NHS
Maidstone and
Tunbridge Wells
NHS Trust

Ref: FOI/GS/ID 5956

Please reply to:
FOI Administrator
Trust Management
Maidstone Hospital
Hermitage Lane
Maidstone, Kent
ME16 9QQ
Email: mtw-tr.foiadmin@nhs.net

03 February 2020

Freedom of Information Act 2000

I am writing in response to your request for information made under the Freedom of Information Act 2000 in relation to IV MgSO4.

You asked:
IV MgSO4 for Pre-eclampsia -
IV MgSO4 for Pre term labour to prevent cerebral palsy
1. Does the hospital have a policy for the management of both of these conditions which includes the use of magnesium sulphate and when were the policies were written or last updated?
1a. What dose is recommended in the policies and how is it administered?
2. How many babies does the trusty deliver per year?
2b.How many babies are delivered under 33+6 weeks?
3. What strengths of IV MGSO4 does the pharmacy stock?
4. Have there been any serious incidents with the use of magnesium sulphate?
5. Have there been any patient safety incidents reported in relation to the prescription or administration of MgSO4 in the last 3 years?

Trust response:
1. Yes we have guidelines for both.
IV MgSO4 for Pre term labour to prevent cerebral palsy – Written in October 2016. Review date was October 2019 and is awaiting review.

IV MgSO4 for Pre-eclampsia – Written in September 2016. Review date was September 2019 and is awaiting review.
1a. Please see the following policies:

5.1f <u>Magnesium Sulfate Use for Fetal Neuroprotection in Imminent Preterm Labours less than 34 weeks Gestation</u>

- It is estimated that 1 in 400 babies born in the UK suffer from cerebral palsy. Figures indicate that with the birth rate in excess of 700,000 per year there may be as many as 1800 new cases of cerebral palsy each year
- Cerebral palsy risk is 80 times greater in babies born at less than 28 weeks compared to term babies
- The beneficial effect of Magnesium Sulfate (MgSO4) may be greatest at early gestations
- Its use is not associated with adverse long-term fetal or maternal outcome
- This guideline is applicable for use for managing women in spontaneous or planned preterm labour before 34 weeks of gestation

Timing

- At the time of diagnosis of preterm labour
- When birth is planned, commence Magnesium Sulfate as close to four hours before birth as possible
- If birth before 34 weeks is planned or expected to occur sooner than four hours (e.g. scheduled caesarean or late presentation to hospital), administer Magnesium Sulfate to women at risk of preterm birth, as there is still likely to be an advantage from administration within this time
- Continue regimen until birth or for 24 hours; whichever comes first
- Urgent delivery - In situations where urgent delivery is necessary because of actual or imminent maternal or fetal compromise (e.g. severe fetal distress or antepartum haemorrhage), then birth should not be delayed to administer Magnesium Sulfate
- Magnesium Sulfate infusions should not be used during antenatal transfer. If a clinical decision is made to transfer a woman who has received Magnesium Sulfate in another setting, to a tertiary obstetric unit, the Magnesium Sulfate maintenance infusion should be stopped during the transfer.

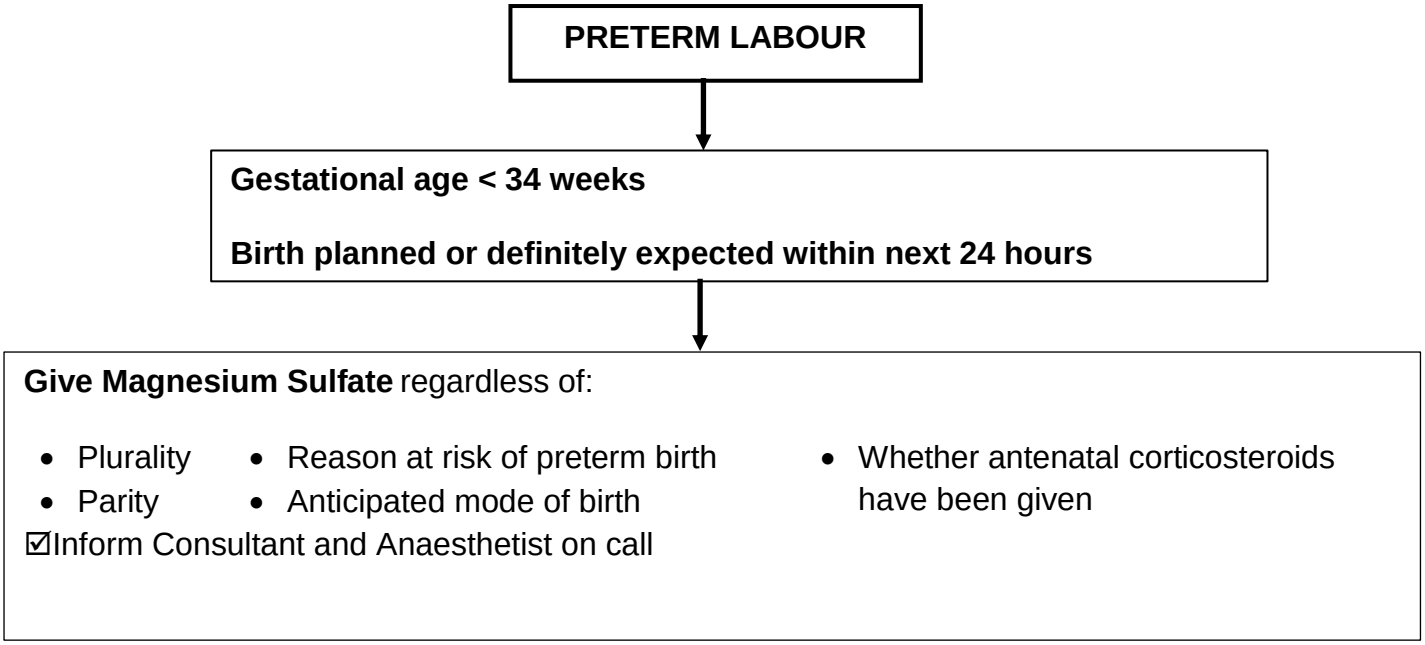
  Administration should occur regardless of:

  - plurality (number of babies in utero)
  - the reason women are considered to be at risk of preterm birth
  - parity (number of previous births for the woman)
  - anticipated mode of birth and

- whether or not antenatal corticosteroids have been given

- **Repeat doses**

  In the event that birth does not occur after giving Magnesium Sulfate, and preterm birth (less than 34 weeks gestation) again appears imminent (planned or definitely expected within 24 hours), a repeat dose of Magnesium Sulfate may be considered at the discretion of the attending health professional.



When urgent delivery/birth needed:
☒ Do not delay delivery to administer Magnesium Sulfate

What/when to administer?

Magnesium Sulfate should be administered intravenously using a dedicated intravenous line:

- Commence Magnesium Sulfate as close to four hours before birth as possible.
- Loading: 4g Magnesium Sulfate dose administered slowly over 20-30 minutes.
- Maintenance: 1g/hour Magnesium Sulfate for up to 24 hours or until birth, whichever comes first.

What if birth does not occur within 24 hours?

Once 6 hours has transpired following the cessation of the 24 hour maintenance dose, a further loading and maintenance infusion may be considered.

How to monitor women?

- Monitoring is essential for both loading and maintenance doses.
- Monitor pulse, blood pressure, respiratory rate and patellar reflexes:
    a. Before loading infusion
    b. 10mins after starting infusion
    c. After loading infusion is complete
    d. Every 4 hours during the maintenance infusion
- Resuscitation and ventilator support should be available during and after administration of both Magnesium Sulfate and Calcium Gluconate.

MAGNESIUM SULFATE REGIME

Same regime as for Eclampsia and Severe PET

Magnesium Sulfate Protocol

	Method of administration	Dose	Rate of administration
Loading dose (initial treatment)	Intravenous	4g over 20minutes (10mls 20% Mag Sulfate x2 ampoules)	Set pump at 60mls/hr and administer the 20mls of Magnesium Sulfate 20% over 20 minutes
Maintenance infusion (started immediately after loading dose via syringe pump)	Intravenous	1g/hr (10mls 20% Mag Sulfate x5 ampoules) in 50ml syringe	Administer at the rate of 5mls/hour

THERE IS NO NEED TO MEASURE MAGNESIUM LEVELS WITH THE ABOVE PROTOCOL

Process for administration

Index	Description
1.	• **Loading dose** should be prepared using 2x 10mls Magnesium Sulfate 20% (equivalent to 2g in 10mls) ampoules in a 50ml syringe (total dose = 4g) • This should be administered intravenously using a syringe driver over 20 minutes at a rate of 60mls/hour • Two staff members must check the syringe and the infusion rate prior to commencing the infusion
2.	• A doctor must be present during the whole process of loading with Magnesium Sulfate • A three lead ECG must be used throughout
3.	• **Maintenance dose** will be made up using 5 x 10mls Magnesium Sulfate 20% (2g in 10mls) ampoules in a 50ml syringe • This should be administered intravenously using a syringe driver at a rate of 5mls/hour (dose = 1g/hr) • Two staff members must check the syringe and the infusion rate prior to commencing the infusion

Side Effects

Common: -

50% of women may experience some side effects during the therapy such as:

- Facial Flushing
- Flushing
- Nausea and vomiting
- Headaches
- Sweating
- Injection site issues

More unusually:

- Hypotension and tachycardia
- Women with neuro-muscular disorders may experience
- Muscle weakness
- Paralysis

Potential Interactions

There is a potential interaction between Magnesium Sulfate and Nifedipine causing hypotension and neuromuscular blockade effects, although this is seldom reported in clinical practice. This does not preclude its use in this situation.

Monitoring

A minimum assessment should include checking pulse, blood pressure, and respiratory rate and patellar reflexes before administration of the loading dose, and at the end of the loading dose infusion.

Monitoring requirements during Magnesium Sulfate infusion

Level of consciousness	Recorded hourly
Respiration rate	Should be >12/min
Urine output	Recorded hourly Should be >100mls/4hours. Catheter not indicated routinely
Pulse Oximeter	To be applied when respiratory rate <12/min or continuously during infusion period.
Fluid balance	Input/output chart

Blood Pressure	Hourly
Patellar Reflexes	Hourly

(All parameters can be recorded on MEOWS chart but patellar reflexes will need to be added.)

Contraindications

Cardiac disease or acute renal failure

Magnesium Toxicity

This is unlikely with the above regime; therefore blood levels are not routinely required.

Management of Magnesium Toxicity

Clinical Presentation	Management
Loss of patella reflex	• Stop maintenance infusion • Send Mg level to laboratory URGENTLY • Withhold further Mg. until patellar reflexes return or blood Mg level known. Restart at 1g/hr and check levels in 6 hrs
Respiratory rate <10/min O_2 saturation persistently <95% (on air)	• Pull emergency buzzer • Call 2222 for Obstetric Emergency Team • Woman should be in left lateral tilt position and institute CPR • Stop maintenance infusion • Administer 10mls 10% Calcium Gluconate IV slowly over 10mins (antidote) • Intubate immediately and manage with assisted ventilation until resumption of spontaneous respirations
Urine output <100mls in 4hrs	• Stop infusion and review after output improves • Increase monitoring for Mag Sulfate toxicity

When to stop Magnesium Sulfate administration?

- Urine output <100mL in 4 hours
- Absent patellar reflexes
- Respiratory depression (< 10 breaths/min)
- Hypotension (diastolic BP < 15 mm Hg below baseline)

MAIDSTONE AND TUNBRIDGE WELLS NHS TRUST

Management of Hypertensive Disorders of Pregnancy including Severe Pre-eclampsia and Eclampsia

Requested/ Required by:	Women's Directorate
Main author:	Consultant Obstetrician (WO)
Other contributors:	Consultant Obstetrician & Gynaecologists (MPM & RB)
	Consultant Anaesthetist (CB & GG)
Document lead:	Consultant Obstetrician/ Obstetric Risk Lead
	Contact Details: wunmi.ogunnoiki@nhs.net
Directorate:	Obstetric, Gynaecology & Sexual Health Directorate
Speciality:	Obstetrics
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Approved by:	Clinical Risk Management Group **Date:** 14 September 2016
Ratified by:	Clinical Risk Management Group **Date:** 14 September 2016
Review date:	September 2019

Document History

Requirement for document:	To ensure that all the appropriate information, follow up and care in respect of hypertensive disorders is provided to pregnant women and in the postnatal period: • Audit • Risk Management
Cross References (external):	1. Central Manchester University Hospitals. (2015) *Gestational hypertension, non-severe pre-eclampsia and chronic hypertension management in pregnant women* 2. Knight, M. (2007) 'Eclampsia in the United Kingdom 2005'. *BJOG: An International Journal of Obstetrics and Gynaecology* 114: 1072–1078 3. Magee L, Sadeghi S. (2005) *Prevention and treatment of postpartum hypertension*. Cochrane Database of Systemic Reviews, Issue 1 *4.* MBRRACE-UK. (2014) *Saving lives, improving mothers' care – lessons learned to inform future maternity care from the UK and Ireland Confidential Enquiries into maternal deaths and morbidity 2009–12*. Oxford: National Perinatal Epidemiology Unit, University of Oxford 5. National Institute for Health and Clinical Excellence (NICE). (2011) *Hypertension in Pregnancy. The management of hypertensive disorders during pregnancy*. Available at: www.nice.org.uk 6. Wessex Academic Health Science Network. (2016) Reducing the risk from medication errors with IV Magnesium Sulfate. *Magnesium Sulfate Safety Bulletin*
Associated Documents (internal):	Maidstone & Tunbridge Wells NHS Trust Intranet, Policies and Guidelines, Women & Children's Database, Maternity: • Antenatal Booking and Clinical Risk Assessments • Missed Antenatal Appointments Guideline • Care of the Obese Woman in Pregnancy • Care of Women in Labour including Clinical Risk Assessment in

	Labour • Criteria for Birth Centres and at Home • Gestational Diabetes in Pregnancy Guideline • Pre-existing Diabetes in Pregnancy Guideline • Maternity Critical Care Guideline • Maternity Training Strategy & Training Needs Analysis • Maternal Transfer Guideline • Operational Policy for Maternity Services at Crowborough and Maidstone Birth Centres • Preterm Delivery and Delayed Cord Clamping in Preterm Infants • Record Keeping and Management of Health Records • Referral Criteria for Maternity Day Unit • Venous Thromboembolism (VTE) in Pregnancy & Puerperium Guideline

Version Control:		
Issue:	**Description of changes:**	**Date:**
1.0	Severe Hypertension & PET	Nov 2005
2.0	Severe Hypertension & PET – amended	Jan 2008
3.0	Severe Hypertension & PET – amended	Sep 2008
4.0	Updated & renamed – Severe Pre eclampsia	Nov 2009
5.0	Flow chart amended	May 2010
6.0	Guideline amended to address service reconfiguration and new NICE guidance. Now also includes 'Detection and Referral in Pregnancy' document	October 2011
7.0	Key changes (unified with NICE hypertensive disorders in pregnancy guidelines-2011) different from the current guideline; and therefore with implications for current practice and skills training include: • Change in first line intravenous anti-hypertensive from Hydralazine to Labetalol • Postnatal discharge information for women with hypertension in pregnancy • Follow-up in Consultant Clinic 6-8 weeks postnatal for women with severe PET, complicated Severe PET or early onset severe PET requiring delivery before 34 weeks • Change to Magnesium Sulphate regime	June – September 2016
7.1	Correction of an error regarding duration of Magnesium Sulphate maintenance dose in Section 5.12.12 Magnesium Sulphate Prophylaxis	3 January 2017

7.2	Change with Magnesium Sulfate regime following national directive to use IV Magnesium Sulfate 20% in order to reduce the risks from medication errors (see Cross References No. 6). Note: Change of spelling to Sulfate as per branding.	24th May 2019
7.3	Further change to ensure clarity with dosage of Magnesium Sulfate	29 May 2019

Guideline Statement for

Hypertensive Disorders of Pregnancy Including Severe Pre-eclampsia and Eclampsia

Hypertensive disorders complicates up to 10% of pregnancies. Pre-eclampsia and Eclampsia are amongst the leading direct causes of maternal death. Pre-eclampsia is associated with fetal growth restriction, small for gestational weight (SGA) and preterm delivery.

The main stay of management is dependent on identification of women at risk, early recognition and prompt diagnosis with timely establishment of treatment measures to reduce life-threatening complications of Pre-eclampsia.

This guideline summarises the quality of the evidence to date and provides a practical approach to the diagnosis, assessment and treatment of the hypertensive disorders of pregnancy in the antenatal, intrapartum and postnatal period (up to 6 weeks).

Hypertensive Disorders of Pregnancy including Severe Pre-eclampsia and Eclampsia

Contents

1.0 Introduction and Scope of Procedural Document

1.1 Introduction

This guideline outlines the management of women with hypertensive disorders in pregnancy. Women with hypertension will present throughout gestation and in the postnatal period, and their management is dependent on the diagnosis. The different hypertensive disorders are defined below and the guideline includes management for all of these conditions.

The definitions and management guidance within this document is based on the NICE Hypertension in Pregnancy Guidelines (NICE, 2011).

1.2 Purpose

This Document should guide the referral, initial and ongoing treatment of hypertensive disorders in pregnancy in the various care settings, including in the hospital. It aims to ensure:

- Recognition of and Identification of Blood Pressure above which urgent referral (from community) for prompt and effective antihypertensive treatment is required
- Ensure that life-threatening hypertension is treated effectively and avoid high systolic blood pressures associated with the risk of intracerebral haemorrhage
- Early involvement of Consultant Obstetrician in the management of women with suspected or proven Severe Pre-eclampsia and Eclampsia
- To avoid potentially serious consequences of fluid overload with emphasis on careful monitoring of fluid input and output, fluid restriction and central monitoring
- Early Involvement of Multidisciplinary team including Obstetricians, Midwives, Anaesthetist, Critical Care Specialist and Neonatologists

2.0 Definitions

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

Gestational hypertension is new hypertension presenting after 20 weeks without significant proteinuria.

Pre-eclampsia is new hypertension presenting after 20 weeks with significant proteinuria.

Severe pre-eclampsia is pre-eclampsia with severe hypertension and/or with symptoms, and/or biochemical and/or haematological impairment.

Eclampsia is a convulsive condition associated with pre-eclampsia.
HELLP syndrome is haemolysis, elevated liver enzymes and low platelet count.

Gestational proteinuria: Significant proteinuria (see below) diagnosed after 20 weeks in the absence of hypertension.

Significant proteinuria is if there is more than 0.3g protein (>0.03g of Albumin) in a 24-hour urine collection or a more than 30 mg/mmol in a spot urinary protein: creatinine sample.

3.0 Duties

It is the registered professional's responsibility to deliver care based on current evidence, always acting in the patient's best interests.

It is the responsibility of all staff involved in the care of patients to ensure that they conform to professional record keeping standards. An integral part of providing good care is ensuring record keeping is accurate, contemporaneous and complete.

Refer to MTW Guideline: Record Keeping and Management of Health Records. The link is:
RWF-WC-OPG-MAT-CG15

4.0 Training / Competency Requirements

Annual, mandatory attendance and participation at multidisciplinary eclampsia skills drills and lectures is required for all Midwives, Obstetric staff, Obstetric Anaesthetists and Maternity Staff Nurses.

Sign off is required to be obtained and periodically presented to Educational Supervisors / Appraisers (Doctors). Attendance at updates is contained within the Training Needs Analysis document. The link is:

RWF-WC-OPG-MATERNITY-CG15

5.0 Procedure

5.1 General Antenatal Risk Assessment considerations

The Maternity Service provided to women by Maidstone & Tunbridge Wells NHS Trust was reconfigured in September 2011.

Inpatient services for high risk women are available at the Tunbridge Wells Hospital at Pembury (TWH) with level 2 Neonatal Unit also based at TWH. High Risk women are those identified by risk assessment as having a condition or problem that requires them to have additional care during their pregnancy.

Women are offered the following:

- Low risk women, identified by clinical risk assessment as suitable for midwifery-led care during their pregnancy, may choose to give birth at TWH, at home or the midwife-led Birth Centres at Maidstone and Crowborough.
- A range of outpatient maternity services including Antenatal Clinics, Obstetric Ultrasound and a Maternity Day Unit are offered at both TWH and Maidstone

Hospital. These are accessed, as appropriate by both high and low risk pregnant women in each geographical area.

Appointments are planned for the most suitable geographical location to reduce the risk as far as possible of needing an emergency ambulance transfer from elsewhere to Tunbridge Wells Hospital at Pembury, as the high-risk obstetric unit.

All pregnant women should be risk assessed at the booking visit for the risk of developing hypertensive disorder in the course of their pregnancy. In the presence of one high risk factor or two moderate risk factors, the woman should be referred to her GP for prescription to start low dose Aspirin 75 mgs daily for the course of the pregnancy, and referral to consultant clinic (see Appendices 4 & 5).

Practitioners should familiarise themselves with the specific individual referral criteria for the Maternity Day Unit (& Triage area) facilities available at Tunbridge Wells Hospital at Pembury and Maidstone Hospital when planning monitoring for maternal and fetal wellbeing. Guideline link: RWF-WC-OPG-MAT-CG104

5.2 Degrees of hypertension

The three grades of hypertension in pregnancy are classified as follows:

Mild: Systolic blood pressure 140–149 mmHg, diastolic blood pressure 90–99 mmHg

Moderate: Systolic blood pressure 150–159 mmHg, diastolic blood pressure 100–109 mmHg

Severe: Systolic blood pressure ≥160 mmHg, diastolic blood pressure ≥110 mmHg

5.3 Initial assessment of women with new onset hypertension

- This guidance refers to women seen on the maternity day assessment unit, antenatal clinic and antenatal/postnatal wards.
- Women presenting with suspected NEW ONSET hypertension should have a minimum of 3 blood pressure readings over at least a half hour period using an appropriate sized cuff.
- Women should have urinalysis performed and if ≥"+" on dipstick, a PCR should be requested urgently

Following initial assessment, it should be possible to make a diagnosis of gestational hypertension or pre-eclampsia. Women should then be assessed according to the **Flow Charts in Appendices A or B**.

5.4 Diagnosis of significant proteinuria

- The reliable detection of significant proteinuria is most important in women with new-onset hypertension during pregnancy because it distinguishes between those pregnancies with pre-eclampsia from those with gestational hypertension and this sets the scene for future monitoring and management
- An MSU should always be performed in women with any degree of proteinuria to exclude urinary tract infection
- Significant proteinuria is defined as PCR ≥30mg/mmol in the NICE guidelines

- 24 hour protein quantifications are not more reliable than PCR protein quantifications and should be reserved for use in women with chronic renal disease
- Once a diagnosis of significant proteinuria is made, it is NOT necessary to repeat PCR assessments. Deteriorating proteinuria does not predict worse maternal or fetal outcomes
- Women with new proteinuria without hypertension are at a higher risk of developing pre-eclampsia and adverse pregnancy outcomes than women with gestational hypertension alone (See Section 5.9.1 on Gestational Proteinuria for details of management)

5.5 Blood tests

Currently there are no blood tests, which diagnose or exclude pre-eclampsia.

Blood tests are used to obtain baseline haematological, renal and liver function and/or to diagnose multisystem disease.

Whilst abnormal blood results therefore indicate significant disease and require urgent senior obstetric review, normal blood tests do not exclude a diagnosis of pre-eclampsia or exclude the possibility of adverse maternal or fetal outcomes.

Diagnosis and subsequent management should be made on the presence of clinical features (blood pressure +/- proteinuria).

5.6 Management of women with gestational hypertension

- Gestational hypertension can become pre-eclampsia at any stage and the progression to pre-eclampsia is unpredictable. Around 15% of women with gestational hypertension will progress to pre-eclampsia but there are several risk factors, which make the progression more likely. These are listed below, but the absolute risk is not easily quantifiable and therefore frequent monitoring of blood pressure and proteinuria should be used to continually review the diagnosis.
- If the diagnosis is made before 36 weeks then an ultrasound for fetal growth, AFI and umbilical artery Doppler should be performed and repeated as clinically indicated.
- Women with the following should be considered to be at higher risk of progression to pre-eclampsia:
    - nulliparity
    - age ≥40 years
    - pregnancy interval of more than 10 years
    - family history of pre-eclampsia
    - multiple pregnancy
    - BMI of 35 kg/m² or more
    - gestational age <32 weeks at diagnosis
    - previous history of pre-eclampsia or gestational hypertension
    - pre-existing vascular disease
    - pre-existing kidney disease
    - Women diagnosed with gestational hypertension should be managed according to the Flow Chart in Appendix A.

5.6.1 Gestational hypertension: mild hypertension (BP 140/90–149/99 mmHg)

- Admission to hospital is not usually necessary
- Hypertension should not be treated
- Measure the woman's BP weekly
- An assessment of the subsequent risk of the woman developing pre-eclampsia should be performed: for women presenting before 32 weeks or at high risk of pre-eclampsia, test for proteinuria and measure the woman's BP twice per week
- Presence of new proteinuria should be assessed at each visit and a PCR requested if ≥+ proteinuria dipstick. If significant proteinuria treat as per pre-eclampsia (see Section 5.8. & Appendix B)

5.6.2 Gestational hypertension: moderate hypertension (BP 150/100–159/109 mmHg)

- Admission to hospital not usually necessary
- Treat the woman with oral Labetalol (starting dose 200mg tds) or Nifedipine MR (starting dose 10-20mg bd) to keep BP <150/80 mmHg mmHg (see Section 5.10.1 on treatment of chronic hypertension)
- Assess her response to treatment within 2 days
- Check baseline FBC, U&E, LFTs, Urate
- An assessment of the subsequent risk of the woman developing pre-eclampsia should be performed
- Measure the woman's BP at least twice per week
- Test for proteinuria at each visit; request PCR if ≥+ proteinuria, if significant proteinuria treat as per pre-eclampsia (see Section 5.8 & Appendix B)
- Further blood tests are not necessary if there is no subsequent proteinuria

5.6.3 Gestational hypertension: severe hypertension (BP ≥ 160/110 mmHg)

- Admit to hospital until BP ≥ 159/109 mmHg
- Treat the woman with oral labetalol (starting dose 200mg tds) and/or Nifedipine M/R (starting dose 10-20mg bd) to keep BP <150/80–100 mmHg (see Section 5.10.1 on treatment of chronic hypertension)
- Measure the woman's BP at least 4 times a day.
- Test for proteinuria daily; request PCR if ≥+ proteinuria dipstick. If significant proteinuria treat as per pre-eclampsia (see Section 5.8 & Appendix B)
- Check baseline FBC, U&E, LFTs, urate at presentation and then weekly
- In women, receiving outpatient care after severe hypertension has been effectively controlled in hospital: BP and urinalysis should be checked at least twice per week.

5.6.4 Gestational hypertension: delivery planning

- A care plan should be documented by a Senior Obstetrician which includes:
    - timing and nature of future fetal monitoring
    - maternal and/or fetal indications for delivery
    - if and when corticosteroids should be given.

Examples of clinical features, which should be discussed with a Senior Obstetrician and may indicate the need for delivery, include:

- Development of severe hypertension and/or rise in blood pressure requiring significant increases in antihypertensive doses or necessity for a second antihypertensive agent
- EFW below 10th centile and/or oligohydramnios
- Significant reduction in platelet count (<100x10^{9}/L) or abnormal serum Cr (>80 µmol/L), Urate (>500µmol/L), AST (>40U/L), Bilirubin (>16µmol/L)
- Development of significant maternal symptoms (frontal headache, blurred vision, new vomiting, epigastric pain)
- In women with gestational hypertension alone with no other signs of maternal or fetal compromise, delivery is not usually indicated before 37 weeks
- In women requiring antihypertensive therapy, delivery should be discussed and offered after 37 weeks following discussion between a Senior Obstetrician and the patient. Exact timing of delivery will depend on other maternal factors (previous obstetric history, maternal preference etc)
- In women not requiring antihypertensive treatment, there is very little evidence to support delivery over expectant management after 37 weeks. The timing of delivery should therefore be agreed between the woman and a Senior Obstetrician

5.6.5 Gestational hypertension: intrapartum management

- Antenatal hypertensive treatment should be continued as prescribed
- The woman's blood pressure should be monitored 4 hourly prior to the establishment of labour and hourly during established labour
- Aim to keep the woman's BP <150/100 mmHg. Blood pressure above this level should be treated with short acting agents (e.g. Labetalol 100-200mg). This can be used in labour if the patient was previously on Nifedipine throughout pregnancy. In women in established labour where gastric absorption may be compromised, IV antihypertensive therapy should be considered where there is sustained moderate/severe hypertension (i.e. the woman has not responded to oral medication within one hour of treatment) Labetolol would also be the first line IV agent
- **Do not give** Syntometrine® (Ergometrine) for third stage of labour
- Haematological and biochemical testing does not need to be repeated if it has been previously normal (within the previous week) and there are no additional signs of pre-eclampsia, even if regional analgesia is being considered
- Do not routinely limit duration of second stage of labour if BP stable.

5.6.6 Gestational hypertension: postnatal management

- Measure the woman's blood pressure:
    - At least daily for the first two days after birth
    - At least once between day 3 and 5 after birth
    - As clinically indicated if antihypertensive medication is required or changed
- Aim to keep the woman's blood pressure <140/90 mmHg

- Continue use of antenatal antihypertensive treatment
- Consider reducing the woman's medication if BP <130/80 mmHg
- Stop treatment if the woman's BP <120/70 mmHg
- If a woman has been initiated on Methyldopa to treat gestational hypertension because other agents suggested have been unsuccessful, stop within two days of birth because of its depressive effects – consider a beta blocker (Labetalol tds as first line or Atenolol once daily if compliance is an issue), calcium channel blocker (Nifedipine M/R first line or Amlodipine if required as an alternative). For full details on their use in breastfeeding please see Section 5.11 on Postnatal Management
- Do not repeat blood tests unless abnormal in the antenatal/intrapartum period
- A postnatal discharge letter should be completed by the clinical staff (see Appendix D) stating the diagnosis, frequency of blood pressure monitoring required in the community and the next medical review. Women requiring medication in the postnatal period should be reviewed by their GP 2 weeks post-delivery or sooner if blood pressure is not well controlled (>140/90 mmHg)
- Women who have developed gestational hypertension should be advised that they are at increased risk of developing essential hypertension in the future and given advice regarding diet, exercise and smoking cessation as appropriate

5.7 Antenatal management of women at risk of Pre-eclampsia

All pregnant women should be risk assessed at the booking visit for the risk of developing hypertensive disorder in the course of their pregnancy. In the presence of one high risk factor or two moderate risk factors, the woman should be referred to the Consultant's clinic.

5.7.1 Risk factors for pre-eclampsia

Moderate

- First Pregnancy
- Age ≥ 40 years
- Pregnancy interval > 10 years
- BMI ≥ 35kg/m^2 at first visit
- Family History of pre-eclampsia
- Multiple Pregnancy

High

- Hypertensive disorders during previous pregnancy
  - Previous severe eclampsia
  - Previous pre-eclampsia needing delivery before 34 weeks
  - Intra-uterine death
  - Placental Abruption
- Chronic kidney disease
- Autoimmune disease such as Systemic Lupus Erythematosis or Antiphospholipid Syndrome

- Type 1 or Type 2 Diabetes
- Chronic Hypertension

5.7.2 Prevention

Advise Aspirin 75mg/day from 12 weeks until birth with one high risk factor or two moderate risk factors (see Appendices 5 & 6).

5.7.3 Maternal & Fetal Monitoring/Assessment

Practitioners should familiarise themselves with the specific individual referral criteria for the Maternity Day Unit (& Triage area) facilities available at Tunbridge Wells Hospital at Pembury and Maidstone Hospital when planning monitoring for maternal and fetal wellbeing. Refer to MTW Guideline available at:
RWF-WC-OPG-MAT-CG104

- Referral Criteria for Maternity Day Unit
  Women that are in the high-risk group should have:
- BP and urinalysis to be checked two weekly from 28 weeks and weekly from 36 weeks till delivery. More frequent fetal growth monitoring will be required if the woman develops hypertension and/ or proteinuria.
- If woman reports reduced fetal movements arrange CTG.
- Advice to seek advice from midwife or GP if the experience symptoms of pre-eclampsia:
    - Severe headache
    - Problems with vision, such as blurring or flashing before the eyes
    - Epigastric pain
    - Sudden swelling of the face, hands or feet

5.8 Management of women with pre-eclampsia

Pre-eclampsia is a multisystemic disorder characterised by gestational hypertension with significant proteinuria.

If the patient has Severe Pre-eclampsia as defined in Section 5.12, **please refer to Section 5.12**. However, Pre-eclampsia is a diverse syndrome and it should be remembered that women can present with a mixture of signs and symptoms which are likely to be attributable to the same disease process.

Women with hypertension and any of the following should be managed as though they have Pre-eclampsia and discussed with a Senior Obstetrician:

- Gestational hypertension with associated signs of maternal multi-system disease (platelets $<100x10^9$/L, serum Cr >80 µmol/L, Urate >500µmol/L, AST >40U/L, Bilirubin >16µmol/L)
- Gestational hypertension with maternal symptoms (frontal headache, visual disturbance, new vomiting, epigastric pain)
- Gestational hypertension with associated fetal growth restriction (EFW $<10^{th}$ centile/oligohydramnios/abnormal Doppler's)
- Gestational proteinuria with any of the above

Women with a history of chronic hypertension are also at significant risk of developing pre-eclampsia, which can be difficult to diagnose. In women with chronic hypertension: development of proteinuria, significant increases in antihypertensive medication, maternal symptoms or deterioration in biochemical or haematological parameters should be considered as potential signs of pre-eclampsia.

5.8.1 Assessment of women with Pre-eclampsia

- Carry out a full assessment including serial BP measurements.
- Perform PET bloods.
- Quantify proteinuria using PCR.
- Perform fetal monitoring.
- **Admit to hospital for monitoring.**
- Admission to hospital is necessary for most women with a confirmed diagnosis of pre-eclampsia. In women not requiring antihypertensive therapy (BP <150/100 mmHg) and/or with borderline proteinuria (PCR 30-50mg/mmol) it may be appropriate to manage as an outpatient with alternate day assessments. Development of hypertension requiring treatment and/or significant proteinuria (>50mg/mmol) should prompt admission.
- If delivery is not required within the next 24 hours, carry out an ultrasound for fetal growth, AFI and umbilical artery Doppler.
- Once a diagnosis of significant proteinuria is made, it is not necessary to repeat proteinuria assessments. Increasing levels of proteinuria are not indicative of worsening disease.
- Women diagnosed with Pre-eclampsia should be managed according to the Flow Chart in Appendix B.

5.8.2 Pre-eclampsia: mild hypertension (BP 140/90–149/99 mmHg)

- Do not treat hypertension
- Measure BP at least 4 times a day
- Check FBC, U&Es, LFTs, urate twice per week

5.8.3 Pre-eclampsia: moderate hypertension (BP 150/100–159/109 mmHg)

- Treat with oral agent labetalol or Nifedipine M/R to keep BP < 150/80–100 mmHg
- Measure the woman's BP at least 4 times a day
- Check FBC, U&Es, LFTs, urate twice per week

5.8.4 Pre-eclampsia: severe hypertension (BP ≥ 160/110 mmHg)

- URGENT MEDICAL REVIEW
- MOVE TO HDU ON DELIVERY SUITE
- See SEVERE PRE-ECLAMPSIA PROTOCOL

5.8.5. Pre-eclampsia: delivery planning

- A care plan should be documented by a Senior Obstetrician which includes:

- timing and nature of future fetal monitoring
- maternal and/or fetal indications for birth
- if and when corticosteroids should be given

- Examples of clinical features which should be discussed with a Senior Obstetrician and may indicate the need for delivery include:
  - Development of severe hypertension and/or rise in blood pressure requiring significant increases in antihypertensive doses or necessity for a second antihypertensive agent
  - EFW below 10th centile and/or oligohydramnios
  - Significant reduction in platelet count (<100x10^{9}/L) or abnormal serum Cr (>80 µmol/L), Urate >500µmol/L, AST (>40U/L), Bilirubin (>16µmol/L)
  - Development of significant maternal symptoms (frontal headache, blurred vision, new vomiting, epigastric pain)

Before 34 weeks: Manage conservatively (do not plan same-day delivery of baby). Consultant obstetric staff to:

- Document maternal (biochemical, haematological and clinical) and fetal indications for elective birth before 34 weeks
- Write plan for antenatal fetal monitoring and course of corticosteroids (if required) (please see guideline on Preterm labour for dosing advice). Link is: RWF-WC-OPG-MAT-CG14
- Offer birth if severe refractory hypertension, or if maternal or fetal clinical indication develops as defined in plan.

34+0 to 36+6 weeks:

- Recommend birth after 34 weeks if pre-eclampsia with severe hypertension, BP controlled and, if required, course of corticosteroids completed
- Offer birth at 34+0 to36+6 weeks if pre-eclampsia with mild or moderate hypertension, depending on maternal and fetal condition, risk factors and availability of neonatal intensive care.

After 37+0 weeks:

- Recommend birth within 24–48 hours in women with confirmed pre-eclampsia with mild or moderate hypertension.

5.8.6 Pre-eclampsia: intrapartum care

- Antenatal hypertensive treatment should be continued as prescribed.
- The woman's blood pressure should be monitored 4 hourly prior to the establishment of labour and hourly during established labour.
- Aim to keep the woman's BP <150/100 mm Hg. Women who develop severe hypertension >160 mmHg (systolic) and/or 110 mmHg (diastolic) (average of 3 readings over 15 minutes) should be managed according to the SEVERE PRE-ECLAMPSIA PROTOCOL.
- Check FBC, U&Es, LFTs at the onset of labour, do not repeat during labour if normal.
- Do not give Syntometrine® (Ergometrine) for third stage of labour.

- Do not routinely limit duration of second stage of labour if BP stable.

5.8.7 Pre-eclampsia: postnatal investigation, monitoring and treatment (including after discharge from HDU/ITU)

- In women with pre-eclampsia, measure blood pressure:
  - at least four times a day while the woman is an inpatient
  - every 1–2 days for up to 2 weeks after transfer to community care until the woman is off treatment and has no hypertension
- Women should be asked about severe headache and epigastric pain each time blood pressure is measured
- Maintain the woman's blood pressure <140/90 mmHg
- Continue use of antenatal antihypertensive treatment
- Consider reducing medication if BP <130/80 mmHg
- Stop treatment if BP <120/70 mmHg
- If a woman has been initiated on Methyldopa to treat gestational hypertension if other agents suggested have been unsuccessful, stop within two days of birth because of its depressive effects - consider a beta blocker (Labetalol tds as first line or Atenolol once daily if compliance is an issue), calcium channel blocker (Nifedipine M/R first line or amlodipine if required as an alternative) for full details with breastfeeding please see Section 5.13.6
- Do not repeat blood tests unless abnormal in the antenatal/intrapartum period
- A postnatal discharge letter should be completed by the medical staff (see Appendix D) stating the diagnosis, frequency of blood pressure monitoring in the community and the next medical review. Women requiring medication in the postnatal period should be reviewed by their GP 2 weeks post-delivery or sooner if blood pressure is not well controlled (>140/90 mmHg)
- Women who have developed severe pre-eclampsia or who required delivery prior to 34 weeks should be referred for a 6-8 weeks review with their Consultant
- Women who have developed pre-eclampsia should be advised that they are at increased risk of developing essential hypertension in the future and given advice regarding diet, exercise and smoking cessation as appropriate

5.9 Gestational proteinuria (without hypertension)

A small subset of women present with proteinuria in the absence of hypertension. In some cases, this is physiological or attributable to a urinary tract infection, but it may also herald the development of pre-eclampsia. Studies have demonstrated that around 50% of women with isolated proteinuria develop pre-eclampsia and importantly, even in the absence of hypertension, these women are at significantly increased risk of adverse pregnancy outcomes such as fetal growth restriction and placental abruption. If hypertension develops in women with proteinuria they should be managed according to Pre-eclampsia guidelines (see Section 5.8).

- Women diagnosed with gestational proteinuria should be managed according to the Flow Chart in Appendix C.

5.9.1 Gestational proteinuria: management

- Admission to hospital not usually necessary
- Check baseline FBC, U&E, LFTs, urate in women with PCR >30mg/mmol or ++ proteinuria dipstick
- Once proteinuria confirmed DO NOT REPEAT PCR
- Perform an ultrasound to assess fetal growth if <37 weeks or conservative management planned
- An assessment of the subsequent risk of developing Pre-eclampsia should be performed (as per gestational hypertension Section 5.6)
- Measure BP at least twice per week. If presenting before 32 weeks or at high risk of pre-eclampsia, measure BP three times per week
- Check FBC, U&Es, LFTs, urate once per week
- Repeat urinalysis at each visit send repeat PCR ONLY if ≥ +++ proteinuria dipstick
- If PCR >300mg/mmol then there is an increased thrombotic risk: discuss with Senior Obstetrician regarding need for LMWH. Consider admission particularly if first presentation
- If abnormalities in haematological or biochemical parameters or if hypertension develops, treat as per Pre-eclampsia guidelines (see Section 5.8)

5.9.2. Gestational proteinuria: delivery planning

- A care plan should be documented by a Senior Obstetrician, which includes: timing and nature of future fetal monitoring, maternal and/or fetal indications for birth, if and when corticosteroids should be given
- Examples of clinical features which should be discussed with a Senior Obstetrician and may indicate the need for delivery include:
  - EFW below 10th centile and/or oligohydramnios
  - Significant reduction in platelet count (<100x10^{9}/L) or abnormal Cr (>80 µmol/L), Urate >500µmol/L, AST (>40U/L), Bilirubin (>16µmol/L)
  - In women with gestational proteinuria alone with no other signs of maternal or fetal compromise, delivery is not usually indicated before 37 weeks
- In women with significant proteinuria (even in the absence of hypertension) delivery should be discussed and offered after 37 weeks following discussion between a Senior Obstetrician and the patient. Exact timing of delivery will depend on other maternal factors (previous obstetric history, maternal preference etc).

5.9.3. Gestational proteinuria: postnatal management

- Measure blood pressure:
  - At least daily for the first two days after birth
  - At least once between day 3 and 5 after birth
  - As per pre-eclampsia guidance if antihypertensive medication is required
- Do not repeat blood tests unless abnormal in the antenatal/intrapartum period
- Do not repeat proteinuria assessment
- Women who have developed gestational proteinuria which required delivery prior to 34 weeks should be referred for a 6-8 weeks review with their Consultant
- A postnatal discharge letter (see Appendix D) should be sent at discharge

5.10 ANTENATAL MANAGEMENT OF WOMEN WITH CHRONIC HYPERTENSION

- Women on ACE inhibitors and ARBs (Angiotensin receptor blockers) should be advised to stop their medication on confirming the pregnancy
- Women with chronic hypertension should be prescribed Aspirin 75mg once daily from at least 12 weeks gestation to reduce the risk of Pre-eclampsia, this should be continued throughout pregnancy
- An assessment of proteinuria (PCR) and renal function should be obtained at booking or at diagnosis (whichever is earlier)
- Women with significant proteinuria (PCR>30mg/mmol) before 20 weeks should be investigated for underlying renal disease if a renal diagnosis has not been established
- All women with a diagnosis of chronic hypertension should be offered a renal scan if it has not previously been performed
- Women with a diagnosis of chronic hypertension should be informed of the increased risk of fetal growth restriction and superimposed pre-eclampsia requiring preterm delivery
- If BP stable, monitoring of BP and urinalysis to be checked two weekly from 28 weeks and weekly from 36 weeks and until delivery. More frequent monitoring will be required if the woman develops hypertension and or proteinuria
- Ultrasound scans 3 weekly scans from 26-28 weeks to assess liquor volume and umbilical artery Doppler
- Low molecular weight heparin should be considered for women with nephrotic range proteinuria (PCR >300mg/mmol)
- Women with chronic hypertension who develop Pre-eclampsia (sudden significant increase in blood pressure, development of new proteinuria or abnormal haematological or biochemical indices) should be managed in line with the Pre-eclampsia guideline in Section 5.8 above (see Appendix B)

5.10.1Treatment of chronic hypertension

- Women with uncomplicated hypertension (no renal or other end organ disease) should maintain their blood pressure <150/80-95mmHg
- Women with renal disease should maintain their BP <140/75-85mmHg
- First line antihypertensives:
  - Labetalol 200mg tds/qds increasing to a maximum of 600mg qds (contraindication severe asthma)

  and/or
  - Nifedipine M/R 10mg bd increasing to a maximum 40mg bd
- Second line antihypertensives

  Women requiring second line antihypertensives will be complex women who will require consultant input. The drugs listed below are for possible options for reference but should only be commenced following discussion with a consultant obstetrician as they are used in more complex patients:
  - Methyldopa
  - Doxazosin
  - Amlodipine (as a possible alternative to Nifedipine – limited safety data)
  - Hydralazine (should only be prescribed if all other options explored)
- Blood pressure should be checked within a week of a change in antihypertensive medication
- Antihypertensive medication should be reduced/discontinued if the blood pressure is consistently < 75mmHg (diastolic)

5.10.2 Delivery planning for women with chronic hypertension

- Decision for delivery should be made by a Consultant Obstetrician
- For women requiring antihypertensive medication, delivery should be offered around 38 weeks following discussion with the woman and a full assessment of maternal and fetal factors
- Where a possible a plan for postnatal antihypertensive medications should be made and documented prior to delivery

5.11 POSTNATAL MANAGEMENT

- Measure blood pressure:
  - At least daily for the first two days after birth
  - At least once between day 3 and 5 after birth
  - As per pre-eclampsia guidance if antihypertensive medication is required
- Aim to maintain BP <140/90mmHg in the postnatal period. If BP is above target **discuss ongoing antihypertensive regime with a senior Obstetrician as soon as possible to avoid delaying postnatal discharge.**
- Consider restarting pre-pregnancy antihypertensive medication. The following medications should be considered in the postnatal period dependent upon whether the woman would like to breastfeed. The following antihypertensive drugs have no

known adverse effects on babies receiving breast milk. Other considerations for the welfare of the baby include if they were premature and have any other medical conditions.

- **Labetolol** should be continued if was initiated during pregnancy. There is limited safety data for the use of atenolol 25 or 50mg daily but it can be used as an alternative to Labetolol if compliance is a problem.
- **Nifedipine M/R** can be continued if it was initiated during pregnancy as this is considered safe during breast feeding. Amlodipine 5 or 10mg can be used as an alternative but there is very little published evidence on this.
- **Doxazosin** has little published evidence on use in breast feeding which has to be considered when initiating patients on this. Its use therefore, is usually reserved for consultant initiation only (for renal patients). One reference suggests that up to 4mg may be safe due to low levels excreted in breast milk but there is no published evidence for prolonged use.
- **Enalapril** can be considered for use in breastfeeding if an ACE inhibitor is required. If Enalapril is not tolerated, captopril can also be used.

- Do not repeat blood tests unless abnormal in the antenatal/intrapartum period.
- A postnatal discharge letter should be sent at discharge detailing discharge medication and follow up plans.

5.12 SEVERE PET PROTOCOL

5.12.1 Communication

The effective management of women with severe pre-eclampsia requires clear lines of communication between the midwifery, obstetric and anaesthetic staff. The Consultant Obstetrician and the Consultant Anaesthetist must be informed, by their Middle Grades, of any woman with “severe disease” in order that they can be involved at an early stage in management and this should be documented in the medical notes. Clinicians should ensure the provision and discussion of information of the risks and benefits with women during the antenatal, intrapartum and postnatal periods.

5.12.2 Record Keeping

Staff should clearly document in the health records the discussions and provision of information to women as clinically indicated. Timings of drug administration and delivery decision should also be accurately documented.

5.12.3 Definition and Indicators of Severe Disease

Pre-eclampsia: New hypertension presenting after 20 weeks with significant proteinuria.
Severe pre-eclampsia: Pre-eclampsia with severe hypertension and/or with symptoms, and/or biochemical and/or haematological impairment.
Eclampsia: Convulsive condition associated with pre-eclampsia.

The criteria for managing a woman with these guidelines are subjective to a certain degree. However, the following are indicators of severe disease and justify close assessment and monitoring. They would not necessarily lead to delivery, but assuming a correct diagnosis, it is likely that maternal parameters will not improve until after delivery. They are also not the only entry requirements.

1. Eclampsia
2. Severe Hypertension: Systolic Blood pressure over 160mmHg† with at least + proteinuria
   †average of 3 readings over 15 mins
3. Moderate Hypertension: Systolic Blood pressure over 140/mmHg and/or Diastolic Blood pressure over 90 mmHg with significant proteinuria††
   and any of:
   - severe headache with visual disturbance
   - epigastric pain
   - signs of clonus
   - liver tenderness
   - platelet count falling to below 100 x 10^9/l
   - Alanine amino transferase rising to above 50 units/l
   - Creatinine >100mmol/l

   †† at least "++"proteinuria, PCR ≥30mg/mmol, 0.3g in 24 hours

5.12.4 General Measures

The woman should be managed in a quiet, well lit room HDU room, with one to one midwifery care. After initial assessment, charts should be commenced to record all physiological monitoring and investigation results, using HDU charts. All treatments should be recorded. Initially the woman should be assessed by the Obstetric and the Anaesthetic Middle Grades.
The Consultant Obstetrician and the Consultant Anaesthetist **must** be informed, by their Middle Grades, in order that they can be involved at an early stage in management and this should be documented in the maternal records.

A large bore intravenous cannula should always be inserted, but not necessarily used for infusing drugs or fluid until either an indication presents or a decision is made to deliver. If intravenous fluid is given, it should be by controlled volumetric pump.

5.12.5 Basic Investigations

Blood should be sent for:

- Serum electrolytes (Na, K, Urea, Creatinine, Urate)
- Liver function tests (Albumin, AST, bilirubin)
- Full Blood count (Hb, WCC, Plts)
- Clotting (PT, APPT ± fibrinogen)
- Group and save serum

All tests should be checked daily or more frequently if abnormal.

5.12.6 Measurement of BP

While Dinamaps are good for measuring blood pressure trends, absolute measurements of blood pressure should be measured using sphygmomanometers. Korotkoff phase 5 should be used to determine the diastolic pressure. Automotive devices can under estimate raised blood pressure in pre-eclampsia. Thus where the reading from the automated device and the manual device differ the manually device should be used.
It may be appropriate to consider inserting an arterial line to monitor the blood pressure

5.12.7 Monitoring

- Blood pressure and pulse should be measured every 15 minutes until stabilised and then half hourly
- An indwelling catheter should be inserted and urine output measured hourly whenever intravenous fluids are given
- Oxygen saturation should be measured continuously and charted with the blood pressure. If saturation falls below 95% then medical review is essential
- Fluid balance should be monitored very carefully. Detailed Input and Output recordings should be charted
- Respiratory rate should be measured hourly
- Temperature should be measured four hourly
- When present CVP/arterial lines should be measured continuously and charted with the blood pressure
- Neurological assessment should be performed hourly using either AVPU or GCS
- Fetal wellbeing should be assessed carefully. In the initial stages this will be with a cardiotocograph but consideration should be given to assessing the fetus with a growth scan, liquor assessment and umbilical artery doppler flow velocity waveforms
- Blood tests should be repeated every 12 hours whilst on the protocol. In the event of haemorrhage more frequent blood tests should be taken. In the presence of abnormal/deteriorating haematological/biochemical parameters, more frequent testing may be required e.g. every 6-8 hours

5.12.8 Antenatal Fluid Management

Careful fluid balance is aimed at avoiding fluid overload. Total input should be limited to 80ml/hour. If oxytocin (Syntocinon®) is used the volume of fluid should be included in the total input. Oliguria at this point should not precipitate any specific intervention except to encourage early delivery.

5.12.9 Thromboprophylaxis

Prior to Delivery

Women with pre-eclampsia are at increased risk of thrombo-embolic disease. All patients should have anti-embolic stockings and/or flowtrons and/or low molecular weight heparin whilst immobile.

5.12.10 Following Delivery

- Low molecular weight heparin (dose adjusted on early pregnancy weight) should be given daily until the patient is fully mobile (10 days if delivered by caesarean section (CS)) as per the Thromboprophylaxis guidelines in pregnancy. The link is: RWF-WC-OPG-MAT-CG57
- Low molecular weight heparin should not be given until 4-6 hours after spinal anaesthesia.
- An epidural catheter should be left in place for least 12 hours after low molecular weight heparin administration. Following removal of an epidural catheter low molecular weight heparin should not be given for 4-6 hours

5.12.11 Controlling Blood Pressure

Systolic blood pressure ≥160mm Hg requires prompt treatment
The aim of stabilisation of blood pressure is to reduce the blood pressure to <160/105mmHg in the first instance (mean arterial pressure (MAP)† <125mmHg) and maintain the blood pressure at or below that level. This will necessitate medical staff remaining in attendance. Blood pressure may suddenly drop in response to treatment, thus treatment should be titrated gradually by the Obstetrician or Anaesthetist.
† MAP = D + 1/3 (S-D)

- First Choice Agent: Labetalol

  If the woman can tolerate oral therapy an initial 200mg oral dose can be given. This can be done immediately before venous access is obtained as the oral preparation can work as effectively as an intravenous dose at reducing blood pressure. This should lead to a reduction in blood pressure in about half an hour. A second oral dose can be given after 30 minutes following medical instruction if needed.
  If there is no initial response to oral therapy or if it cannot be tolerated orally, control should be by repeated boluses of Labetalol 50mg followed by a labetalol infusion see dosing information below:

  Bolus infusion

  50mg (10ml of Labetalol 5mg/ml) given over at least 5 minutes.

  This should have an effect by 10 minutes and should be repeated if diastolic blood pressure has not been reduced (to <160/105).

This can be repeated in doses of 50mg, at 10 minute intervals, to a maximum dose of 200mg. If this has been successful the patient can be switched to an infusion as dosed below:

Continuous infusion

If patient responds to bolus doses, or as initial treatment in moderate hypertension, a labetalol infusion should be commenced.

A neat infusion of labetalol (5mg/ml) should be commenced at a rate of 4ml/hour (20mg/hour) via a syringe pump.

The infusion rate should be doubled every half hour to a maximum of 32ml/hour (160mg)/ hour or until the blood pressure has dropped and then stabilised at an acceptable level.

Contraindication: severe asthma. Use with caution in women with pre-existing cardiac disease.

If IV labetalol has not reduced BP <160/105mmHg after 60-90 minutes or BP is >160mmHg despite a maximal labetalol infusion, then a second line agent should be considered. In such cases it is normally appropriate to continue the first drug i.e. labetalol while administering the second.

- Second Choice Agents

The use of a second line antihypertensive should always be discussed with a Senior Obstetrician.

The choice of second line agent should be determined by the clinical situation (i.e. suitability of oral or IV therapy, proximity of delivery) and the preference of the senior obstetrician.

CAUTION: The use of a second line agent (Nifedipine or Hydralazine) can precipitate drops in blood pressure, particularly if Magnesium Sulfate therapy is also being administered.

Nifedipine (oral preparation)
Nifedipine 10mg (immediate release) can be considered if Labetalol has not adequately controlled blood pressure. Doses can be repeated 4-6 hourly if necessary to a maximum of 40mg

Profound hypotension can occur with concomitant use of Nifedipine and parenteral Magnesium Sulfate and therefore Nifedipine should be prescribed with caution.

A modified release (12 hour) preparation may be considered in women where a more sustained preparation may be beneficial once patient is stabilised postnatally.

Note: Nifedipine should NEVER be given sublingually to a woman with hypertension.

Hydralazine (IV preparation)

Hydralazine is an alternative agent if labetalol is contraindicated or fails to control the blood pressure.

Hydralazine is given as a bolus infusion 2.5 mg over 5 minutes, measuring the blood pressure every 5 minutes.

This can be repeated every 20 minutes to a maximum dose of 20 mg.

If this has been successful, an **infusion** of Hydralazine can be given as outlined below:

40mg of Hydralazine in 40 mls of normal saline,
This should be run at 1-5ml/hr (1-5mg/hr).

Note: If the Labetalol infusion is continued, Hydralazine infusion may not be required as the blood pressure will probably settle with bolus doses.

5.12.12 Magnesium Sulfate Prophylaxis

It is appropriate to treat cases of severe pre-eclampsia for Magnesium Sulfate to prevent seizures. **NO** other agents are appropriate for prophylaxis.

Magnesium Sulfate Protocol

	Method of administration	Dose	Rate of administration
Loading dose (initial treatment)	Intravenous	4g over 20minutes (10mls 20% Mag Sulfate x 2 ampoules)	Set pump at 60mls/hr and administer the 20ml of Magnesium Sulfate 20% over 20 minutes
Maintenance infusion (started immediately after loading dose via syringe pump)	Intravenous	1g/hr (10mls 20% Mag Sulfate x5 ampoules) in 50ml syringe	Administer at the rate of 5mls/hour

THERE IS NO NEED TO MEASURE MAGNESIUM LEVELS WITH THE ABOVE PROTOCOL

Process for administration

Index	Description
1.	• **Loading dose** should be prepared using 2x 10mls Magnesium Sulfate 20% (equivalent to 2g in 10mls) ampoules in a 50ml syringe (total dose = 4g) • This should be administered intravenously using a syringe driver over 20 minutes at a rate of 60mls/hour • Two staff members must check the syringe and the infusion rate prior to commencing the infusion
2.	• A doctor must be present during the whole process of loading with Magnesium Sulfate • A three lead ECG must be used throughout
3.	• **Maintenance dose** will be made up using 5 x 10mls Magnesium Sulfate 20% (2g in 10mls) ampoules in a 50ml syringe • This should be administered intravenously using a syringe driver at a rate of 5mls/hour (dose = 1g/hr) • Two staff members must check the syringe and the infusion rate prior to commencing the infusion

Side Effects

Motor paralysis, absent tendon reflexes, respiratory depression and cardiac arrhythmia (increased conduction time) can all occur but will be at a minimum if magnesium is administered slowly (at the rate indicated above) and the woman observed as below.

Important Observations while giving IV Magnesium

Formal clinical review must occur at least every 4 hours.
Hourly MEOWS must be recorded with the following additional observations performed:

i) Continuous pulse oximetry (alert Anaesthetist if O_2 sat<95%) and three lead ECG monitoring if available
ii) Hourly urine output
iii) Deep tendon reflexes (every 4 hours)

Cessation/reduction of the Magnesium Sulfate infusion should be c considered if:

i) The biceps reflex is not present.
ii) The respiratory rate is < 12/min.

The antidote is 10ml 10% calcium gluconate given slowly intravenously (over 5 - 10 minutes)

97% of Magnesium is excreted in the urine and therefore the presence of oliguria can lead to toxic levels (respiratory paralysis can be expected at 5-6.5mmol/l and cardiac conduction problems at levels >7.5mmol/l). In the presence of oliguria then further administration of Magnesium Sulfate should be reduced (by 50%) or stopped. If Magnesium is not being excreted then the levels should not fall and no other anticonvulsant is needed. Magnesium should be re-introduced if urine output improves.

5.13 SEVERE PRE-ECLAMPSIA DELIVERY GUIDELINES

- Planned Delivery on the Best Day in the Best Way

  The delivery should be well planned, done on the best day, performed in the best place, by the best route and with the best support team. Timing affects the outcome for both mother and baby. If the mother is unstable then delivery is inappropriate and increases risk. Once stabilised with antihypertensive and possibly anticonvulsant drugs then a decision should be made. In the absence of convulsions prolonging the pregnancy may be possible to improve the outcome of a premature fetus but only if the mother remains stable. Continued close monitoring of mother and baby is needed. It seems ideal to achieve delivery, particularly of premature infants, during normal working hours.
  H2 antagonists should be given as per local guidelines.

  Even a few hours may be helpful if it allows the neonatal unit to be more organised or to transfer a mother to a place where a cot is available, assuming the mother is stable before transfer. (See stabilization - Section 5.13.8. before Transfer Section).

If the pregnancy can be prolonged in excess of 48 hours, steroids help mature the fetal lungs (please see preterm labour management guideline). Available at: RWF-WC-OPG-MAT-CG14
However, even if delivery is planned for within 24 hours, steroids may be of benefit and should be given. Since the benefits to the fetus peak between 48 hours and 6 days, after 48 hours, further consideration must be given to delivery, as further delay may not be advantageous to the baby or mother. In all situations a planned elective delivery suiting all professionals is appropriate.

This position does not necessitate caesarean section; however, worthy of note is that if the gestation is under 32 weeks, induction of labour is unlikely to be successful given the pressing need for delivery. After 34 weeks gestation, vaginal delivery should be considered in the case of a cephalic presentation. The mode of delivery must be discussed with the Consultant Obstetrician. Vaginal prostaglandins will increase the chance of success. Anti-hypertensive treatment should be continued throughout assessment and labour. In cases where delivery does not occur vaginally within 12-24 hours, the mode of delivery should be reconsidered by a Senior Obstetrician. In cases of severe pre-eclampsia even when the baby has died or is not viable, it may be appropriate to expedite delivery by caesarean section in the mother's interests, if induction of labour is prolonged.
The duty consultant should consider whether he/she needs to attend:

i) To perform any necessary CS
ii) If there is haemorrhage >1.5L and continuing.

If blood pressure is controlled (150/80-100mmHg) the second stage should not be limited routinely. An epidural will normally be used. The third stage must be managed with **10 units oxytocin IM or 5 units of IV oxytocin (Syntocinon®** Ergometrine or Syntometrine® (Ergometrine combined with Oxytocin) should not be used because of the risk of severe hypertension.

5.13.1 Regional Blockade and Fluids

Women with genuine Pre-eclampsia tend to maintain their blood pressure, despite regional blockade. When this happens, fluid load is unnecessary and may complicate fluid balance. For this reason, **fluid loading in pre-eclampsia should always be controlled and should never be done prophylactically or routinely**. Hypotension, when it occurs, can be easily controlled with very small doses of Ephedrine (3mg – 6mg repeated according to response every 3-4 minutes with a maximum dose of 30mg. General anaesthesia can add to the risks of delivery since intubation and extubation can lead to increases in systolic and diastolic blood pressure, as well as heart rate, so should be avoided where possible.

5.13.2 Arterial Line Insertion

Invasive blood pressure monitoring may be considered to aid intravenous antihypertensive therapy.

An intra-arterial pressure monitor may be indicated if:

i) the woman is unstable
ii) the blood pressure is very high
iii) the woman is obese, when non-invasive measurements are unreliable
iv) there is a haemorrhage of >1000 mls

5.13.3 Indications for Central Venous Pressure Monitoring

CVP lines can be misleading in women with pre-eclampsia as they often have a constricted vasculature with altered venous pressures, which do not accurately reflect intravascular fluid status. However, a CVP line may be indicated if blood loss is excessive:

i) Particularly at Caesarean section
ii) or if delivery is complicated by other factors such as abruptio placentae.

5.13.4 Severe PET- Postpartum Fluid Management

Following delivery the woman should be fluid restricted in order to wait for the natural diuresis, which usually occurs sometime around 36-48 hours post-delivery. The total amount of fluid (the total of intravenous and oral fluids) given should be no more than 80 ml/hr: Hartmanns solution or equivalent plus other infusions of drugs e.g. magnesium and labetalol infusions. Fluid restriction will usually be continued for the duration of Magnesium Sulfate treatment; however increased fluid intake may be allowed by a Consultant Obstetrician at an earlier time point in the presence of significant diuresis.

Urine output should be recorded hourly and each 4-hour block should be summated and recorded on the chart. Each 4-hour block should total in excess of 80 ml. If two consecutive blocks fail to achieve 80 ml then further action is appropriate. This would either be:

A. If total input is more than 750 ml in excess of output in the last 24 hours (or since starting the regime) then 20 mg of IV furosemide should be given over 5 minutes as a slow IV bolus. If a diuresis in excess of 200 ml occurs in the next hour the fluid should be replaced with 250ml of Gelofusin over 1 hour in addition to baseline fluids.

OR

B. If total input is less than 750 ml in excess of output in the last 24 hours (or since starting the regime) then an infusion of 250ml of colloid over 20 minutes should be given. The urine output should then be watched until the end of the next four-hour block. If the urine output is still low (<80mls over 4 hours) then 20mg of IV furosemide should be given over 5 minutes as a slow bolus. If a diuresis in excess of 200 ml occurs in the next hour the fluid should be replaced with 250ml of Gelofusin over 1 hour in addition to baseline fluids.

If the urine output fails to respond to furosemide in either situation then a discussion with the anaesthetist will be required.

5.13.5 Special Problems

If persisting oliguria requiring fluid challenge or Furosemide occurs then the electrolytes need to be carefully assessed and checked six hourly. If there is concern over a rising creatinine and or potassium the case should be discussed with a Renal Physician.

If the woman has a falling oxygen saturation, this is most likely to be due to fluid overload. Input and output should be assessed together with either clinical or invasive assessment of the fluid balance. However, the most appropriate treatment is likely to be furosemide and oxygen. If there is no diuresis and the oxygen saturation does not rise then renal referral should be considered.

5.13.6 Immediate Postnatal Care

- Women who have received treatment for severe pre-eclampsia should be monitored in hospital until at least the 3rd postnatal day and have 4 hourly blood pressure measurements
- It is important to **predict and anticipate the need for antihypertensives** in order to avoid delaying discharge and to prevent severe hypertension
- The following medications should be considered in the postnatal period and have no known adverse effects on babies receiving breast milk. Other considerations for the welfare of the baby include if they were premature and have any other medical conditions.
    - **Labetolol** should be continued if was initiated during pregnancy. There is limited safety data for the use of atenolol 25 or 50mg daily but it can be used as an alternative to Labetalol if compliance is a problem
    - **Nifedipine M/R** can be continued if it was initiated during pregnancy as this is considered safe during breastfeeding. Amlodipine 5 or 10mg can be used as an alternative but there is very little published evidence on this.
    - **Doxazosin** has little published evidence on use in breastfeeding, which has to be considered when initiating patients on this. Its use therefore, is usually reserved for Consultant initiation only (for renal patients). One reference suggests that up to 4mg may be safe due to low levels excreted in breast milk but there is no published evidence for prolonged use.
    - **Enalapril** can be considered for use in breastfeeding if an ACE inhibitor is required. If enalapril is not tolerated, Captopril can also be used.

- After day 3-4 women may be discharged when asymptomatic, provided the haematology and biochemistry results are normal or improving and the blood pressure is < 150/100mmHg
- Those on treatment should have follow up arranged either from their GP within 2 weeks
- There should be direct communication with the GP via discharge note or via the community midwife. This should include:
    - Who will provide follow-up care, including medical review if needed (GP or secondary care)
    - Frequency of blood pressure monitoring

- Thresholds for reducing or stopping treatment (e.g. BP130/80 reduce treatment, <120/70 stop treatment)
- Indications for referral to primary care for blood pressure review
- Measure BP every 1–2 days for up to 2 weeks after transfer to community care, until antihypertensive treatment has been stopped and no hypertension

After pre-eclampsia, blood pressure can take up to 3 months to return to normal. During this time, blood pressure should not be allowed to exceed 160/110 mmHg.

IF THERE ARE DIFFICULTIES MANAGING POSTNATAL HYPERTENSION, THESE SHOULD BE ESCALATED TO THE CONSULTANT ON CALL. IF FURTHER SPECIAILST ADVICE IS REQUIRED, PLEASE CONTACT ON CALL OBSTETRIC TEAM THROUGH THE HOSPITAL SWITCH BOARD

5.13.7 Postnatal Review

ALL WOMEN WHO DEVELOP PRE-ECLAMPSIA SHOULD BE DISCHARGED WITH A HYPERTENSION DISCHARGE LETTER (see Appendix D)

All patients with severe Pre-eclampsia should be offered a hospital appointment 6-8 weeks post-delivery with their consultant. Blood pressure and proteinuria assessment should be carried out at this appointment and appropriate referral made if antihypertensive treatment is still required and/or significant proteinuria confirmed.

Postnatal review should allow an opportunity for a full debriefing of the events surrounding delivery, a review of ongoing antihypertensive treatment and any further investigations or medical referral, which may be necessary. An opportunity for pre-conceptual counselling should also be available for these patients

5.13.8 Stabilisation before Transfer

When the woman is ill and requires delivery, transfer for fetal reasons is often considered, although ex-utero transfer may be more appropriate. If the woman requires transfer for delivery, it is of paramount importance that her condition is stabilised before transfer. The following are therefore recommended as a minimum requirement before transfer:

1. When the woman is ventilated, it is important to ensure ventilatory requirements are stable and oxygen saturations are being maintained.
2. Blood pressure should be stabilised at <160/105 according to the above protocol.
3. Appropriate personnel are available to transfer the woman. This will normally mean at least a senior midwife and an anaesthetist if the woman is ventilated.

4. All basic investigations should have been performed and the results clearly recorded in the accompanying notes or telephoned through as soon as available.

If the mother is unstable and requires a bed in a tertiary unit or the fetus is very premature or potentially compromised (and therefore also needs a tertiary cot) this can be flagged up by the obstetric staff on the initial referring phone call.

N.B. Before the woman can be transferred, the two Consultants should have a direct discussion to confirm that it is safe and appropriate to conduct the transfer.

Following Consultant to Consultant discussion, the case should be discussed with all the relevant people at the receiving unit e.g. the Neonatal Unit and Neonatal Medical Staff, the resident Obstetrician, the Midwife/Nurse in charge of Delivery Suite, Intensive Care and the Intensive Care Anaesthetist (where appropriate). If after this discussion it is felt that a postnatal transfer would be more appropriate, the referring team need to contact the cot bureau again to forewarn them of this.

5.14 MANAGEMENT OF ECLAMPSIA

Eclampsia is a convulsive condition associated with pre-eclampsia

5.14.1 Introduction and overview of condition and management

As Eclampsia is rare in women with PET most do not require routine seizure prophylaxis. A multicentre trial (MAGPIE) has shown that in the UK, 300 women need to be treated with Magnesium Sulfate to prevent one fit. The trial showed a reduction in maternal morbidity in those treated and suggested a decrease in maternal mortality. Anticonvulsant prophylaxis with Magnesium Sulfate should be considered in all women with severe PET especially if they have low platelets and abnormal liver function tests (HELLP syndrome) or if a patient with severe PET is symptomatic or previously had eclamptic fit. All women on the severe PET protocol should have been **discussed with the Consultant on call**.

5.14.2 Assessment and Diagnosis of Eclampsia

Eclampsia is defined as the occurrence, in pregnancy or postnatal period, of one or more convulsions superimposed on pre-eclampsia in the absence of any other known condition leading to seizures. Eclampsia should be treated with IV Magnesium Sulfate. Thereafter women receive a Magnesium Sulfate infusion to prevent further seizures.

5.14.3 Acute Management

- **Switchboard to BLEEP- 2222** Obstetric Emergency team
- **PREVENT INJURY** Place woman on left side, prevent head Injuries or falls from the bed etc.
- **MAINTAIN AIRWAY** Clear secretions with suction. It will not usually be possible to insert an airway if the jaw is clenched.

- **MAINTAIN OXYGENATION** Give oxygen via facemask.
- **INTRAVENOUS ACCESS** Commence Magnesium Sulfate.

5.14.4 MAGNESIUM SULFATE REGIME

Eclampsia should be treated with IV Magnesium Sulfate. Thereafter women receive a Magnesium Sulfate infusion to prevent further seizures.

Magnesium Sulfate Protocol

	Method of administration	Dose	Rate of administration
Loading dose (initial treatment)	Intravenous	4g over 20minutes (10mls 20% Mag Sulfate x2 ampoules)	Set pump at 60mls/hr and administer the 20mls of Magnesium Sulfate 20% over 20 minutes
Maintenance infusion (started immediately after loading dose via syringe pump)	Intravenous	1g/hr (10mls 20% Mag Sulfate x5 ampoules) in 50ml syringe	Administer at the rate of 5mls/hour

THERE IS NO NEED TO MEASURE MAGNESIUM LEVELS WITH THE ABOVE PROTOCOL

Process for administration

Index	Description
1.	• **Loading dose** should be prepared using 2x 10mls Magnesium Sulfate 20% (equivalent to 2g in 10mls) ampoules in a 50ml syringe (total dose = 4g) • This should be administered intravenously using a syringe driver over 20 minutes at a rate of 60mls/hour • Two staff members must check the syringe and the infusion rate prior to commencing the infusion
2.	• A doctor must be present during the whole process of loading with Magnesium Sulfate • A three lead ECG must be used throughout

Index	Description
3.	• **Maintenance dose** will be made up using 5 x 10mls Magnesium Sulfate 20% (2g in 10mls) ampoules in a 50ml syringe • This should be administered intravenously using a syringe driver at a rate of 5mls/hour (dose = 1g/hr) • Two staff members must check the syringe and the infusion rate prior to commencing the infusion

A. Contra indications of Magnesium Sulfate

Cardiac disease and acute renal failure are relative contra-indications for the use of Magnesium Sulfate. In these cases, the following should be used: Diazemuls: 10mg then 2.5 mg/hr or Rectal Diazepam 10 mg/2.5 ml

B. Duration of infusion Magnesium Sulfate infusion should be maintained for 24 – 48 hours after delivery or the last fit (whichever is the longer). Women must remain on Delivery Suite during this time. About 25% of women may experience flushing or nausea.

C. Monitoring requirements during Magnesium Sulfate infusion

Level of consciousness	Recorded hourly
Respiration rate	Should be over 10/min
Patellar reflex	Checked & recorded 4 hourly
Urine output	Recorded hourly
ECG/Pulse	ECG mandatory during and for 1 hour after loading dose
Pulse Oximetry	Continuous whilst on Magnesium Sulfate infusion

D. Documentation of monitoring observations

Respiratory rate, urine output presence of reflexes and oxygen saturation **MUST** be recorded on the high dependency chart hourly. If the M/W is to carry out clinical monitoring, it is the responsibility of the Middle Grade to ensure these are performed and recorded accurately.

E. Blood tests for Magnesium levels

These are not routinely required **unless** urine output is less than 80 mls in 4 hours **OR** Urea less than 10 mmol/l OR AST is > 250 iu.

Blood should be marked as URGENT and the laboratory staff should be asked to phone the result. The therapeutic range is 2 – 4 mmol/l (4.0 - 8.0 mg/dl). Levels should be less than 4mmols/l

F. Dosage Alterations

Problem	Action
Mg level > 4 mmol/l	Decrease infusion to 0.5g/hr (2.5mls per hr) and repeat blood test in 2 hours
Oliguria Urine output less than 80mls over 4 hours	Measure Magnesium levels every 6 hours (Levels should be less than 4mmols/l)
AST > than 250 iu/l	Measure Magnesium levels every 6 hours

G. Magnesium Sulfate Toxicity

Occurs with blood levels of	Signs & symptoms
Blood levels between 5 – 6 mmols/l	Loss of patellar reflex
	Nausea
	Feeling of warmth
	Flushing
	Weakness
	Somnolence
	Double vision
	Slurred speech
Blood levels between 6 – 7.5	Muscle paralysis
	Respiratory arrest
Blood levels over 12 mmols/l	Cardiac Arrest

H. Management of Magnesium Toxicity

Problem	Action
Loss of patella reflex	• Stop maintenance infusion • Send Mg level to laboratory URGENTLY • Withhold further Mg. until patellar reflexes return or blood Mg level known. Restart at 1g/hr and check levels in 6 hrs

Problem	Action
Respiratory rate less than 10 min Oxygen saturation persistently < 95% (on air)	• Switchboard to Bleep 2222-Obstetric Emergency Team • Woman should be in left lateral tilt position and institute CPR • Stop maintenance infusion • Administer 10 ml 10% Calcium Gluconate IV slowly (antidote) • If apnoeic intubate immediately and manage with assisted ventilation until resumption of spontaneous respirations

I. Recurrent seizures after starting Magnesium Sulfate

- Treat recurrent seizure with a further bolus of Magnesium 2g over 5 minutes using 1x 10ml Magnesium Sulfate 20% (**2g in 10 m**l) ampoule administered intravenously slowly.
- If possible take blood for Mg prior to bolus
- If further seizures occur despite above, consider:
  - Diazepam 10 mg IV bolus and then an infusion (2.5 mg/hr)
  - Thiopentone infusion (on intensive care)
  - Consider paralysis and ventilation

If recurrent seizures, inform anaesthetist and Intensive care unit and consider giving another anticonvulsant.

5.14.5 Fetal Assessment and delivery planning

Once an eclamptic fit has occurred there is no place for continuation of the pregnancy, however the mother must be stabilised before delivery.

Continuous CTG monitoring should be commenced and the Paediatric and SCBU staff should be informed of the gestation of the fetus in preparation for its birth.

The decision to deliver should be discussed with a Consultant. For the third stage, Oxytocin should be given 10units IM/IV 5units, **NOT** Syntometrine or Ergometrine.

5.14.6 Further management

Refer to Severe PET protocol - Section 5.8

5.14.7 Communication

It is essential that multi-disciplinary communication occurs between all professionals involved in the woman's care. The Delivery Suite Co-ordinator should liaise with the Obstetric Middle Grade to ensure that the following professionals are involved in discussions regarding care whenever a patient has had an eclamptic fit and is managed in accordance to Eclampsia and Severe PET protocol

- Consultant Obstetrician
- Consultant Anaesthetist
- On call Paediatric Team/Neonatal Unit
- Consultant Haematologist (as appropriate)
- Intensive Care Unit Team (as appropriate)

5.14.8 Midwifery Care of Delivered Women on PET Protocol

Only women with severe PET will be managed according to the **severe PET protocol.** All women will remain on Central Delivery Suite for a minimum of 24 hrs after delivery. Please ensure that when transferred to the PN ward the ward staff is aware the woman had severe PET.
These patients should be considered high-risk and nursed in High Dependency Unit. They must never be left unattended or nursed in poorly lit rooms.

Aspects of Care:-

1. **PET/High dependency charts**: These should be filled in HOURLY. Record the hourly fluid intake (IV and oral), urine output and fluid balance, BP, CVP, 02 saturation and reflexes (whilst on Mg). Remember to fill in important events, i.e. antihypertensive treatment, epidural insertion, top-ups, delivery and mark delivery blood loss.
2. **BP Measurement**: Use an automatic sphygmomanometer whenever possible. Measurements should be made every 15 min and recorded on the PET chart. Inform the Middle grade if there are two consecutive readings with a MAP >125 mmHg or one reading >140 mmHg. If in doubt, check with mercury sphygmomanometer and stethoscope.
3. **Fluid intake**: The standard IV fluid regime is 80 ml/hr. This includes the 10 ml of Mg each hour (i.e. many women will be on 70 ml Hartmann's/hr), and fluid contained in drug infusions. Once oral fluids are established, the hourly oral intake needs to be subtracted from the IV input (if a woman is drinking 50 ml/hr she needs approximately 30 ml/hr IV).
4. **Urine output**: This is measured hourly using the calibrated meters. Inform the Middle grade if the output is <80 ml over a 4-hr period.
5. **ECG Monitoring**: During infusion of Magnesium loading dose and if K+ > 5.
6. **CVP**: This is recorded hourly. The anaesthetist is responsible for the insertion and supervision of subsequent care of the CVP line. If you have any concerns regarding measurement, inform the anaesthetist. If the CVP is >5 cm inform the Middle Grade.
7. **Magnesium Sulfate**: The drug is given by IV infusion. The first signs of toxicity are loss of tendon reflexes and respiratory depression. Therefore, throughout the infusion hourly recordings must be made of:
   - Patellar reflex: If you fail to detect a reflex, or are unhappy about the method of testing, you must let the SHO know immediately. It is their responsibility to teach you!
   - Oxygen saturation: inform SHO if persistently <95% on air or <97% on 02.

8. **Cord gases**: These are mandatory. Every attempt must be made to get arterial and venous samples and complete results should be recorded in the delivery notes.
9. **Eclamptic fit:** Keep emergency trolley close by and confirm 0_2 and suction working. Place woman in recovery position, clear airway and administer 0_2. Call obstetric emergency team.
10. **General**: Restrict the access of visitors to HDU.

6.0 Audit and Monitoring

Monitoring and Audit of this guideline will be identified with issues raised via Clinical Risk/Governance.

Monitoring Compliance

This guideline will be audited once a year for pre-eclampsia and eclampsia using the appropriate pre-eclampsia/eclampsia audit proforma. This will include:

- the assessment and diagnosis of pre-eclampsia/ eclampsia
- clear lines of communication between the Consultant Obstetrician, Consultant Anaesthetist, Paediatrician and Labour Ward Coordinator
- blood pressure control and fluid balance
- prevention/ control of seizures
- fetal assessment and delivery planning
- postnatal follow up

The audit standard is 75% compliance. The findings of the audit report will be presented to staff via Clinical Governance.

APPENDIX ONE

Process Requirements

1.0 Implementation and Awareness

1.1 Once approved this policy/procedural document will be published on the Trust intranet by the Maternity Compliance & Safety Co-ordinator.
1.2 On publication of any Maternity document, the Maternity Compliance & Safety Co-ordinator will ensure that an email is sent to all Maternity staff and other stakeholders, as appropriate.
1.3 On receipt of the publication notification, all managers should ensure that their staff members are aware of the new publications.

2.0 Review

2.1 It is essential that Trust Policy/procedural documents remain accurate and up to date; this policy/procedural document will be reviewed three years after approval, or sooner if there are changes in practice, new equipment, law, national and local standards that would require an urgent review of the policy/procedure. It is the responsibility of the Document Lead for this policy/procedure to ensure this review is undertaken in a timely manner.
2.2 The Document Lead should review the policy/procedure and, even when alterations have not been made, undertake the consultation process as detailed in **Section 5.5 Consultation** of MTW Policy and Procedure '*Production, Approval and Implementation of Policies and Procedures*'.

3.0 Archiving

3.1The Trust Intranet retains all superseded files in an archive directory in order to maintain document history.

3.2 Old paper guideline copies pre-dating Datix are stored at:
Chatham Archive & Storage document Co.
Anchor Wharf
Chatham
ME4 4TZ
Telephone: 01634 826665

APPENDIX TWO

CONSULTATION ON: Management of Hypertensive Disorders of Pregnancy Including Severe Pre-eclampsia an Eclampsia

Consultation process – Use this form to ensure your consultation has been adequate for the purpose.

Please return comments to: Miss Wunmi Ogunnoiki, Consultant Obstetrician (email: wunmi.ogunnoiki@nhs.net)

By date: 5 August 2016 *(all documents must undergo a minimum of two weeks consultation)*

Name:	Date sent	Date reply received	Modification suggested? Y/N	Modification made? Y/N
Obstetric Consultants	11/07/2016	07/08/16	Y	Y
Consultant Anaesthetists (Obstetric)	11/07/2016	05/09/16	Y	Y
Supervisors of Midwives	11/07/2016			
Midwifery Staff via email	11/07/2016			
Head of Midwifery	11/07/2016	27/06/16 & 12/07/16	Y	Y
Matrons for Maternity Inpatient & Community	11/07/2016			
Delivery Suite Manager	11/07/2016			
All Inpatient & Community Team Leads	11/07/2016			
Maternity Risk Manager	11/07/2016	14/07/16	N (positive comment)	
Consultant Haematologist	11/07/2016			
Clinical Skills Facilitators	11/07/2016	12/07/16	Y	Y
Obstetric Pharmacist	11/07/2016			
Chief Pharmacist	11/07/2016			
Infant Feeding Specialists	11/07/2016			
The role of those staff being consulted upon as above is to ensure that they have shared the policy for				

comments with all staff within their sphere of responsibility who would be able to contribute to the development of the policy.

APPENDIX THREE

Equality Impact Assessment

In line with race, disability and gender equalities legislation, public bodies like MTW are required to assess and consult on how their policies and practices affect different groups, and to monitor any possible negative impact on equality.

The completion of the following Equality Impact Assessment grid is therefore mandatory and should be undertaken as part of the policy development and approval process. Please consult the Equality and Human Rights Policy on the Trust intranet, for details on how to complete the grid.

Please note that completion is mandatory for all policy development exercises. A copy of each Equality Impact Assessment must also be placed on the Trust's intranet.

Title of Policy or Practice	Management of Hypertensive Disorders of Pregnancy Including Severe Pre-eclampsia and Eclampsia
What are the aims of the policy or practice?	Provide evidence based care for women suffering from PET
Identify the data and research used to assist the analysis and assessment	Refer to page 2 of this document for cross references
Analyse and assess the likely impact on equality or potential discrimination with each of the following groups.	**Is there an adverse impact or potential discrimination (yes/no)** **If yes give details.**
Males or Females	NO
People of different ages	NO
People of different ethnic groups	NO
People of different religious beliefs	NO
People who do not speak English as a first language	NO
People who have a physical disability	NO
People who have a mental disability	NO
Women who are pregnant or on maternity leave	NO
Single parent families	NO
People with different sexual orientations	NO
People with different work patterns (part time, full time, job share, short term contractors, employed, unemployed)	NO
People in deprived areas and people from different socio-economic groups	NO
Asylum seekers and refugees	NO
Prisoners and people confined to closed institutions, community offenders	NO
Carers	NO
If you identified potential discrimination is it minimal and justifiable and therefore does not require a stage 2 assessment?	n/a
When will you monitor and review	Alongside this policy/procedure when it is

your EqIA?	reviewed.
Where do you plan to publish the results of your Equality Impact Assessment?	As Appendix 3 of this policy/procedure on the Trust approved document management database on the intranet, under 'Trust policies, procedures and leaflets'

APPENDIX FOUR

Name: .....

DOB: .....

Hospital/NHS No: .....

Maidstone and Tunbridge Wells NHS
NHS Trust

Antenatal Clinic
01892 633041

Date:

Dear Doctor

Prescription request for Prophylactic Low Dose Aspirin 75mg (Enteric Coated)

The above lady has been identified as being at increased risk of developing pre-eclampsia. Following a risk assessment in accordance with NICE (Hypertension in Pregnancy, 2010) and MTW clinical guidance, it is indicated that prophylactic low-dose Aspirin should be administered from 12 weeks of pregnancy until the birth of the baby.
Consultant led care has been considered and an appropriate referral made.

Moderate risk factors for Pre-eclampsia (2 required)	**High risk factors for Pre-eclampsia (1 required)**
▫ First pregnancy ▫ Age ≥ 40 years ▫ Pregnancy interval > 10 years ▫ BMI ≥ 35kg/m2 at first visit ▫ Family history of pre-eclampsia ▫ Multiple pregnancy	▫ Hypertensive disorders during previous pregnancy ○ previous severe eclampsia ○ previous pre-eclampsia requiring birth before 34 weeks ○ stillbirth/late miscarriage ○ placental abruption ▫ Chronic kidney disease ▫ Autoimmune disease such as systemic lupus erythematosus or antiphospholipid syndrome ▫ Type I or type II diabetes

Please could you therefore prescribe a daily low dose of 75mg Aspirin on receipt of this letter.

Yours sincerely

Midwife PIN:

APPENDIX FIVE

INFORMATION LETTER FOR WOMEN

Name: .....

DOB: .....

Hospital/NHS No: .....

Maidstone and Tunbridge Wells NHS
NHS Trust
Antenatal Clinic
01892 633041

Aspirin in Pregnancy to help prevent Pre-eclampsia

Your regular antenatal care involves 'screening' you for Pre-eclampsia. Pre-eclampsia is a condition of raised blood pressure and protein in the urine which may develop for some women in the second half of pregnancy. Whilst Pre-eclampsia is usually mild and not uncommon (affecting up to 8 per cent of pregnant women) it can affect your wellbeing, and that of your baby. In a very small number of cases Pre-eclampsia may develop into a serious illness.

Whilst any pregnant woman has the potential to develop Pre-eclampsia, evidence suggests that some may be more likely to do so. It is recommended that pregnant women at increased risk be prescribed daily low dose Aspirin (75mg) from 12 weeks of pregnancy until the birth of their baby. In clinical trials 75mg Aspirin was shown to significantly reduce the likelihood of this group of pregnant women developing Pre-eclampsia.

Having assessed your individual risk in accordance with our clinical guidelines, it has identified that you may benefit from taking low dose Aspirin from 12 weeks of pregnancy: (for reason see below).

Moderate risk factors for Pre-eclampsia (2 required)

- First pregnancy
- Age ≥ 40 years
- Pregnancy interval > 10 years
- BMI ≥ 35kg/m2 at first visit
- Family history of pre-eclampsia
- Multiple pregnancy

High risk factors for Pre-eclampsia (1 required)

- Hypertensive disorders during previous pregnancy
  - previous severe eclampsia
  - previous pre-eclampsia requiring birth before 34 weeks
  - stillbirth/late miscarriage
  - placental abruption
- Chronic kidney disease
- Autoimmune disease such as systemic lupus erythematosus or antiphospholipid syndrome
- Type I or type II diabetes
- Pre-existing high blood pressure

Further information specific to low dose aspirin prophylaxis is available via the Royal College of Obstetricians and Gynaecologists leaflet:

https://www.rcog.org.uk/en/patients/patient-leaflets/pre-eclampsia

APPENDIX SIX

SEVERE PRE-ECLAMPSIA PROFORMA

Criteria for Inclusion <u>where the decision has been made to deliver</u> and where one of the following criteria is met

Either

A. Eclampsia

B. Severe hypertension (systolic >160 mm Hg or diastolic >110 mm Hg) with proteinuria (PCR >30) or Moderate Hypertension: Systolic Blood pressure over 140/mmHg and/or Diastolic Blood pressure over 90 mmHg with proteinuria (PCR >30)

AND at least **ONE** OF THE FOLLOWING:

a) Headache, visual disturbance, epigastric pain
b) Clonus (>3 beats)
c) Platelet count <100 x 109, AST >50 IU/1**(think HELLP syndrome)**
d) Creatinine level >100 (In the absence of pre-existing renal impairment)

CONSULTANT OBSTETRICIAN INFORMED
Time attended: …….. If no give reason:
……..

DECISION TO START PROTOCOL **DATE:** … / … / …… **TIME:** …….
Reason if protocol not started:
……

ANAESTHETIST INFORMED: …… **CONS ANAESTHETIST INFORMED:** …..
Time attended: ……....

INITIAL OBSERVATIONS **TIME:** …….

RESP RATE: …… Pulse rate: …… BP: …… O2 SATS: …… TEMP: ……. °c

MGSO4 THERAPY	Date	Time
LOADING DOSE		
MAINTENANCE		

HYPERTENSIVE THERAPY	Date	Time
PRELOAD		
HYDRALAZINE / LABETOLOL		

HDU CHART COMMENCED AT: ……..

URINARY CATHETER INSERTED AT: ……

PLAN FOR FLUID THERAPY: Yes / No

BLOODS (FBC, G and Save, LFTs, U &Es, Clotting):
……..
……
….

APPENDIX SEVEN

ECLAMPSIA PROFORMA

DATE: … / … / …… **TIME OF FIT: ……** **DURATION OF FIT: …….**

PERSONS PRESENT AT ONSET OF ECLAMPTIC FIT:
……
……
……..

EMERGENCY BELL ACTIVATED: Yes / No

	NAME	ALREADY PRESENT	TIME INFORMED	TIME ARRIVED
SENIOR OBSTETRICIAN				
MIDWIFE CO-ORDINATOR				
ANAESTHETIST				
JUNIOR OBSTETRICIAN				
OTHER PERSON				

CONSULTANT OBSTETRICIAN INFORMED:
Time attended: …….. If no give reason:
……
CONSULTANT ANAESTHETIST INFORMED:
Time attended: …….. If no give reason:
……

LEFT LATERAL

HIGH FLOW OXYGEN

IV ACCESS

BLOODS

MGSO4 THERAPY	Date	Time
LOADING DOSE		
MAINTENANCE		

INITIAL POST ECLAMPTIC FIT OBSERVATIONS TIME: …….....

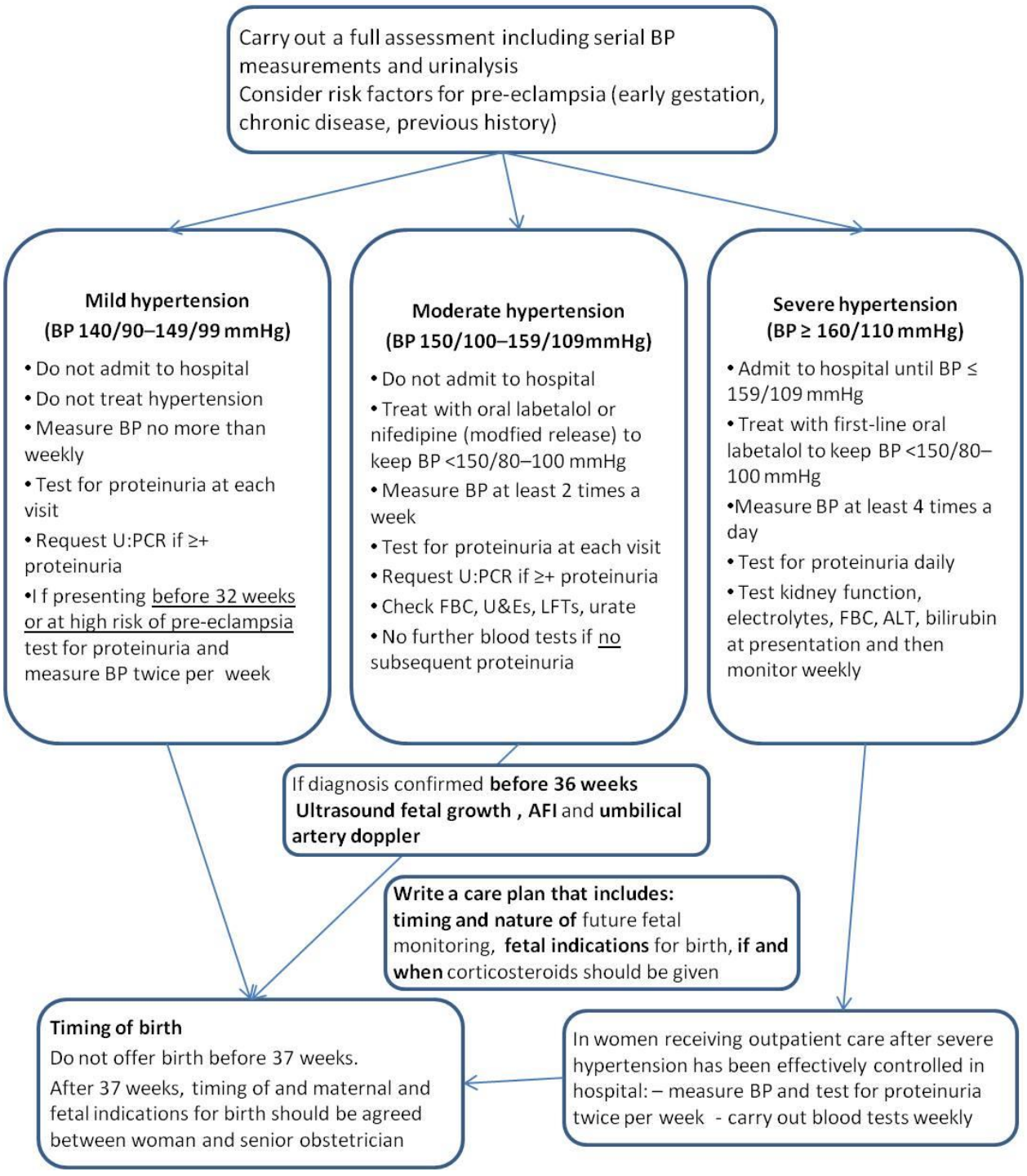
RESP RATE: …… Pulse rate: …… BP: …… O2 SATS: …… TEMP: ……. °c

URINARY CATHETER INSERTED: Yes / No

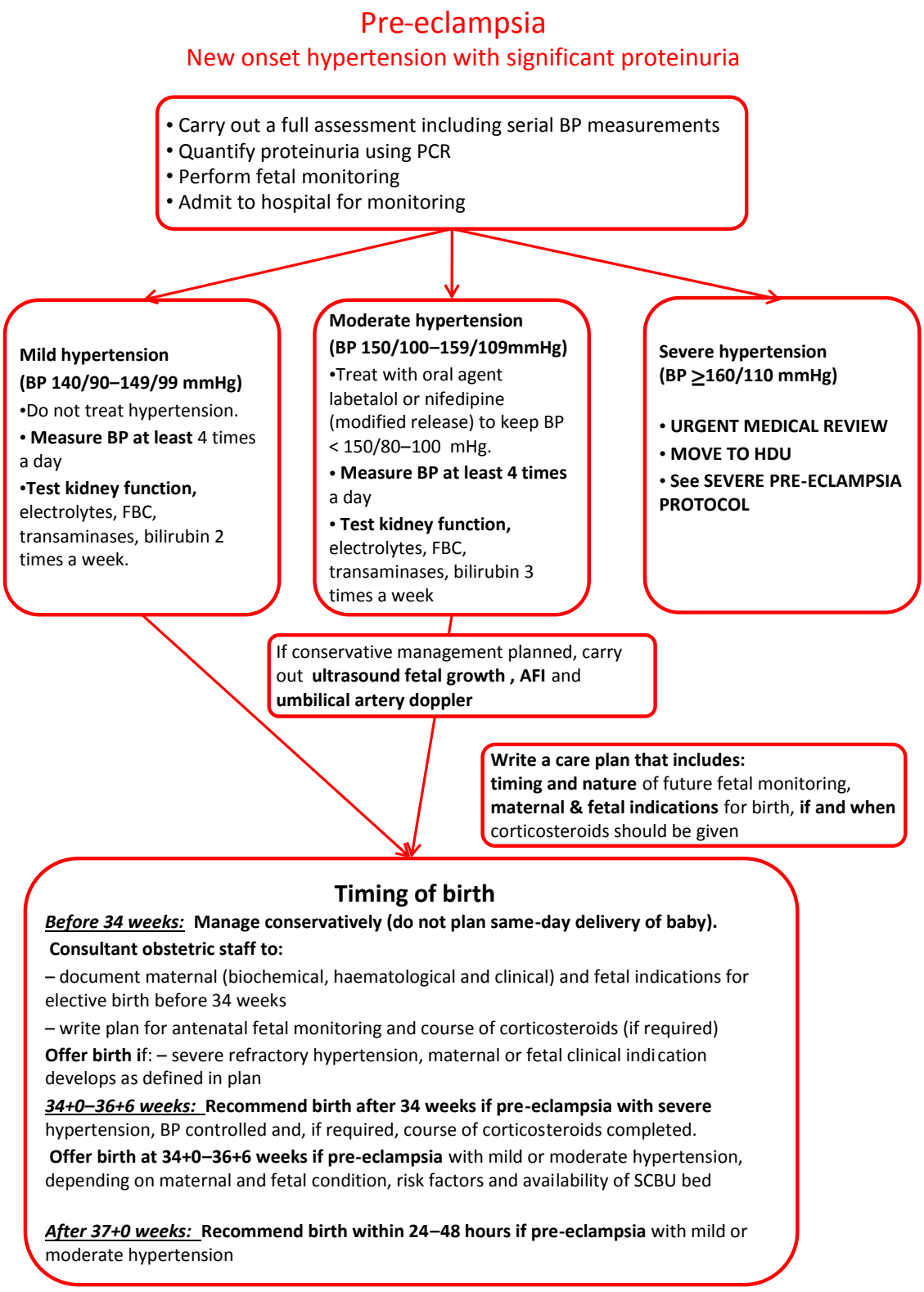
HYPERTENSIVE TREATMENT ADMINISTERED: Yes / No
Appendix A: Management of gestational hypertension

Gestational Hypertension

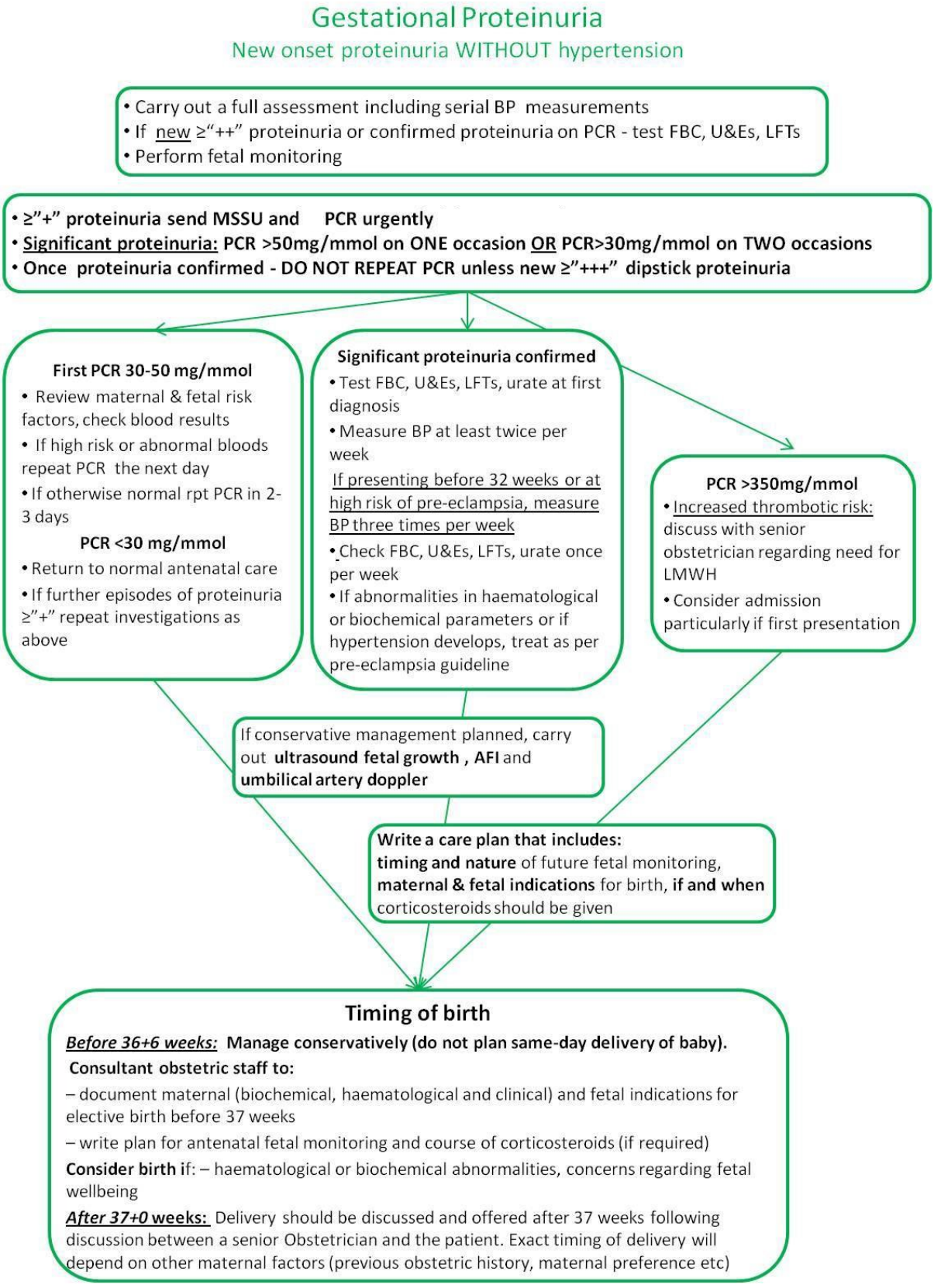
New onset hypertension without significant proteinuria



Appendix B: Management of pre-eclampsia



Appendix C: Management of gestational proteinuria



Appendix D:

Important postnatal discharge information for women with hypertension in pregnancy

_____/_____/ 20__

Dear Community Midwife / General Practitioner

Re:……..... Hospital No……..

DOB……../……./…….. NHS no…….

This patient is currently …….days postnatal and has been discharged from the postnatal ward on ……/……/……..

Diagnosis: **gestational hypertension / gestational proteinuria / pre-eclampsia / chronic hypertension (**Delete appropriate)

In view of her hypertension in pregnancy she requires close postnatal monitoring.

Discharged on Medication YES / NO

DO NOT USE METHYLDOPA POSTNATALLY

DRUG	Dose	Frequency
_____	_____	_____
_____	_____	_____
_____	_____	_____

Please monitor Blood Pressure daily for 5 days from the date of discharge. If the BP is not within normal limits continue to monitor on alternate days for 2 weeks.

Aim for a Blood Pressure of less than < 140 / 90 and follow management plan below:

IF BP <120/ 70 STOP REGIME.	IF BP <130/ 80 REDUCE REGIME	IF BP > 150/100 REFER TO GP FOR REGIME MANAGEMENT	IF BP >160/110 OR SYPMTOMATIC REFER TO HOSPITAL FOR SAME DAY REVIEW.

Please arrange GP review if still on medication in 2 weeks post discharge.

Consultant clinic Follow up YES / NO _____/_____/_____ (6-8 weeks postnatal)
(All women with early onset pre-eclampsia <34wks or severe pre-eclampsia or Eclampsia require 6-8 week follow up appointment).

For women **not** requiring Consultant Clinic review:

- Please check the woman's urine at the 6 week postnatal check to ensure that any proteinuria has resolved.
- If proteinuria is still present please check urine PCR
- If urine PCR is raised then Gp to please refer to a renal physician.

Women with hypertensive disease in pregnancy are at increased risk of recurrence in future pregnancies and hypertension in later life and therefore justify long term surveillance. Women should be advised regarding weight loss where appropriate.

Name……..Signature……Date…../……/…….

Please contact Triage 01892 633500 for further information/queries

Appendix E: Management of severe pre-eclampsia and/or eclampsia

Severe Pre-eclampsia +/- eclampsia

Features of Severe Pre-eclampsia

BP >160/110mmHg† *with* at least "+" proteinuria

Or

BP >140/90 mmHg with significant proteinuria†† *and* signs/symptoms including:

- Headache
- Visual disturbance
- RUQ pain/vomiting
- Clonus (≥3 beats)
- HELLP syndrome
- Platelet <100
- ALT/AST > 70iu/L

†average of 3 readings over 15 mins
†† "++" on dipstick, PCR ≥30mg/mmol or 0.3g in 24 hours

Management of severe hypertension

- Measure BP every 15 minutes until stable consider continual monitoring with arterial line
- Continue antenatal hypertensive treatment
- Treat hypertension with IV labetalol first line, then nifedipine (oral) or IV hydralazine
- Monitor response to treatment (maternal & fetal wellbeing)
- Aim BP <150/80-100 mmHg
- If BP controlled, do not routinely limit second stage

Anticonvulsants

- Give IV Magnesium Sulphate if woman with severe hypertension/pre-eclampisa has or previously had eclamptic fit
- Consider giving IV Magnesium Sulphate to women with severe pre-eclampsia, if birth planned within 24 hours
- Alternative anticonvulsants are not indicated in women with eclampsia

General Measures:

- Inform Consultant Obstetrician and Anaesthetist
- IV access
- Hourly MEWS
- Urinary catheter with urometer
- CTG monitoring as appropriate

Regimen for Magnesium Sulphate

- Loading dose 4g IV over 5-10 minutes, followed by infusion 1g/hour for 24 hours
- Further dose of 2g given over 5 minutes if recurrent seizures

Corticosteroids

For fetal lung maturation:
If birth likely within 7 days in women with pre-eclampsia

- Give 2 doses betamethasone 12mg IM 24 hrs apart between 24 and 34 weeks
- Consider giving 2 doses bethamethasone at 35-36 weeks

Do not use steroids to treat HELLP syndrome

Fluid balance:

- Do not preload with IV fluids before establishing low-dose epidural analgesia and combined spinal epidural analgesia
- Limit maintenance fluids to 80mls/hr unless there is significant haemorrhage
- Do not use volume expansion

Appendix F: Neurological monitoring

The Glasgow coma score is a quantitative assessment of the level of consciousness. It is the sum of the three responses of eye opening, verbal response and motor response

Response	Points
Eye opening	
Spontaneous	4
Eye opening to speech on request	3
Eye opening to painful stimulus	2
No eye opening	1
Verbal response	
Orientated	5
Confused	4
Inappropriate words	3
Incomprehensible sounds	2
No verbal response	1
Motor response	
Obeys commands	6
Localises to pain	5
Withdraws from painful stimulus	4
Abnormal flexion, decorticate posture	3
Extensor response, decerebrate posture	2
No movement to stimulus	1

The AVPU score is a simplified and quick neurological assessment where the patient can be

A Alert
V Responds to voice
P Responds to pain
U Unresponsive

2. On average 5,800
2b. On average this equates to 1.4% of our annual deliveries.
3. We stock 10ml Vials - each containing 2G MgSo4 in 10mls.
4. No Serious Incidents recorded
5. One incident involving the correct amount of MgSo4 being administered over a shorter duration period than prescribed. No harm was caused.