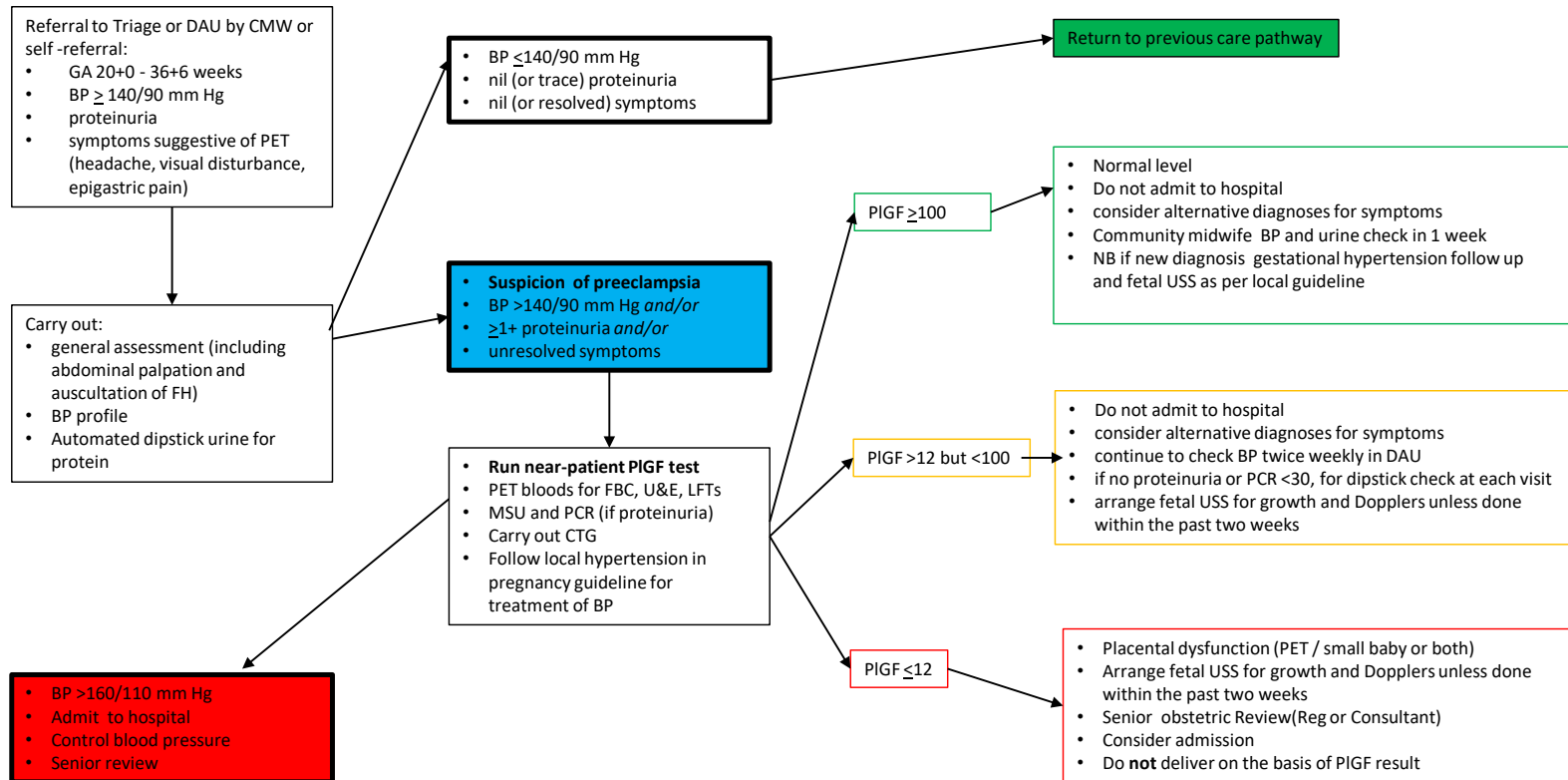
*PET bloods - FBC, LFT's and U/E's, only send clotting if Platelets <100 or ALT >40

NICE Guidance on Hypertension in Pregnancy Diagnosis and Management – NG133

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26.0 Flowchart for PIGF testing

PIGF flowchart ASPH 2019

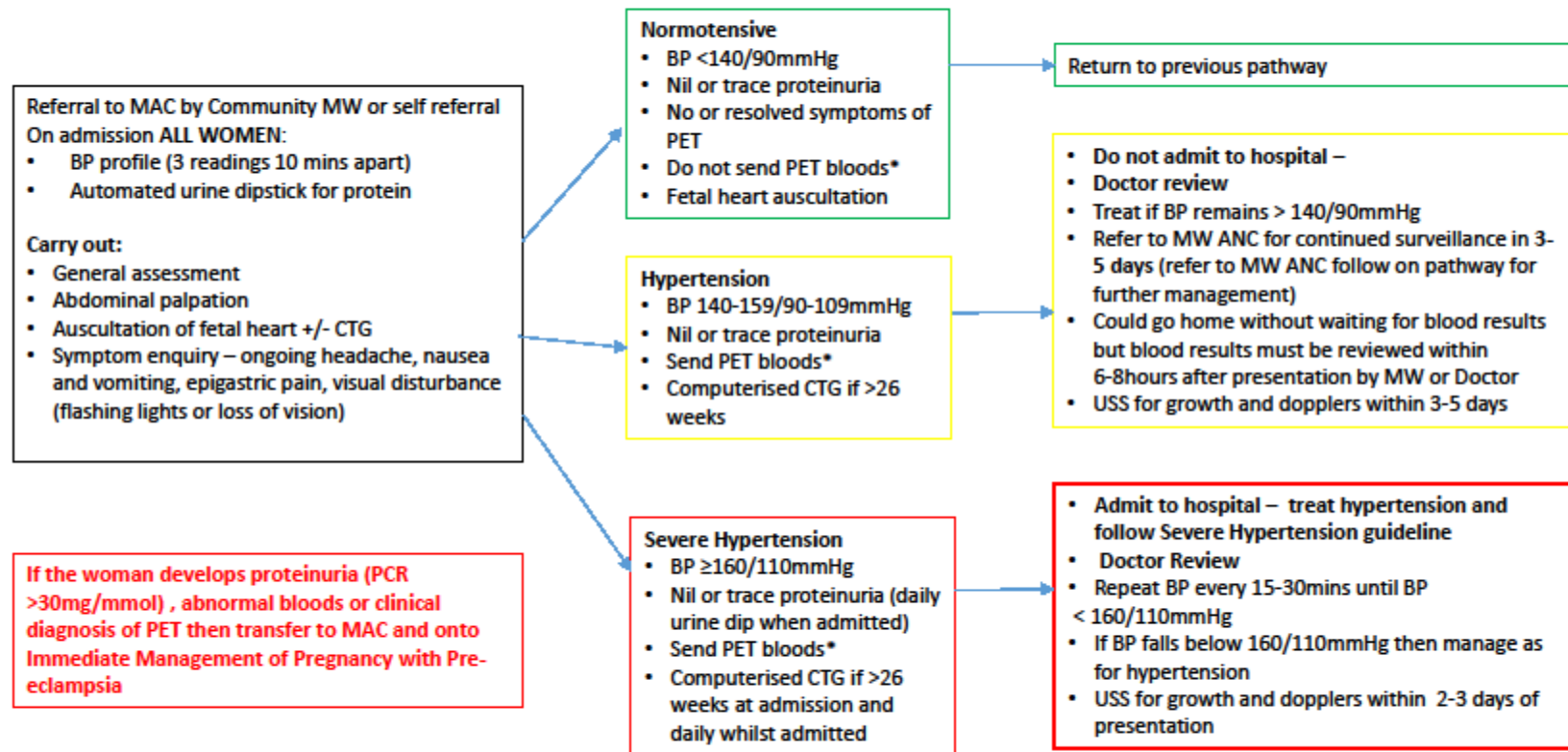


Based on Duhig et al Lancet 2019, integrated with NICE 2019 (NG133)

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27.0 Flowchart gestational hypertension MAC

MAC – Immediate Management of Pregnancy with Gestational Hypertension



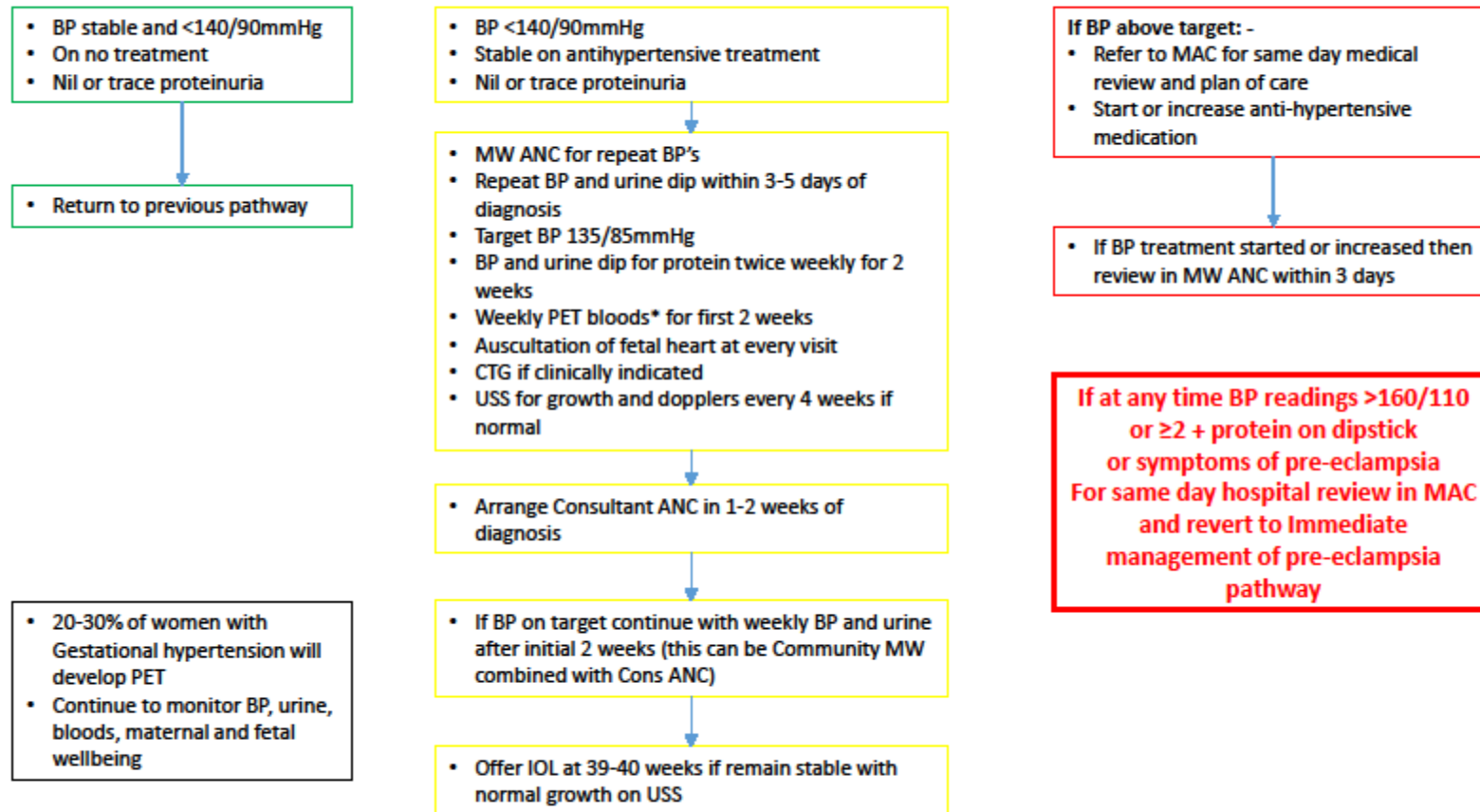
*PET bloods - FBC, LFT's and U/E's, only send clotting if Platelets <100 or ALT >40

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28.0 Flowchart ongoing management gestational hypertension

MW ANC - Follow on Management of Pregnancy with Gestational Hypertension



• 20-30% of women with Gestational hypertension will develop PET
• Continue to monitor BP, urine, bloods, maternal and fetal wellbeing

*PET bloods - FBC, LFT's and U/E's, only send clotting if Platelets <100 or ALT >40

NICE Guidance on Hypertension in Pregnancy Diagnosis and Management – NG133

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29.0 Severe Hypertension Treatment Flowchart

BP \geq 160/110mmHg requires prompt medical treatment.

- Aim to steadily reduce BP to $<$ 150/100
- Check blood pressure with the correct sized cuff
- Consider current treatment, overall clinical picture and allergies / asthma / contraindications

Oral Nifedipine 10mg modified release (preferred choice)
Use 20mg MR if BP $>$ 180/120

Check blood pressure with the correct sized cuff

Oral Labetalol 100mg (if Nifedipine contraindicated)
Use 200mg if BP $>$ 180/120

Check blood pressure with the correct sized cuff

Check blood pressure every 15 minutes until controlled
Admit to observation bay labour ward

BP $>$ 150/100 after 15min
Repeat oral 10mg Nifedipine
Measure again in 15 mins and repeat if needed

BP $>$ 150/100 after 15min
Repeat oral 100mg Labetalol
Measure again in 15 mins and repeat if needed

Check blood pressure every 15 minutes until controlled
Then every 30-60 minutes

80% of cases will achieve control with oral treatment by 60 minutes

Maximum doses:

- 40mg Nifedipine
- 400mg Labetalol

Consider adding second agent if response inadequate

If BP $>$ 160/110mmHg after 2 hours consider intravenous antihypertensives (involve Consultant on call)

1. Intravenous Labetalol (preferred option)
2. Intravenous Hydralazine (second option if Labetalol contraindicated eg asthma)

30.0 Severe Pre-eclampsia Protocol

Severe PET protocol

Admit to labour ward observation bay for Enhanced Maternal Care (1 to 1 midwifery care):

- IV access (PET bloods, clotting and G+S)
- TEDS
- Keep NBM unless instructed otherwise
- Hourly observations (minimum) VitalPac
 - BP, pulse, RR, pulse oximetry and AVPU
- Oral omeprazole 20mg 12 hrly
- Repeat PET bloods every 6 hours

Control Blood pressure – aim for BP<150/100

- Continue oral antihypertensives
- If BP >160/110 follow severe hypertension pathway

Fluid Balance

- Insert urinary catheter with a urometer
- Document all fluid intake and urinary output hourly on BadgerNet
- Fluid restrict to 85mls/hr (to include all intravenous and oral fluids)
- Infusion pumps for the administration of all fluids

Prevention seizures - MgSO₄ protocol to reduce the risk of seizures

See Appendix

Fetal wellbeing

- Continuous CTG if >26 weeks
- Fetal heart auscultation if <26 weeks
- Review previous growth scans
- Preterm - consider need for steroids and MgSO₄ and inform NICU

Delivery Planning

- Decision for timing and mode of delivery must be taken at consultant level
- Involve MDT and document discussions

Intrapartum care

- Continue severe PET protocol monitoring
- Epidural if not contraindicated
- Do not limit second stage unless severe hypertension
- Active management third stage (avoid Ergometrine)

Post Delivery

- Fluid restrict to 85ml/hour
- Monitor urine output and fluid balance hourly
- Enhanced Maternal Care on Delivery Suite for at least 24 hours

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- Bloods 6 hourly until step down from severe PET protocol
- No NSAIDs

Stepdown - usually 24-48hrs after delivery

Once resolution of symptoms, diuresis and improving biochemical / haematological parameters

- Follow postnatal care in pre-eclampsia (section 9.6) for ongoing care
- Do not measure fluid balance if creatinine is normal
- SBAR handover to postnatal ward and detailed plan

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31.0 Labetalol Intravenous Protocol

Labetalol Intravenous Protocol

This is for the safe reduction in blood pressure if BP is $\geq 160/100$ mmHg and the woman has not responded to oral medication or unable to tolerate oral treatment.

- Target blood pressure 140mmHg-150mmHg systolic
- Commence continuous CTG if >26 weeks

Labetalol Bolus - For safe reduction in blood pressure

- 50mg over five minutes via infusion pump / driver.
- If necessary, doses of 50mg can be repeated at 15 minute intervals until a satisfactory response occurs.
- The total dose should not exceed 200mg
- Monitor blood pressure every 5 minutes
- Consider need for arterial line in women who requiring intravenous antihypertensive

Labetalol Infusion - For the maintenance of blood pressure control

- Give undiluted
- Add 50mls (i.e 2.5 ampoules) of Labetalol in a 50ml syringe
- This makes a concentration of 5mg/ml
- Use an infusion pump
- Maximum dose 160mgs/hr
- Monitor blood pressure and heart rate every 30minutes

Labetalol Infusion: Rate and Dosage

	Rate	Dose
Start	4ml/hr	20mg/hr
30 mins	8ml/hr	40mg/hr
60 mins	16ml/hr	80mg/hr
90 mins	32ml/hr	160mg/hr

Weaning of Labetalol infusion

- Once BP $<150/100$
- Wean up to 10mg every 30 minutes (2mls every 30 minutes)
- Start regular oral anti-hypertensives

Possible adverse effects – **contraindication severe asthma and cardiac failure**

Potentially serious adverse cardiovascular effects include excessive postural hypotension and bradycardia

Bronchospasm may occur in susceptible individuals. Avoid in asthma

Extravasation may cause tissue damage

Additional Information

To avoid excessive postural hypotension, patients should remain semi recumbent during, and for 3 hours following the administration of the drug

Excessive bradycardia can be reversed by atropine sulphate 600mcg in divided doses (maximum dose 2.4mg) with anaesthetic input

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32.0 Hydralazine Intravenous Protocol

Hydralazine Intravenous Protocol

This is for the safe reduction in blood pressure if BP is $\geq 160/100$ mmHg and the woman has not responded to oral medication or unable to tolerate oral treatment.

3rd choice agent where Labetalol / Nifedipine contraindicated or 3rd line needed

- Target blood pressure 140mmHg-150mmHg systolic
- Commence continuous CTG if >26 weeks
- Consider 500ml preload IV fluid if antenatal over 20mins

Hydralazine Bolus - For safe reduction in blood pressure

- Each ampoule contains 20mg of hydralazine
- Dissolve hydralazine in 1ml of water for injection
- Make this up to 20ml with normal saline (concentration of 1mg/ml)
- 5mg dose IV over 5min (1mg=1ml/min).
- Measure BP every 5 minutes
- Dose can be repeated every 20 minutes to a maximum of 20mg total (4doses)

The woman may not require this entire dose. Watch and wait if there appears to be a decrease in the BP. Remember the cumulative effect of hydralazine.

Hydralazine Infusion - For the maintenance of blood pressure control (not always required)

- Dilute 40mg of hydralazine in 40ml of normal saline (1mg/ml)
- Use a syringe driver
- Monitor blood pressure and heart rate every 30minutes
- Reduce or stop infusion if maternal pulse >120bpm

Hydralazine Infusion Rate and Dosage:

	Rate	Dose
Start	2.4ml/hr	2.4mg/hr
30 mins	4.8ml/hr	4.8mg/hr
60 mins	7.2ml/hr	7.2mg/hr
90 mins	9.6ml/hr	9.6mg/hr

Weaning of hydralazine infusion

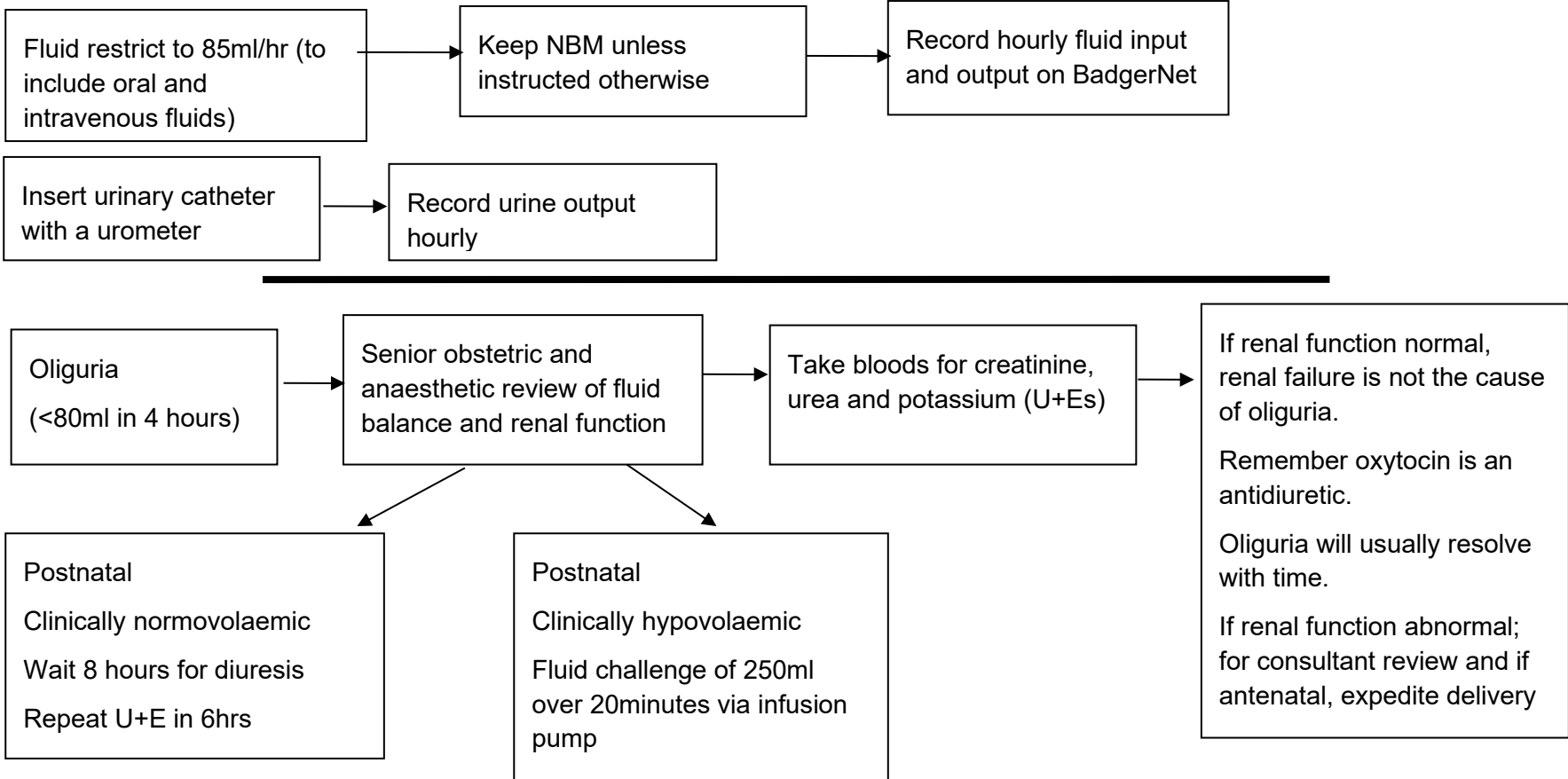
- Once BP <150/100
- Wean up to 0.6-1.2mg every 30 minutes (0.6-1.2mls every 30 minutes)
- Start regular oral anti-hypertensives

Possible adverse effects- **Contraindications Idiopathic SLE and high output cardiac failure**

- Maternal Tachycardia
- Headaches
- Flushing
- Maternal hypotension and CTG abnormalities

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33.0 Fluid Management in severe PET Flowchart



34.0 Magnesium Sulphate Protocol

Magnesium Sulphate Protocol

Initial treatment (loading dose)

- 4g (40ml) 10% MgSO₄ infused IV over 20 minutes.

Followed by maintenance dose

- 1g (10ml)/hour IV 10% MgSO₄

Duration of Infusion

- 24 hours after delivery or 24 hours after last seizure

Contraindications

- Neuromuscular disease
- Myasthenia gravis
- Renal disease is not a contraindication but reduce maintenance infusion (see below)

Monitoring

Patellar reflex

- After completion of loading dose
- Hourly whilst on maintenance dose (use arm reflexes in women with epidural)

Respiratory

- Respiratory rate every 30 minutes.
- Should be >10 breaths/minute
- Pulse oximetry throughout treatment
- Maintain sats >95%

Pulse, blood pressure and ECG

- Every 15 minutes after loading dose for 1 hour then every 30 minutes
- Continuous ECG monitoring

Fetal monitoring

Commence CTG if >26 weeks

Toxicity

- Loss of patella reflexes, weakness, nausea
- Feeling of warmth, flushing, somnolence
- Double vision, slurred speech, muscle paralysis,
- Respiratory arrest, cardiac arrest

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MgSO₄ protocol - Serum Magnesium Levels and Dose Alteration

Send serum Magnesium every 6 hours levels if:

- Urine output < 80ml over 4hr
- Evidence of renal impairment (Creatinine > 90)
- Recurrent seizures
- Suspected / previous toxicity

If none of the above and no toxicity - levels not required

Oliguria / Renal impairment (< 80ml/4 hours or creatinine > 90mmol/L)

Reduce maintenance infusion to 0.5g/hr and monitor levels every 6hrs

Serum Magnesium indicated:

Mark 'urgent' and ask the laboratory to phone results

Therapeutic Range: 2-4 mmol/l

Serum Magnesium level

Actions

> 4mmol/L

Stop maintenance dose if suspected toxicity or decrease to 0.5g/hr depending on level

1.7-2.0mmol/L

If woman is stable continue on 1g/hr maintenance dose

Serum Magnesium level in 2 hours

If < 2.0mmol/l on repeat - Increase maintenance dose to 1.5g/h

< 1.7mmol/L

Consider further 2g bolus IV over 20 minutes

Increase maintenance dose to 1.5g/hr

Serum Magnesium level in 2 hours

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MgSO4 protocol - Suspected Toxicity and management

Symptoms and Signs

- Loss of patella reflexes, weakness, nausea
- Feeling of warmth, flushing, somnolence
- Double vision, slurred speech, muscle paralysis,
- Respiratory arrest, cardiac arrest

Loss of reflexes / suspected toxicity

- Stop maintenance infusion.
- Send blood for Mg level. Mark 'urgent'.
- Inform senior Obstetrician and duty Anaesthetist.
- Withhold further Mg until reflexes return or blood levels known. Restart at 0.5g/hr and check levels at 1hr

Oxygen saturation persistently <95%

- Commence oxygen (4L/min) by mask
- Stop maintenance infusion and send Mg level
- Inform duty Anaesthetist
- Exclude pulmonary oedema

Cardio-respiratory arrest

- Call 2222 – 'adult cardiac arrest' and institute CPR
- Stop Magnesium infusion
- Give (1g) 10ml 10% calcium gluconate IV slowly
- Intubate and ventilate.
- Send blood for Magnesium level to lab urgently

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35.0 Eclampsia Emergency Management

Emergency Management of Eclampsia

Do not leave patient alone – emergency buzzer

Call for help: Phone 2222 and ask for 'obstetric emergency'.

Contact switchboard to contact the consultant obstetrician and consultant anaesthetist

Assess ABC

Airway: Assess, maintain patency and apply oxygen 15litres

Breathing: Protect airway and ventilate as required.

Turn patient into semi-prone left lateral

Circulation: check pulse and BP

If pulse and BP absent – initiate CPR and dial 2222 for 'adult cardiac arrest'

Immediate actions:

Get Eclampsia box

- Secure IV access x2
- Send PET bloods, G+S, clotting & VBG
- Prepare MgSO₄ loading dose
- Attach pulse oximeter
- Insert catheter with urometer – test for protein
- Measure blood pressure every 5 minutes
- Assign scribe – document observations

Control seizures:

MgSO₄ loading dose 4g over 5 minutes

Followed by maintenance 1g/hr

If seizures continue or recur: additional 2g bolus of Magnesium

If this fails consider Diazepam 10mgs IV and ITU / imaging

Control hypertension

Follow severe hypertension treatment if BP>160/110

Treat with IV antihypertensive if drowsy / fitting

Fetal assessment once mother stabilised

Commence CTG if > 26 weeks gestation

Delivery planning

Plan for delivery if not postnatal

Stabilise and await bloods before delivery

Ongoing monitoring as per Severe Pre-eclampsia Protocol

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36.0 References

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