Milton Keynes University Hospital NHS Foundation Trust

# Title: Hypertensive Disorders of Pregnancy (including Pre-eclampsia and Eclampsia)

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|---|---|
| **Classification**: | Guideline |
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**Guideline to be followed by (target staff): all staff- maternity**

**To be read in conjunction with the following documents:** None

**CQC Fundamental standards:**
Regulation 9 – person centred care
Regulation 10 – dignity and respect
Regulation 11 – Need for consent
Regulation 12 – Safe care and treatment
Regulation 13 – Safeguarding service users from abuse and improper treatment
Regulation 14 – Meeting nutritional and hydration needs
Regulation 15 – Premises and equipment
Regulation 16 – Receiving and acting on complaints
Regulation 17 – Good governance
Regulation 18 – Staffing
Regulation 19 – Fit and proper

## Disclaimer –

Since every patient's history is different, and even the most exhaustive sources of information cannot cover every possible eventuality, you should be aware that all information is provided in this document on the basis that the healthcare professionals responsible for patient care will retain full and sole responsibility for decisions relating to patient care; the document is intended to supplement, not substitute for, the expertise and judgment of physicians, pharmacists or other healthcare professionals and should not be taken as an indication of suitability of a particular treatment for a particular individual.

The ultimate responsibility for the use of the guideline, dosage of drugs and correct following of instructions as well as the interpretation of the published material **lies solely with you** as the medical practitioner.

# Index

## Guideline Statement

To enable staff to care for women who have hypertension in pregnancy.

In this guideline, we use the terms maternity service user, woman and women's health. We acknowledge however that some maternity service users who do not identify as women will use our services. We aim to give all those who access the maternity service have appropriate, inclusive and care sensitive to their individual needs.

## Executive Summary

Hypertensive disorders of pregnancy occur in up to 10% of pregnancies. This includes pre-existing hypertension, as well as high blood pressure (BP) which develops during pregnancy i.e gestational hypertension and pre-eclampsia (PET). The presence of hypertension carries risks for women and their developing baby and remains one of the leading causes of maternal morbidity and mortality worldwide, secondary to the complications including intra-cerebral hemorrhage, abruption, eclampsia and pulmonary oedema. In the UK, risk of serious harm to a woman with hypertension remains low, however undertreatment of high blood pressure remains a key factor in mortality audits.

Hypertension can confer increased risks to the baby including fetal growth restriction, preterm birth (both iatrogenic and spontaneous) and intrauterine death.

It is now well recognized that hypertension during pregnancy is an independent risk factor for cardiovascular disease (ischaemic heart disease, cerebrovascular disease) in the future. Advice should be given to women to aim to modify other risk factors (optimize BMI, stop smoking) as well as having annual BP checks.

These guidelines provide a structured approach to the diagnosis, evaluation, and management of hypertensive disorders in pregnancy. Many medications used in pregnancy are not licensed, all medications mentioned in the guidance are nationally recognized and recommended for use.

## 1.0 Roles and Responsibilities:

It is the responsibility of all clinical staff to comply with and provide treatment in line with current guidelines. The guideline will be reviewed every three years and updated as appropriate in line with national guidance.

## 2.0 Implementation and dissemination of document

This document is available on the hospital intranet.

## 3.0 Definitions

ADAU – Antenatal Day Assessment Unit
AKI – Acute Kidney Injury
BMI – Body Mass Index
BP – Blood Pressure
CS – Caesarean Section
ECG – Electrocardiogram
FBC – Full Blood Count
HELLP – Haemolysis, Elevated Liver Enzymes, and Low Platelet Count

ISSPH – International Society for Study of Hypertension in Pregnancy
IV – Intravenous
LDH – Lactate Dehydrogenase
LW – Labour Ward
PET – Pre-eclampsia
SBL – Saving Babies' Lives version 2
UPCR – Urine Protein Creatinine Ratio
USS – Ultrasound Scan

**Blood Pressure values (S: systolic, D diastolic):**

| | |
|---|---|
| **Mild hypertension:** | S: 140-149 mmHg<br>D: 90–99 mmHg |
| **Moderate hypertension:** | S; 150-159 mmHg<br>D: 100–109 mmHg |
| **Severe hypertension:** | S: ≥160 mmHg<br>D ≥ 110 mmHg |

BP monitoring should be performed with an appropriately sized cuff. If automated device is used, manual BP check should be used to confirm high BP.

**Chronic or essential hypertension:**
Pre-existing hypertension with or without anti-hypertensive medications or found at the booking appointment or persistent raised BP before 20 weeks gestation.

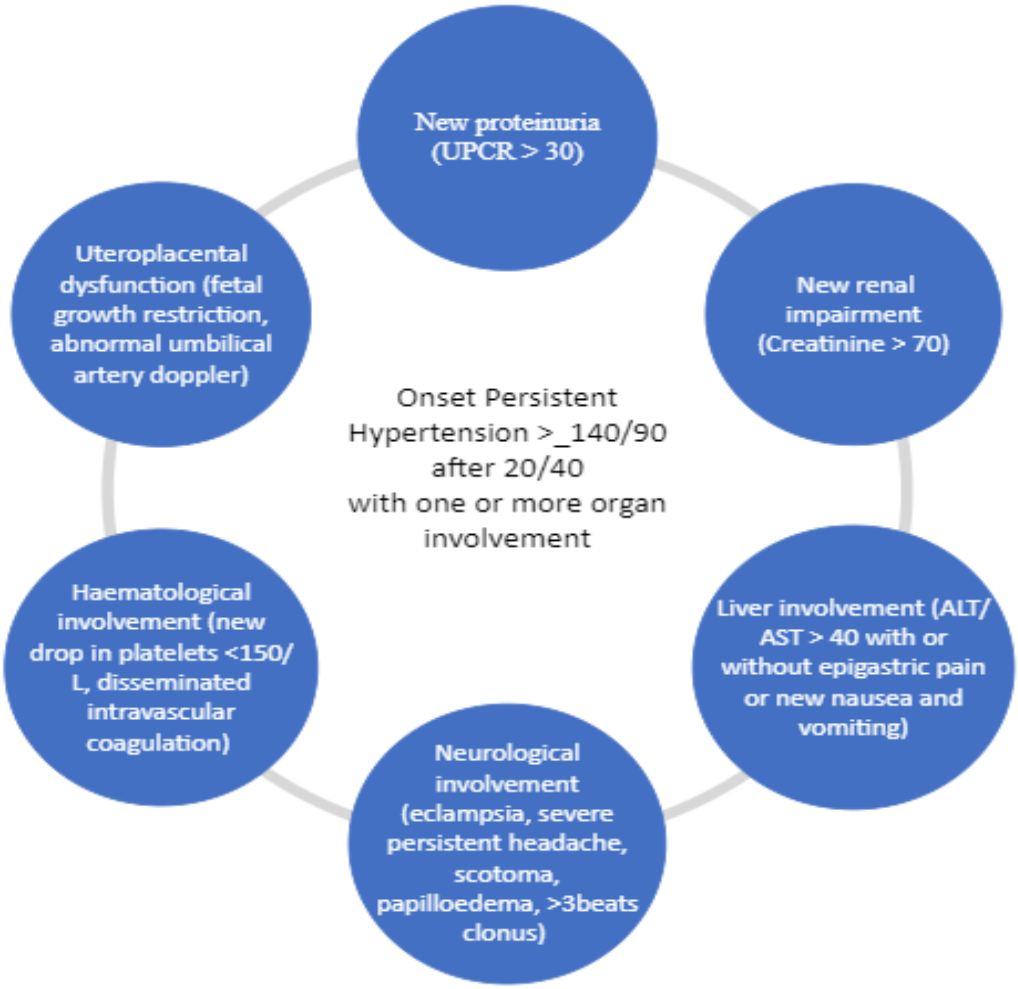
Hypertension may be primary ("essential") or have a secondary aetiology, consider investigations if concerns of an underlying pathology (e.g., renal artery stenosis, coarctation of the aorta, endocrine disorders eg Conns, Cushings)

**Gestational hypertension:**
New persistent hypertension presenting after 20 weeks of pregnancy without significant proteinuria or other signs of maternal organ dysfunction (liver, haematological) or uteroplacental dysfunction (fetal growth restriction, abnormal dopplers).

**Pre-eclampsia:**
New persistent hypertension presenting after 20 weeks with **ONE or more of the following**:

1. Significant proteinuria (urinary protein: creatinine ratio (UPCR) ≥ 30 mg/mmol)
2. New onset renal dysfunction (creatinine >70)
3. New onset thrombocytopenia (platelets <150)
4. New onset liver dysfunction (ALT or AST > 40)
5. Evidence of fetal growth restriction
6. Evidence of neurological involvement (eclampsia, scotoma, papilloedema)

Pre-eclampsia (ISSPH definition):
Hypertension on two occasions more than 15 minutes apart with one or more of the following features:




**PET Symptoms:**

- severe headache
- problems with vision, such as blurring or flashes
- severe pain epigastric / right upper quadrant
- new onset vomiting
- sudden swelling of the face or hands
- can be ASYMPTOMATIC

**Eclampsia:**

The occurrence of one or more convulsions. Fitting in pregnancy in a woman not known to have background of seizures should be assumed to be eclampsia in the first instance. The woman may NOT have a diagnosis of pre-eclampsia prior to the seizure.
Note 40% of eclampsia seizures happen in the postnatal period.

**Assessment of proteinuria in hypertensive disorders of pregnancy:**

Interpret proteinuria measurements for pregnant women in the context of a full clinical review of symptoms, signs and other investigations for pre-eclampsia

| If dipstick screening is positive (1+ or more), use **protein: creatinine ratio** (**UPCR)** to quantify proteinuria |
|---|
| • use ≥30 mg/mmol for significant proteinuria with NEGATIVE urine culture<br>• if the result is 30 mg/mmol or above and there is still uncertainty about the diagnosis of pre-eclampsia, consider re-testing. |

- Do not use first morning urine void to quantify proteinuria in pregnant women
- Do not routinely use 24-hour urine collection to quantify proteinuria in pregnant women

**Gestational proteinuria:**
Those who develop persistent proteinuria >20 weeks (UPCR > 30 in absence of infection) with no known renal impairment. New diagnosis woman needs full clinical review (consider underlying renal disorder) and should be monitored for PET weekly in ADAU.

## 4.0 Process and Procedure

### 4.1 Risk assessment for pre-eclampsia at the booking appointment:

Use following table to assess for risk of PET in pregnancy:

Offer women at increased risk: aspirin 150 mg in the evening, from 12 weeks until delivery.
(Use 75mg if BMI <20 or chronic kidney disease stage 3-5)

Educate all women regarding symptoms of PET

| **High Risk Factors (only 1 needed for aspirin)** | **Moderate Risk Factors (two or more)** |
|---|---|
| ☐ Hypertensive disease in a previous pregnancy (PET or gestational HTN) | ☐ First pregnancy |
| ☐ Chronic hypertension | ☐ Age 40 years or older (at booking) |
| ☐ Type 1 or Type 2 diabetes | ☐ Pregnancy interval of more than 10 years |
| ☐ Chronic kidney disease | ☐ BMI of 35 kg/m$^2$ or more at first visit |
| Autoimmune disease, (eg lupus, or antiphospholipid syndrome) | ☐ Family history of pre-eclampsia (1$^{st}$ degree relative – sister/mother) |
| ☐ Histology confirmed placenta dysfunction in previous pregnancy | ☐ Multiple pregnancy |
| ☐ Previous fetal growth restriction (<10$^{th}$ centile) or stillbirth secondary to placental dysfunction | ☐ IVF pregnancy with donor egg |

Ensure women receive a prescription for aspirin from their GP, if they are unable to obtain themselves over the counter.

Offer the information leaflet *Reducing the risk of pre-eclampsia.*

Discuss/email with a Maternal Medicine Consultant if there are concerns regarding severe liver disease, peptic ulcer disease, bleeding or platelet disorder, sensitivity to aspirin or severe asthma straight after the booking appointment.

Any woman meeting criteria for aspirin, should be considered at higher risk, and referred to Consultant Led antenatal clinic for review and consideration of the SBL fetal monitoring pathway.

**At the first antenatal clinic review:**

The antenatal clinic review for those with an elevated risk of PET should include:

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| • Full medical history |
| • VTE risk assessment |
| • Advice for vitamin D supplements (800-1000 units) per day – consider whether additional dose needed if serum vitamin D is very low. No prescription needed – can buy over the counter |
| • Check PET bloods (**FBC, renal profile, liver function tests**) and **UPCR** as baseline |
| • Organise fetal growth ultrasound scans (SBL 2 – likely 28/32/36/39 weeks) Consider Uterine artery dopplers at 22-24 weeks |
| • If history of previous early onset PET or very high-risk women, consider need for 24-week growth USS – discuss with consultant |

### 4.2 Antenatal Care:

*Guidelines of Interest: hyperlink*
*Antenatal care guideline*
*ADAU*
*Diabetes management in pregnancy*
*NICE guideline on hypertension in adults: diagnosis and treatment*

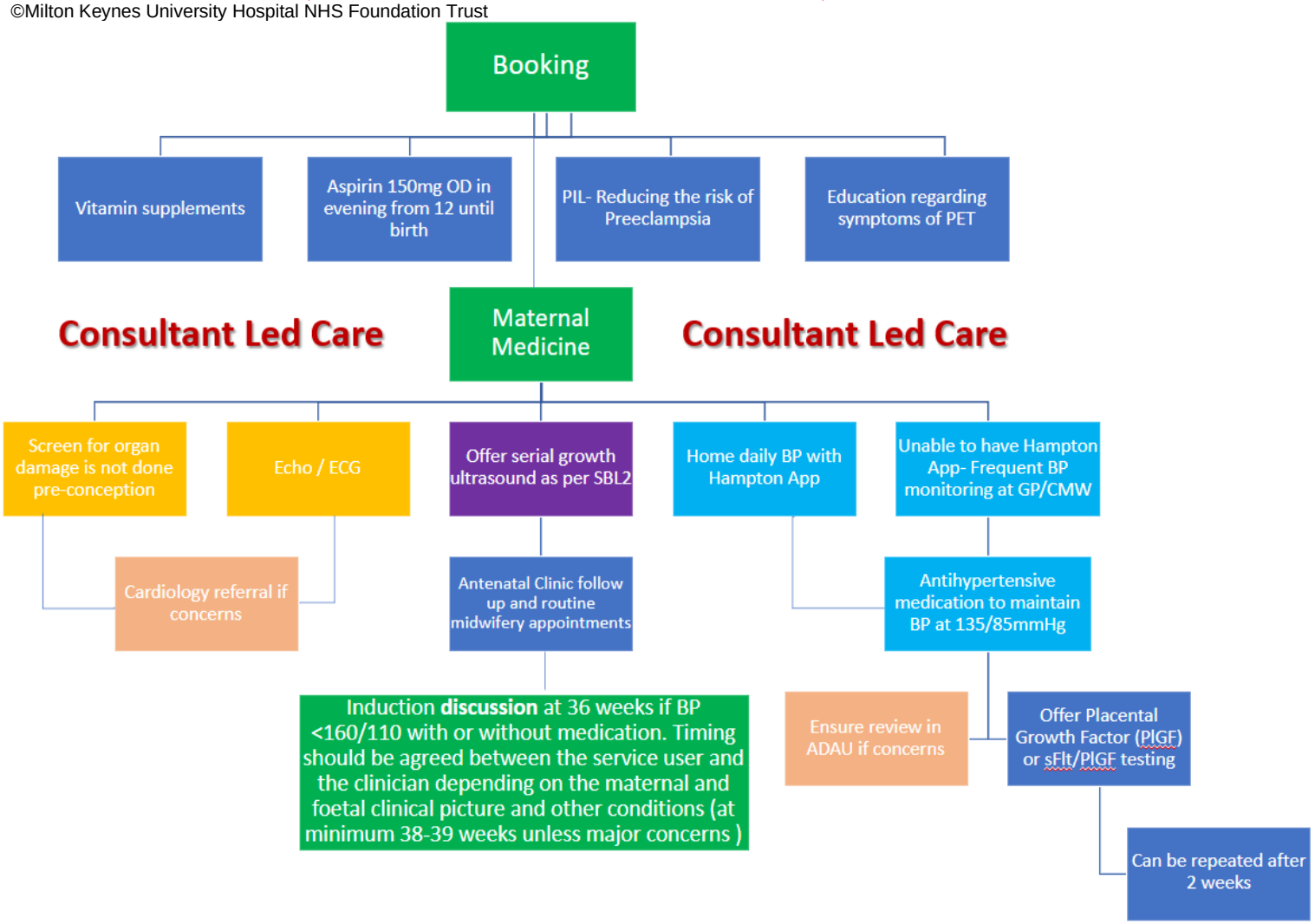
### 4.2.1 Antenatal Management of women with pre-existing Hypertension

**Pre-pregnancy counselling**

Anyone with pre-existing hypertension should be offered pre-pregnancy counselling to plan their pregnancy, understand implications and safety of potential medication and issues arising from a pregnancy.

- Screen for end organ damage (ECG, Echo, renal profile, liver function, UPCR)
- Convert antihypertensive to pregnancy-safe medications (ideally labetalol, nifedipine modified release or methyldopa)
- Give advice regarding maintaining a healthy weight via diet and exercise, lowering the amount of salt in their diet, smoking cessation.
- Advice on folic acid 5mg, vitamin D 800 - 1000 units and consider calcium supplements (1g per day) to continue throughout pregnancy.
- Give advice regarding the increased chance of developing PET (up to 30%)

**Flow chart**



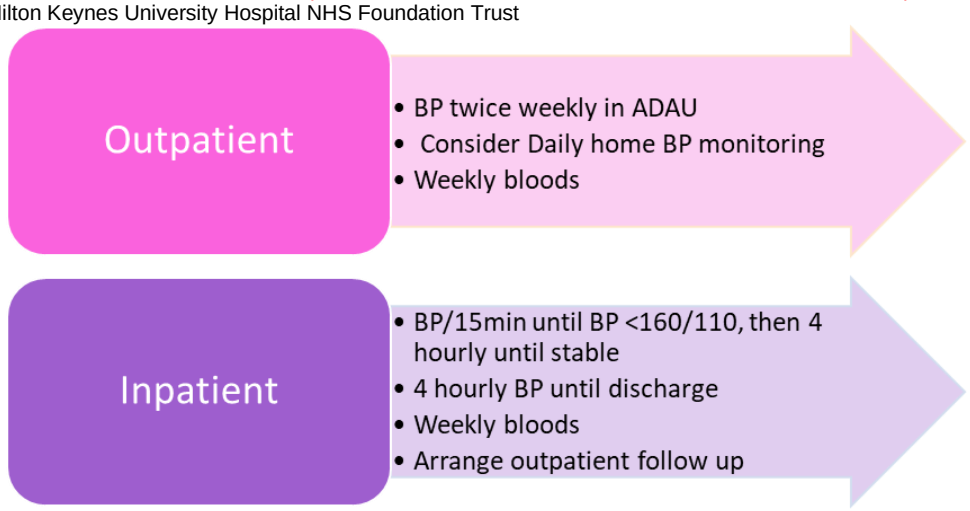
### 4.2.2 Antenatal management of women with gestational hypertension

New finding of high BP, same day referral to ADAU as this can be the first sign of PET and then referral to Antenatal clinic for follow up.

**ADAU review process:**

| | |
|---|---|
| History | • Full medical and obstetrical history<br>• Review notes<br>• Ask symptoms |
| Urine | • Dipstick positive for proteinuria : MSU<br>• + PCR |
| BP profile | • Min 3 BP 15 min apart<br>• Immediate review if BP≥ 160/110mmHg |
| Bloods | • PET : FBC, renal profile, liver function<br>• PIGF or plGf/sflt ratio |
| Fetal Surveillance | • CTG if BP≥160/110 or reduced Fetal movements<br>• Fetal growth USS urgent request at diagnosis then 2-4 weekly |
| Obstetric Review | • Care plan and symptoms discussion<br>• Outpatient management / Inpatient management<br>• Refer to the FullPiers calculation |
| Medication | • Start medication if BP persistently >140/90 mmHg to aim to control at 135/85mmHg |

| Labetalol | Nifedipine MR | Methyldopa |
|---|---|---|
| • Starting dose 100mg BD<br>• Max dose 2400mg/ 24h<br>• Avoid if Type 1 diabetic or asthmatic | • Starting dose 10mg BD<br>• Max dose 40mg BD | • Starting dose 250mg TDS<br>• Max dose 1g TDS |




If outpatient management is considered, explain signs and symptoms of pre-eclampsia and low threshold to present to hospital if concerns.
** In Type 1 DM, labetalol may reduce hypoglycemia awareness and block the adrenergic response to hypoglycemia.*

### 4.2.3 Antenatal Management for those with suspected pre-eclampsia

All women with a concern of potential diagnosis of PET, need an obstetric review in ADAU or LW. Use the SOP for Use of PlGF to help guide management.

#### 4.2.3.1 ADAU Review process:

| | |
|---|---|
| History | • Full medical history and symptoms review |
| Urine | • MSU and PCR if dipstick for proteinuria |
| BP | • Min 3 BP 15min apart<br>• Immediate obstetric review if BP≥ 160/110mmHg |
| Bloods | • PET bloods, FBC, renal, liver function<br>• Consider sflt/PlGF ratio <36/40<br>• Clotting screen if platelets <100x10⁹L |
| Fetal surveillance | • CTG if BP≥160/110 or reduced Fetal movements<br>• Fetal growth USS urgent request at diagnosis then 2-4 weekly |
| Obstetric review | • Admission for observation for minimum 24h<br>• Consultant review |
| Medication | • Consider starting antihypertensive if BP persistently>140/90<br>• Aim to increase anti-hypertensives after 24 if uncontrolled BP unless BP >160/110 ( see severe hypertension management)<br>• Increase current anti-hypertensive to maximum dose before adding second agent. |

| Labetalol | Nifedipine MR | Methyldopa | Doxazosin |
|---|---|---|---|
| • Starting dose 100mg BD<br>• Max dose 2400mg/ 24h<br>• Avoid if Type 1 diabetic or asthmatic | • Starting dose 10mg BD<br>• Max dose 40mg BD<br>• First line for black or Afro-Caribbean women | • Starting dose 250mg TDS<br>• Max dose 1g TDS | • Starting dose 1mg OD<br>• Max dose 8mg OD<br>• Need discussion with Mat-med consultant |

Other specific bloods:
If any concerns for HELLP, check LDH, reticulocyte count, blood film +/- haptoglobin level.
If any concerns for acute fatty liver, Check serial blood glucose +/- serum ammonia +/- USS liver

Following admission, the decision for ongoing management of a patient with a diagnosis of PET as outpatient or inpatient is based on clinical circumstances and should be discussed with a consultant obstetrician.

The **fullPIERS** calculation can be used as a guide to potential management as an outpatient at the discretion of the Consultant Obstetrician. **[https://pre-empt.obgyn.ubc.ca/home-page/past-projects/fullpiers/]**

The **fullPIERS** model is an application which allows prediction of adverse maternal events in women with diagnosed PET. If the risk of adverse maternal events is <30% for the next 48 hours, the woman can be **considered** for outpatient management after consultant discussion. This is if there are no fetal concerns and the woman is understanding of the condition, is asymptomatic and will not be alone at home and can re-present quickly into hospital.

The growth scan should be performed during the admission unless the patient had one within the previous 2 weeks.

#### 4.2.3.2 Outpatient Management for confirmed PET:

Clear instructions for review in ADAU are needed:

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| ADAU | • Review every 48h |
| Urine | • Dipstick<br>• No further quantification with UPCR needed once diagnosis made unless significant clinical change |
| BP | • BP profile |
| Bloods | • PET bloods 2 to 3 times per week ( FBC, renal and liver profile) |
| Fetal Surveillance | • CTG for fetal wellbeing<br>• Growth USS every 2 weeks from diagnosis until birth |
| Obstetric review | • Consider fullPIERS risk assessment and document in the notes<br>• Registrar or Consultant review<br>• Plan for timing of delivery |

#### 4.2.3.3 In patient Management:

If criteria for out-patient management not met, the woman should be admitted for in-patient management.

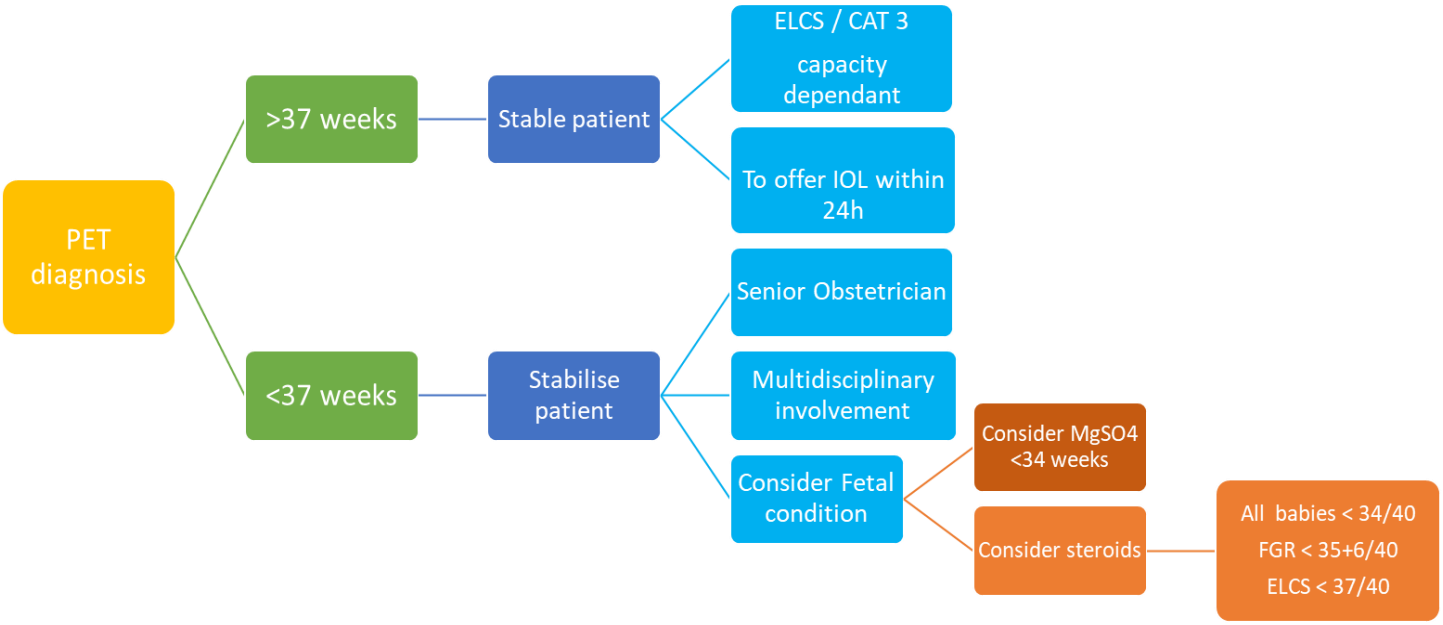
Any abnormal findings must be escalated, and obstetric review should be carried out and documented.

| | |
|---|---|
| BP | • 4-6 hourly<br>• If labile every 15-30 min until stable |
| Bloods | • PET bloods 2 to 3 times / week<br>• Clinical situation dependent |
| Fetal surveillance | • CTG daily<br>• Growth USS every 2 weeks until birth |

## 4.2.3.4 Timing of delivery

**PET diagnosis <37 weeks:**
Iatrogenic preterm birth can be required for treatment of pre-eclampsia for either maternal or fetal concerns. This decision should be made once the patient is stabilized, with senior obstetric input and discussion with anaesthetic and paediatric teams.
The mode of delivery should consider the presentation of the fetus and the fetal condition, together with the likelihood of success of induction of labour after assessment of the cervix and patient choice.

**PET diagnosis >37 weeks:** Offer induction or birth by Caesarean in the next 24 hours if stable.



## Thresholds for considering early (preterm) delivery:

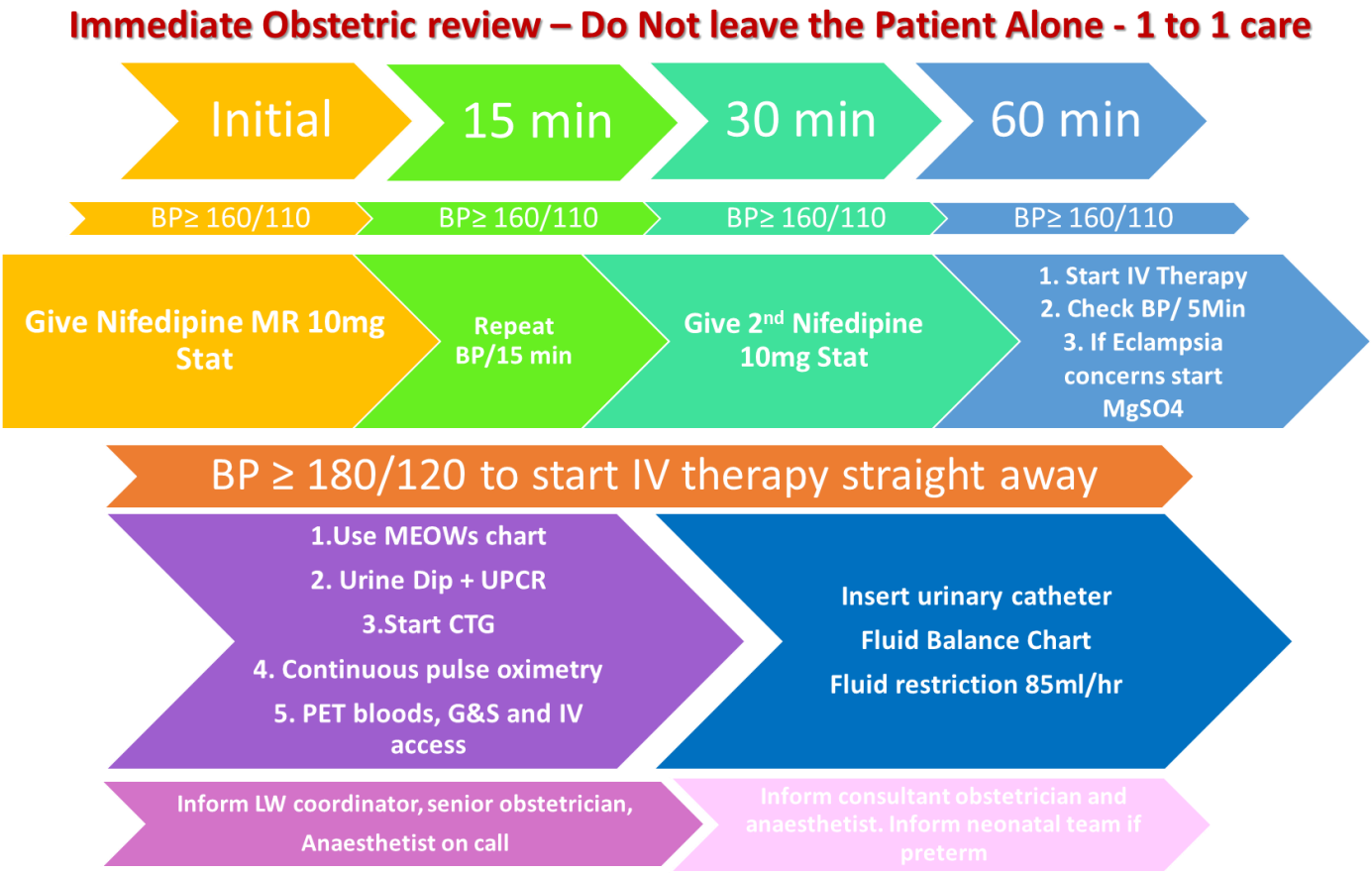
- Inability to control BP despite 3 antihypertensive medications
- Progressive deterioration of creatinine (> 90 mmol/L), platelets (< 100 x$10^9$/L)
- Liver function tests (ALT/AST > 70iU/L) to discuss with maternal medicine consultant
- Severe hypertension requiring intravenous infusions
- Maternal Eclampsia, Pulmonary oedema, stroke, hepatic rupture, papilloedema, persistent scotoma
- Fetal concerns as per Fetal Medicine

### 4.2.4 Antenatal Management of severe hypertension >160/110 with or without pre-eclampsia diagnosis

Blood pressure of > 160/110 is potentially life threatening and needs immediate review. Should the woman be in the community, she needs transferring into the hospital by ambulance service if needed.

Undertreatment of high systolic blood pressure is frequently cited in maternal mortality cases. Uncontrolled high blood pressure can lead to **severe complications of pre-eclampsia** (eclampsia, pulmonary oedema, liver rupture) and even without a diagnosis of pre-eclampsia severely high systolic blood pressure can lead to **haemorrhagic stroke** and **placental abruption**.

**Flow chart for treatment of severe hypertension (refer to appendices for IV therapy – labetalol, hydralazine, Magnesium sulphate)**




- **Sustained BP BP ≥160/110mmHg or BP ≥180/120mmHg: 1 to 1 care & transfer to labour ward if stable**
- **If not for imminent delivery, start/increase regular anti-hypertensive medication and urgent growth scan if not done in the previous 14 days.**
- **If significant maternal tachycardia or contraindication, consider oral labetalol 200mg in place of nifedipine.**

### 4.3 Eclampsia Emergency Management:

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|---|---|
| Safety | • **Do not leave patient alone. Ensure safety: lower bed, flat, cots sides raised.** |
| HELP | • **Ext 2222 and ask for 'OBSTETRIC EMERGENCY' location and room.**<br>• Contact switchboard to contact the consultant obstetrician and consultant anaesthetist if at night or the weekend. |
| Equipment | • Eclampsia tray<br>• Cardiac arrest trolley |
| Airway | • Assess, maintain patency and protect airway |
| Breathing | • Assess, apply oxygen 15 litres and ventilate as required. Manually displace uterus. Attach pulse oximeter and monitor oxygen saturations continuously. |
| Circulation | • Secure IV access as soon as safely possible. Take and send bloods for FBC, G&S, LFT, U&E, clotting..<br>• Insert urinary catheter and measure urine output hourly with a urometer. Test urine for protein<br>• Monitor pulse and B/P continuously |
| Control Seizures | • Magnesium Sulphate loading dose 4g over 5-10 minutes followed by 1g/hr<br>• If seizures continue or recur: additional 2g bolus of magnesium<br>• If this fails consider diazepam 10mgs IV |
| Control Hypertension | • Treat with intravenous antihypertensive as per protocol if blood pressure persistently >160/110mmHg |
| Fetal assessment | • Once the patient is stabilised.<br>• Commence CTG monitoring if ≥ 26 weeks gestation. Intermittent monitoring for ≤ 25+6 unless instructed otherwise by a consultant obstetrician |
| Delivery Planning | • The patient must be stabilised before delivery |
| Unresponsive | • Initiate CPR if the patient is unresponsive<br>• **Ext 2222 Maternal Cardiac Arrest location and room** |

See Appendixes for IV anti-hypertensive medication

### 4.4 Care in labour with Hypertension or Pre-eclampsia

*Guidelines of interest:*
*BSOTS*
*MEOWS*
*Care in Labour*

### 4.4.1 Intrapartum Management for those with pre-existing hypertension or gestational hypertension

In absence of other obstetric concerns, women with can be offered a vaginal birth. There is evidence suggesting induction of labour around 38-39 weeks avoids development of severe hypertension.
Discuss mode and timing of birth with woman and an Obstetric consultant. During labour, monitor for developing pre-eclampsia, ensure BP controlled, fluid balance charted and adequate fetal surveillance.

| | |
|---|---|
| Fetal Surveillance | • Continuous FHR monitoring |
| Bloods | • If proteinuria found on dipstick, send UPCR with urgent PET bloods |
| Fluid Balance | • Fluid balance chart |
| Obstetric Review | • Obstetric review on arrival to labour ward |
| BP | • Hourly Observation,<br>• If BP ≥160/110mHg, treat, see severe hypertension management |
| Medicine Management | • Continue antenatal medications<br>• Caution with NSAIDs if any renal concerns (rising creatinine, reduced urine output) |
| Second Stage | • No need to limit second stage, unless BP uncontrolled |
| Third stage | • Avoid ergometrine |

### 4.4.2 Intra-partum management for those with pre-eclampsia

The multi-disciplinary team (obstetric, midwifery, anaesthetic, paediatric) should be made aware of any patient in the antenatal ward with a diagnosis of pre-eclampsia having an induction of labour. Minimum of daily review by the Obstetric team.

**Once on Labour ward, principles of management :**

| | |
|---|---|
| Fetal Surveillance | • Continuous FHR monitoring |
| Bloods | • IV access with PET bloods repeated 6 hourly during labour |
| Analgesia | • Epidural analgesia in labour is recommended but is not essential |
| Fluid Balance | • Strict Fluid balance chart (consider whether catheter is needed for hourly urine output) |
| Second Stage | • Avoid prolonged second stage<br>• Offer assisted vaginal birth if severe hypertension in 2nd stage |
| Obstetric Review | • Obstetric and Anaesthetic review on arrival to labour ward<br>• 12 hourly obstetric review in labour, including abdominal palpation and auscultation of lung bases. |
| BP | •Hourly Observation, If BP ≥160/110mHg see severe hypertension management<br>•Treat severe hypertension as above 3.4.3 |
| Medicine Management | •Continue and adjust Hypertensive treatment<br>•Caution with non-steroidal anti-inflammatory drugs if concern (reduced urine output <30 ml/hr, creatinine > 90, platelets < 50) |
| Third stage | • **Syntocinon 10 units IM** should be administered for third stage<br>• Avoid ergometrine |

### 4.4.3 Intra-partum management of Severe pre-eclampsia:

The management of an eclamptic fit in labour is the same as in 3.3 Eclampsia emergency treatment.

For women with severe pre-eclampsia, particularly if they are needing IV antihypertensive medications or MgS04 infusion
*In addition to above:*

**Fluid restriction** – to 85ml/hr or 1ml/kg/hr until post-partum diuresis
- aim to ensure urine output > 25 ml/hr (see below)

Use 250ml fluid boluses rather than uncontrolled fluid input.

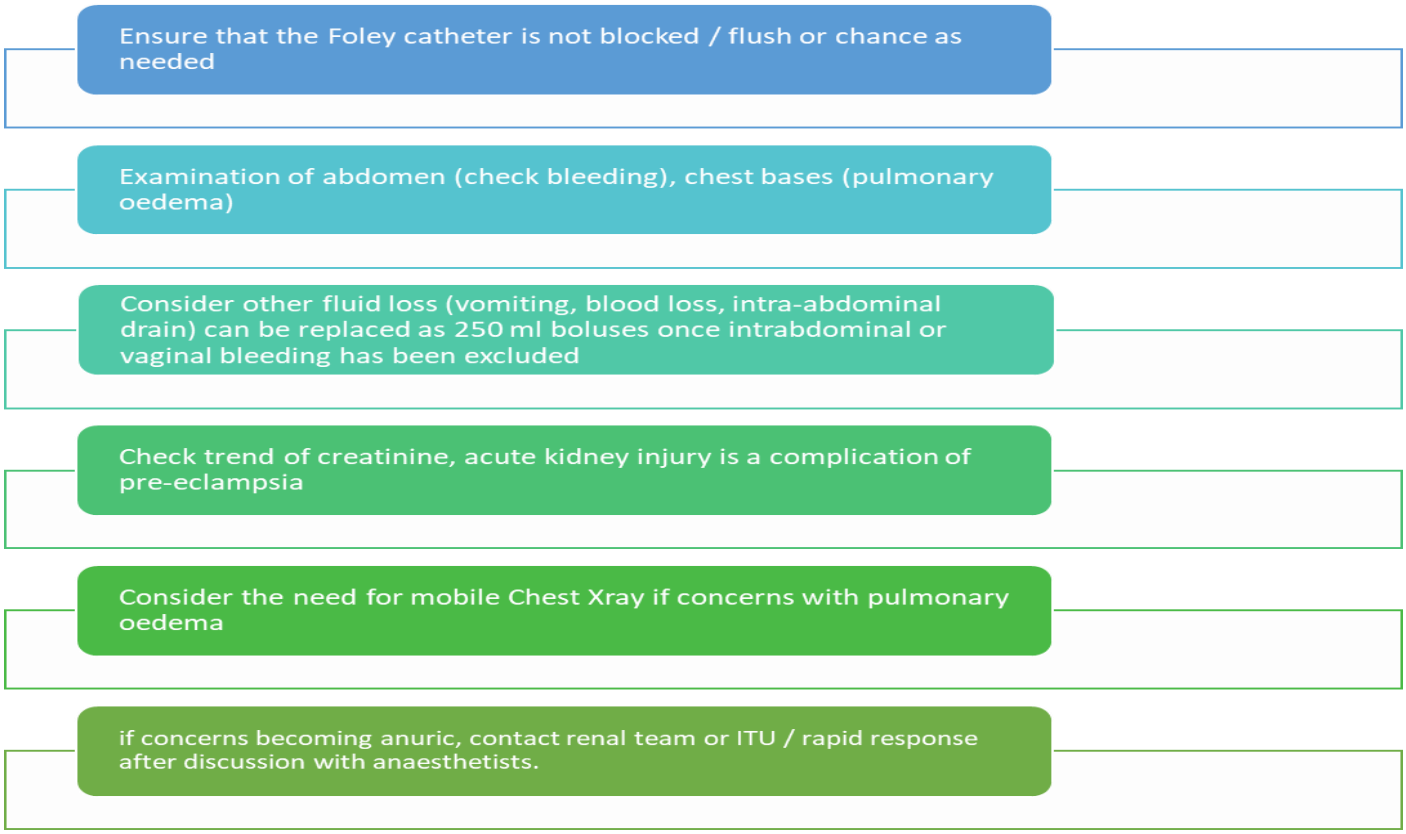
**Oxytocin (appendix 4)**

**-** consider for **augmentatio**n: concentrated form of oxytocin (10 units in 50mls)
for PPH management (40 units oxytocin in 50 ml sodium chloride 0.9% over 4 hours)

**Anaesthetic considerations**

A fixed intravenous fluid bolus should not be administered prior to regional anaesthesia or Caesarean section
Fluid preload for Elective CS – Preload with Plasma Lyte 500mls, maintain input at 85ml/hr, replace blood losses, ephedrine or phenylephrine as required to maintain BP at pre-block levels.
In Emergency CS with working epidural – extend block without additional fluid
Emergency CS without epidural – give fluid preload as per Elective CS.

**Management of reduced urine output <25 ml/hr**

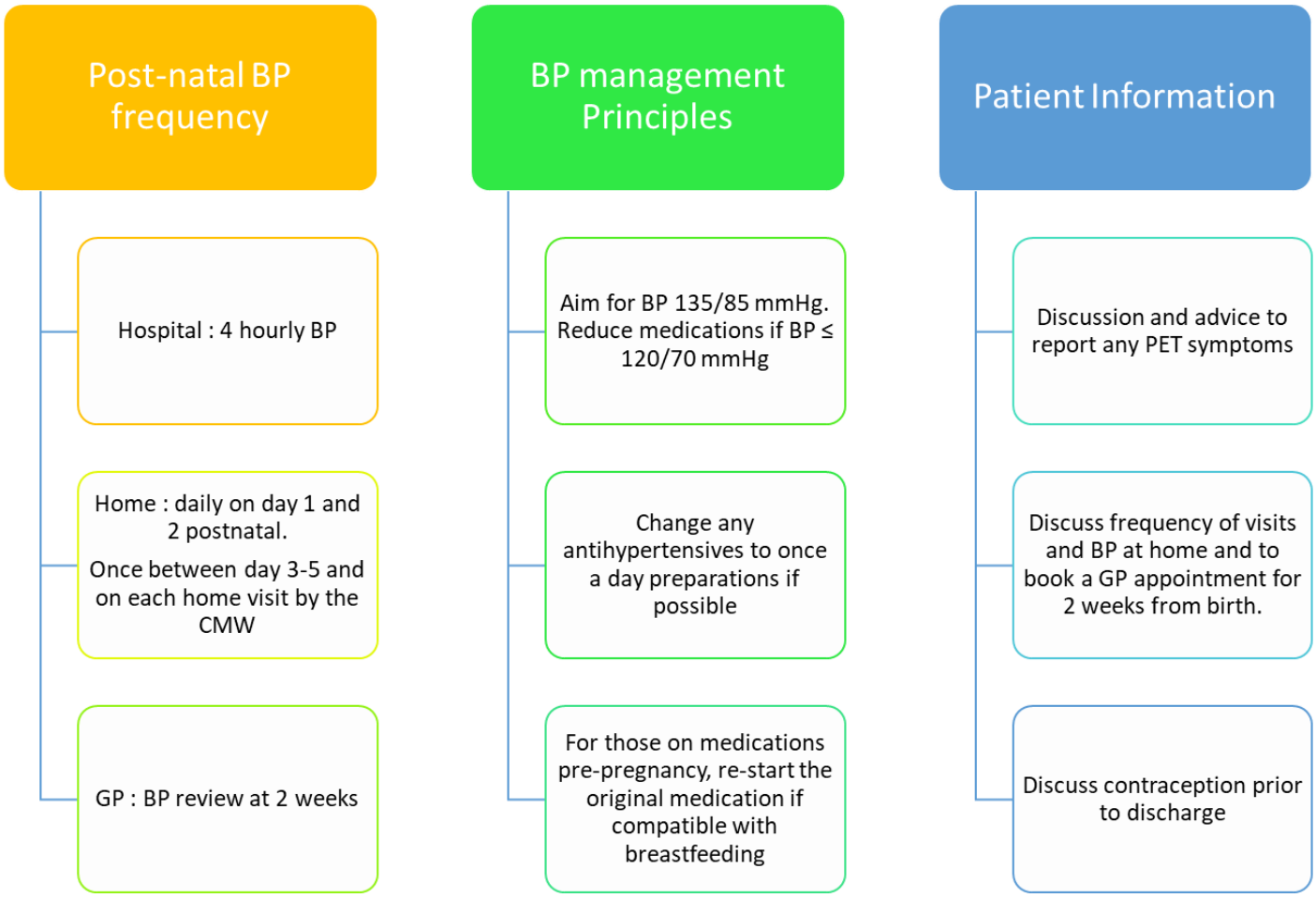


## 4.5 Post-partum care for women with hypertension/pre-eclampsia

*Guidelines of Interest:*
*Post-partum care*

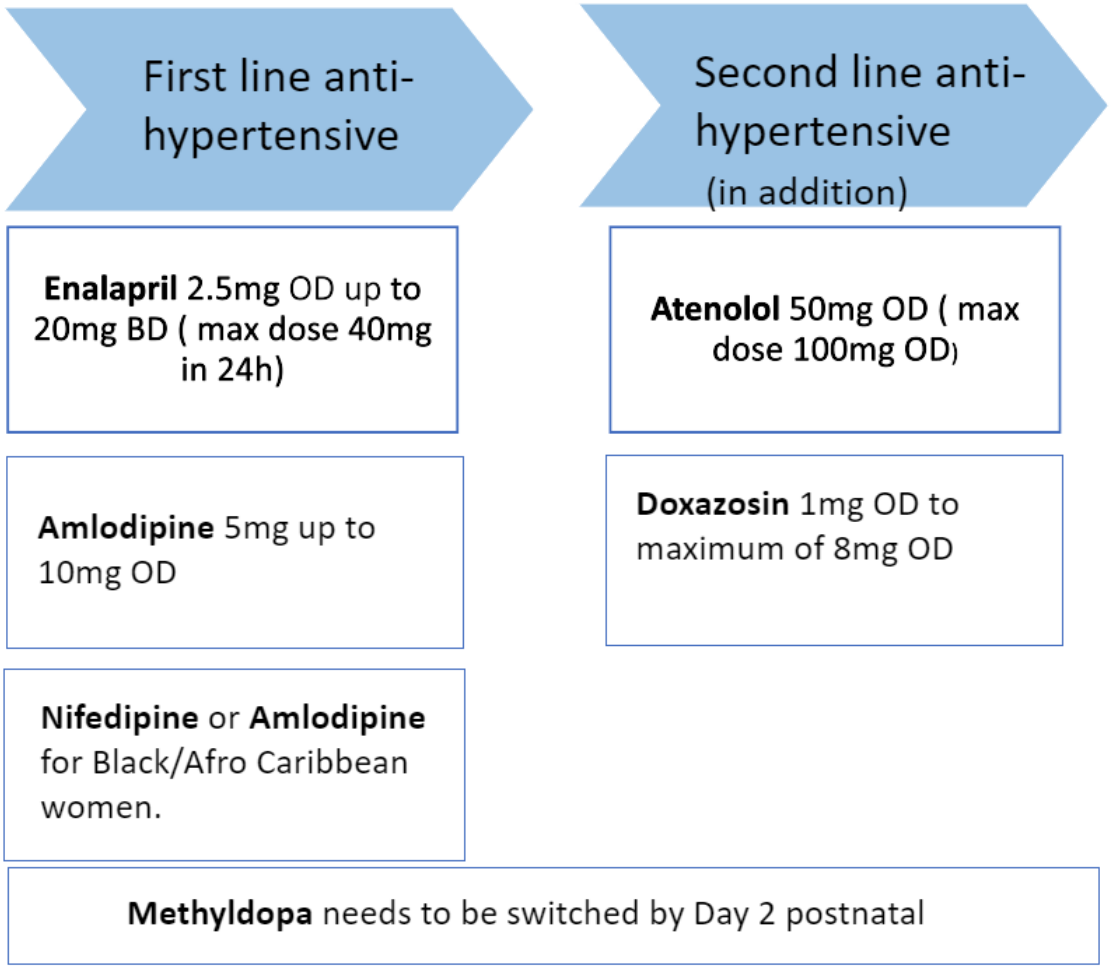
### 4.5.1 Post-partum Care with pre-existing hypertension or gestational hypertension

Postnatal obstetric review daily and postnatal care plan post birth and prior discharge home. Escalation of abnormal observations to trigger an obstetric review as needed.




- BP checks may be needed more regularly if BP has been difficult to control.
- Progesterone only contraception can be used safely with antihypertensives and whilst breastfeeding, included Progesterone only pill, Implant, Mirena IUS or copper coil.
- **Avoid** oestrogen containing contraceptives (eg Combined OCP)

Medications to control blood pressure in the post-natal period:



## 4.5.2 Postpartum Management for women with pre-eclampsia

### 4.5.2.1 Immediate postpartum management (first 24h):

Women with pre-eclampsia may deteriorate after delivery and should be monitored on Labour ward for 24 hours post birth with HDU level care. There is a risk of eclampsia and pulmonary oedema.

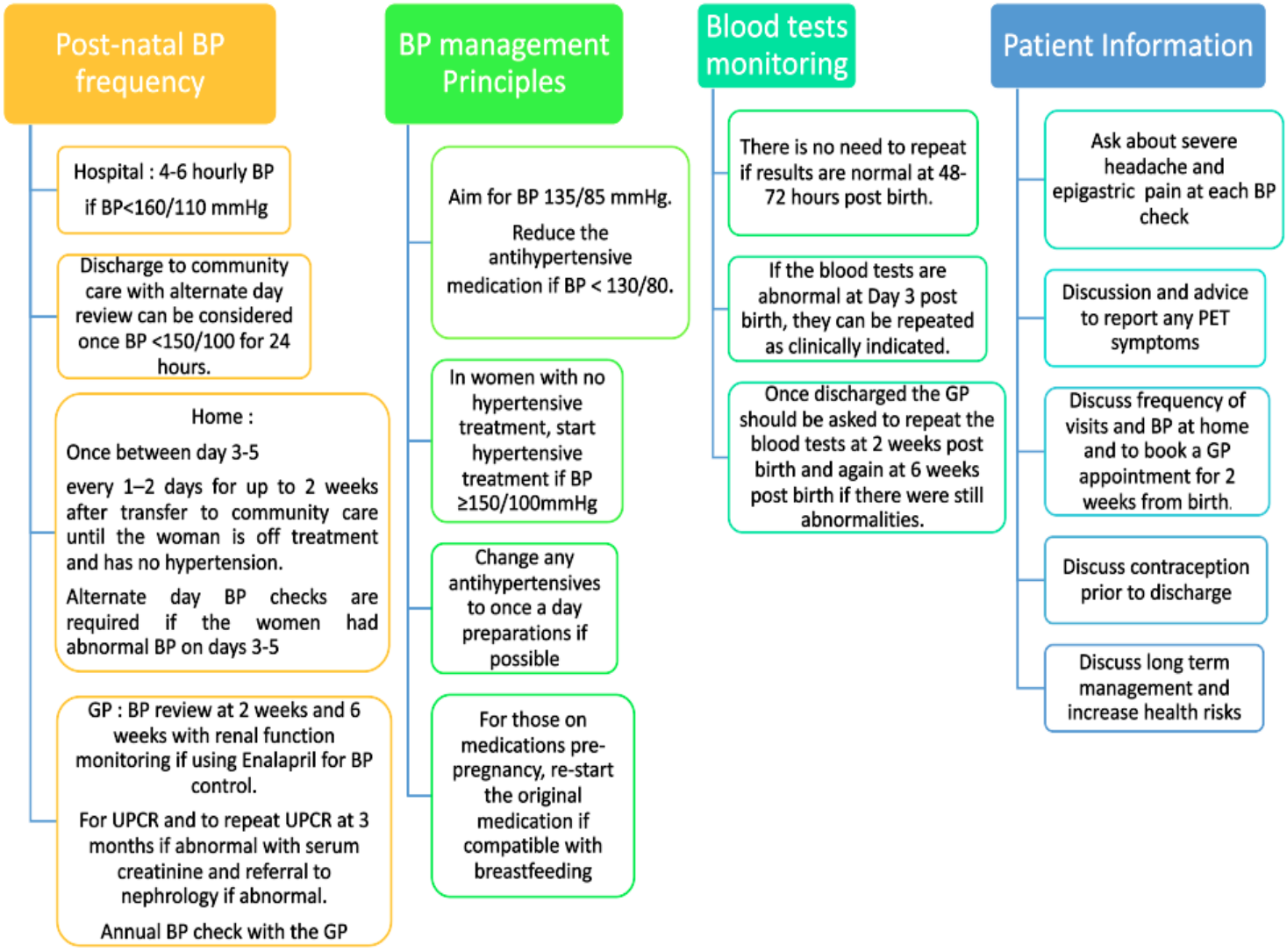
- Continue strict fluid balance +/- fluid restriction until a diuresis occurs.
- Regular MDT review (obstetrics, anaesthetists and midwife) at least every 12 hours, or 6 hourly if severe pre-eclampsia.
- Bloods 6 hourly until diuresis occurs
- Ensure adequate VTE prophylaxis – either with TEDS and LMWH or flowtrons if unable to have LMWH (platelets < 50). Re-start LMWH as soon as possible.
- Continue treatment for seizures with magnesium sulphate for 24 hours after delivery or for 24 hours after the last seizure; whichever was last.
- Avoid NSAIDs if oliguria, creatinine >90mmol/L or platelets <50 until at least 24hours postpartum and biochemical resolution
- Inform paediatric team if a woman has been taking antihypertensives (particularly labetalol antenatally) or is started on medications post birth and is breastfeeding.

**Prior to transfer to postnatal ward:**

Ensure there is a plan for

- Thromboprophylaxis – all in-patients require LMWH (PET adds score 1 to VTE risk)
- Blood pressure medication
- Obstetric follow up (with reg / consultant if severe PET)

## 4.5.2.2 Postpartum management (after 24h):




### Antihypertensive medication

Although PET should improve post birth, this may take a number of weeks and some women may need anti-hypertensive medication postnatally only. Women should be advised that some of the complications of PET may only occur after birth (eg eclampsia, acute fatty liver) and so should be advised to inform their midwife or seek medical help should they experience symptoms of headache, new nausea/vomiting or epigastric pain.

Aim to start or continue anti-hypertensive medication if BP >150/100. Ideally use a once-a-day preparation which is compatible with breastfeeding. Some women will have resistant BP and will require multiple agents.

See diagram above for medications.

The principles for the management of an eclamptic fit postnatally is the same as 3.3 Emergency care.

## Information to the Woman and GP on discharge

The discharge letter to the GP needs clear instructions for follow up care.
Consider whether there is a need for a postnatal review with the obstetric team in clinic in 6-8 weeks eg PET requiring delivery before 36 weeks, difficult to control BP post birth.
Advise the woman, that having pre-eclampsia or blood pressure problems during pregnancy increasing the chance of having

1. Recurrence of BP problems in future pregnancy (1 in 5 chances, more if severe or early onset)
2. They have an increased chance of having cardiovascular disease including high blood pressure and chronic kidney disease in later life.

Advise women to work with their GP to reduce cardiovascular risk factors as well as have annual BP and renal function check.
For those with severe hypertension requiring preterm birth, book post natal debrief with Maternal Medicine consultant at 6 – 8 weeks.

## 5.0 Statement of evidence/references

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# 6.0 Governance

## 6.1 Record of changes to document

| **Version number: 4** | | **Date: 02/2022** | | |
|---|---|---|---|---|
| **Section Number** | **Amendment** | **Deletion** | **Addition** | **Reason** |
| **Document re-written** | | | | **Re-written** |
| | | | | |
| **Section Number** | **Amendment** | **Deletion** | **Addition** | **Reason** |
| Executive Summary | Audit criteria frequency changed from quarterly to annual | n/a | n/a | Audit not required quarterly |
| **Version number**: 3 | | **Date:** 03/2019 | | |
| **Section Number** | **Amendment** | **Deletion** | **Addition** | **Reason** |
| | | | | |
| Executive Summary | Reworded | | | Update from comments |
| 3.7, 3.7.1,, 3.10.3, | Nifedipine | | Modified release | To make it clearer throughout the guideline |
| 3.10.6 | Hartman's changed to Plasma Lyte | Hartman's | Plasma Lyte | In line with current practice |
| Appendix 3 | Incorporated NICE guidance in relation to Labetalol use in Afro-Caribbean | | NICE guidance | Relevant information |
| Appendix 4 | | | Use of antihypertensive tray | Update |
| Appendix 7 | Monitoring levels of MgSO4 | | | Made it clearer |
| Appendix 8 | Eclampsia Emergency Treatment | | | Made it clearer |

## 6.2 Consultation History

| **Stakeholders Name/Board** | **Area of Expertise** | **Date Sent** | **Date Received** | **Comments** | **Endorsed Yes/No** |
|---|---|---|---|---|---|
| All staff in obstetrics – consultants, junior doctors and Midwives | Obstetrics | 14/03/2019 | | See individual comments | |
| Francisca Mngola | Pharmacist | 14/03/2019 | | No comments received | |
| Kate Ewing | Midwife | 14/03/2019 | 19/03/2019 | Yes | Yes - Majority of them |

| | | | | | |
|---|---|---|---|---|---|
| Anna O'Neill | Midwife | 14/03/2019 | 19/03/2019 | Yes | Yes – majority of them |
| Julie Cooper | Head of Midwifery | 14/03/2019 | 17/03/2019 | Yes | Yes |
| Jodie Halliwell | Midwife | 14/03/2019 | 14/03/2019 | Yes – question asked and answer given | N/A |
| Laura Jewell | Midwife | 14/03/2019 | 02/04/2019 | Reviewed by consultant | |
| Rachel Eastaff | Midwife | 31/05/2022 | 01/06/2022 | Specify bloods required | Yes |
| Melanie Smith | Midwife | 27/05/2022 | 01/06/2022 | Plgf/sflt query – updating test SOP | yes |

## 6.3 Audit and monitoring

A= Auditable Criteria

| Audit/Monitoring Criteria | Tool | Audit Lead | Frequency of Audit | Responsible Committee/Board |
|---|---|---|---|---|
| a) Pregnant women at increased risk of pre-eclampsia at the booking appointment are offered a prescription of 75-150 mg of aspirin to take daily from 12 weeks.<br><br>b) Women with hypertension in pregnancy have a blood pressure target set below 150/100 mmHg or, if they also have target organ damage, below 140/90 mmHg.<br><br>c) Pregnant women with severe hypertension are admitted for a full assessment, carried out by a healthcare professional trained in managing hypertension in pregnancy.<br><br>d) Women with a diagnosis of pre-eclampsia are admitted to hospital and monitored daily.<br><br>e) Women with pre-eclampsia have an agreed consultant obstetrician-led plan for the timing and mode of birth.<br><br>f) Women who have had hypertension in pregnancy have a plan for ongoing antihypertensive management included in their postnatal care plan, which is communicated to their GP when they are transferred to community care after the birth. | Audit, statistics, Datix | Midwives and doctors as designated by audit leads | Annual | Midwives and doctors as designated by audit leads |

### 6.4 Equality Impact Assessment

As part of its development, this Guideline and its impact on equality has been reviewed. The purpose of the assessment is to minimise and if possible remove any disproportionate impact on the grounds of race, gender, disability, age, sexual orientation, religion or belief, pregnancy and maternity, gender reassignment or marriage and civil partnership. No detriment was identified. Equality Impact assessments will show any future actions required to overcome any identified barriers or discriminatory practice.

| **Equality Impact Assessment** | | | |
|---|---|---|---|
| Division | Women and Children | Department | Maternity |
| Person completing the EqIA | Lila Ravel | Contact No. | |
| Others involved: | Anja Johansen-Bibby | Date of assessment: | 15/06/2022 |
| Existing policy/service | Yes | New policy/service | No |

| | |
|---|---|
| Will patients, carers, the public or staff be affected by the policy/service? | Yes |
| If staff, how many/which groups will be affected? | *Midwives- Doctors all grades* |

| Protected characteristic | Any impact? | Comments |
|---|---|---|
| Age | NO | Positive impact as the policy aims to recognise diversity, promote inclusion and fair treatment for patients and staff |
| Disability | NO | |
| Gender reassignment | NO | |
| Marriage and civil partnership | NO | |
| Pregnancy and maternity | NO | |
| Race | NO | |
| Religion or belief | NO | |
| Sex | NO | |
| Sexual orientation | NO | |

| What consultation method(s) have you carried out? |
|---|
| *Guideline review group. Women's health CIG- MK patient group present* |
| How are the changes/amendments to the policies/services communicated? |
| Intranet- Guideline monthly memo |
| What future actions need to be taken to overcome any barriers or discrimination? |

| What? | Who will lead this? | Date of completion | Resources needed |
|---|---|---|---|
| Ethnicity dashboard review | Data midwife | 04/2023 | Audit |
| | | | |
| Review date of EqIA | 15/06/2025 | | |

# Appendix 1: IV Therapy in Pre-eclampsia / eclampsia

For rapid reduction if systolic BP is ≥ 160mmHg and no reponse to oral medication.
Start immediately if systolic ≥ 180mmHg

All women who require intravenous antihypertensive need anaesthetic input – MDT discussion regarding arterial line monitoring

- **Target blood pressure < 150 / 100 mmHg**

**Once BP reached target, will need 30 min BP and pulse check until completely stable.**

## A Labetalol

**PET box available on LW with laminated quick references guides**

1. **Labetalol Bolus**

- **Available in 50 mg /10mls ampoule**
- Give 50mg (ie 10mls) over 2-3 minutes with flush before and afterwards
- Monitor blood pressure every 5 minutes, record on MEOWS
- If necessary, 3 further 50mg doses can be repeated at 5 minute intervals
- The total dose should not exceed 200mg bolus

**2. Labetalol Infusion: For the reduction or maintenance of the blood pressure**

- Add 50mg (i.e. 2.5 ampoules) of labetalol in a 50ml syringe
- This makes a concentration of 5mg/ml
- Use an infusion pump

| | | | |
|---|---|---|---|
| Start | 4ml/hr | *equivalent of* | 20mg/hr |
| 30mins | 8ml/hr | *equivalent of* | 40mg/hr |
| 60mins | 16ml/hr | *equivalent of* | 80mg/hr |
| 90mins | 32ml/hr | *equivalent of* | 160mg/hr |

- Maximum dose 160mgs/hr

**Weaning of labetalol infusion**

- Wean up to 5-10mg every 30 minutes (1-2mls every 30 minutes)

**3. Possible adverse effects**

- Postural hypotension and bradycardia (care with mobilising)
- Bronchospasm may occur in susceptible individuals caution with women with asthma.

## B Hydralazine

1. **Bolus Intravenous Hydralazine**:

- No preload needed, but ensure fluids available

Available 20mg of DRY POWDER hydralazine (CHECK OUR DOSING)

- Dissolve hydralazine in 1ml of water for injection
- Make this up to 20ml with sodium chloride 0.9% to make 20 mg of hydralazine [1mg/ml]
  Give 5mg dose of hydralazine IV over 30 mins
  Give further 5mg doses can be repeated at 20-30 minutes intervals (usually only 2 doses needed)
- Maximum dose 20mg (usually only 5-10mg of hydralazine required)

2. **Maintenance Infusion Hydralazine**

- Dilute to give 1mg/ml - using 40mg of hydralazine in 40ml of sodium chloride 0.9%
- Use a syringe driver

**Infusion Rate and Dosage**

| | |
|---|---|
| Start | 2.4 ml/hr |
| 30mins | 4.8 ml/hr |
| 60mins | 7.2 ml/hr |
| 90mins | 9.6 ml/hr |

**Weaning**

- Infusion may be reduced by 0.6-1.2ml every 30minutes

**Possible adverse effects**

- Tachycardia
- Headaches
- Flushing

# Appendix 3 Magnesium Sulphate Regime

Magnesium sulphate vials available in emergency PET box .
**MgS04 vials contain solution of 2g MgS04 in 10ml**

**Magnesium sulphate for the management of eclampsia:**

**Loading dose: 4g (in 20ml) give IV over 10-15 minutes (Use 2 vials in 20 ml syringe)**

**Maintenance dose** 1g/hour

Use five 10mL ampoules into a 50mL syringe (10g in 50ml) infuse at 5mL/hour

Infusion: 24 hours post seizure or 24 hours post birth (which may be longer)

**A one-off second loading dose of 2g IV over 5 minutes can be given for a recurrent seizure**

**Contraindications**

- Myasthenia gravis
- Caution with dosing in renal impairment (if creatinine > 150 umol/L use 0.5g/L)

**Monitoring a patient on Magnesium sulphate infusion**

**The woman should have 1:1 care HDU care, observations on MEOWS chart and fluid restriction to 85ml/hr. Light diet only, and nil by mouth if in established labour.**

**Continuous pulse oximetry and CTG if not delivered**

**Blood pressure**

- Every 15 minutes after loading dose for 1 hour then every 30 minutes till stable.

**Respiratory rate**
Every 30 minutes. Should be >10 breaths/minute

**Deep tendon reflexes (patella or arm reflex with epidural)**

- After completion of loading dose, then after 30 minutes
- Hourly whilst on maintenance dose

**Urine output**

- Hourly on fluid balance chart

**Bloods send as URGENT**

- Every 6 hours PET bloods (with Magnesium level at 6, 12 and 24 hours)
- Do magnesium level if
  - Urine output becomes < 30ml/hour
  - Creatinine > 120
  - recurrent seizures
  - Sign of magnesium toxicity (reduced resp rate <10, loss of reflexes)

**Magnesium therapeutic Range:** 2-3.5 mmol/L

## Dose Alterations to Magnesium sulphate regime

**Oliguria** If Urine output < 30 mls/hour, for obstetric review, check Mg level with creatinine

If urine output is 10-20mls/hour then adjust treatment according to plasma creatinine levels

| Creatinine level | Infusion rate | Re-check serum Mg level |
|---|---|---|
| <100 nmol | Continue infusion at current rate | 2 hours unless urine output improves |
| 100 – 150 nmol | Reduce infusion to 0.5g/h | 2 hours |
| >150 nmol | Stop infusion | 2 hours |

If urine output is less than 10mls/hour stop magnesium sulphate infusion. Seek Consultant advice

**Stop infusion if signs of Toxicity OR reduced Oxygen saturations < 94%**

- Loss of reflexes, weakness, nausea, flushing, somnolence
- Double vision, slurred speech, muscle paralysis
- Respiratory rate < 12

- Stop maintenance infusion and send Mg level.
- Commence oxygen (4L/min) by mask in order to maintain oxygen sats >94%.
- Anaesthetic and obstetric review.
- Exclude pulmonary oedema with examination +/- CXR

**Cardio-respiratory arrest**

- Call cardiac arrest team (**2222**) and initiate CPR
- Stop magnesium infusion

**Antidote to Magnesium toxicity: give (1g) 10ml 10% calcium gluconate IV over 10 minutes**

- Calcium gluconate should only be given under Consultant/Registrar **supervision.**

**Response to $MgSO_4$ blood levels with normal urine output**

| Magnesium level | | |
|---|---|---|
| **2-3.5 mmol/l** | **Normal** | **Continue current infusion regime, check 6 hrs** |
| **<2** | **Low** | **Increase infusion rate to 2g/hr for maximum 2 hours, recheck serum level in 2 hours** |
| **>3.5 – 5.0** | **High** | **Stop infusion for 15 minutes, restart at half original rate if urine output >30 ml/hr** |
| **>5.0** | **Very high** | **Stop infusion, do ECG, consultant obstetrician and anaesthetic input** |

## Management of recurrent seizures

- Magnesium levels should be monitored when repeat fitting occurs or renal compromise is evident (therapeutic range 2-4 mmol/litre)

- IV Diazepam may be administered if fits continue, at the discretion of the Consultant and in discussion with the anaesthetists. This should be given as a single dose only of 10mg IV. It should be given cautiously with close observation of respiratory rate.

- If convulsions persist, transfer to intensive critical care is recommended. Intubation is likely to be necessary to protect airway and maintain oxygenation.

- With recurrent seizures, it is important to exclude other causes. A neurological assessment should be performed and an emergency imaging of the brain (CT or MRI) should be considered

## Appendix 4: Concentrated regime of Oxytocin use in fluid restricted patients

| Time after starting (mins) | Oxytocin dose (units/min) **DOSE** | Volume infused (mls/hr) **RATE** |
|---|---|---|
| 0 | 0.001 | 0.3 |
| 30 | 0.002 | 0.6 |
| 60 | 0.004 | 1.2 |
| 90 | 0.008 | 2.4 |
| 120 | 0.012 | 3.6 |
| 150 | 0.016 | 4.8 |
| 180 | 0.020 | 6 |
| *210 (discuss with reg/consultant)* | *0.024* | *7.2* |
| *240* | *0.028* | *8.4* |
| *270* | *0.032* | *9.6* |

Unlicensed use.

- 10 International units (iu) oxytocin to be made up to 50mls with 0.9% sodium chloride (normal saline).

- A new infusion must be set up if continued treatment is required beyond twelve hours

- Please ensure that the *RATE* is recorded on the partogram.