This Clinical Guideline has been developed by the Monash Women's Maternity Guideline Development Group in consultation with Anaesthetics and Pharmacy and is underpinned mainly by the (2014) Society of Obstetric Medicine of Australia and New Zealand (SOMANZ) evidence based guidelines.[1]

Target population for the guideline

Pregnant and post-partum women who present with or develop hypertensive disorders, pre-eclampsia and/or eclampsia.

Target users of the guideline

Monash Health medical staff and midwives.

Background

Hypertension (defined as a systolic blood pressure (SBP) ≥ 140 mmHg **and/or** diastolic blood pressure (DBP) ≥ 90 mmHg) is a common medical problem encountered in pregnancy. It can be classified into four categories:

1. Pre-eclampsia/eclampsia
2. Gestational hypertension
3. Chronic hypertension; and
4. Pre-eclampsia superimposed on chronic hypertension.

The definition and diagnostic criteria for each condition is based on the gestation at diagnosis and the presence of co-existing haematological, biochemical and/or feto-placental abnormalities. More details regarding these conditions can be found in the SOMANZ Guideline.[1]

Pre-eclampsia is a unique condition to human pregnancy, diagnosed after 20 weeks gestation. It is a multi-system disorder characterised by hypertension with associated involvement of one or more organ systems such as haematological, renal, hepatological, neurological and/or feto-placental compromise. Pre-eclampsia affects around 5% of pregnancies and can also either develop, or continue into the post-natal period.

Risk factors for pre-eclampsia include a previous personal or family history, co-existing medical conditions (e.g. diabetes, antiphospholipid syndrome, renal disease), multiple pregnancy, nulliparity and obesity. In women with a moderate to high risk of developing pre-eclampsia, prophylaxis with low dose aspirin (75-150 mg/day) and calcium supplementation (1.5 g/day), commencing in the mid-trimester until term, is recommended.

There is a SOMANZ and National Institute for Health and Care Excellence (NICE) consensus regarding classification of the degree of hypertension, but similar classification of pre-eclampsia is controversial. The recent International Society for the Study of Hypertension in Pregnancy (ISSHP) statement suggested there was general consensus that factors determining severity include difficulty in controlling blood pressure and deteriorating clinical condition including HELLP (Haemolysis, Elevated Liver enzymes and Low Platelets) syndrome, impending eclampsia, worsening thrombocytopenia or worsening fetal growth restriction while there is less concern regarding increasing proteinuria. The NICE hypertension in pregnancy guideline defines severe pre-eclampsia as pre-eclampsia with severe hypertension and/or with symptoms, and/or biochemical and/or haematological impairment.

HELLP syndrome represents a subset of women with severe preeclampsia characterised by **H**aemolysis; **E**levated **L**iver enzymes (transaminases); And **L**ow **P**latelets with or without other pre-eclamptic features.

Management of hypertensive disorders of pregnancy is largely dependent on severity, gestation and other coexisting maternal conditions and includes blood pressure control, fetal surveillance and monitoring for associated complications.

Contents

Quick reference

Clinical practice recommendations	Section Detail	Evidence level
Treatment of mild to moderate hypertension in the range 140-160 / 90-100 mm Hg should be considered an option.	1.1	Consensus
Commence antihypertensive treatment in severe hypertension, defined as a SBP greater than or equal to 160 mmHg with or without DBP greater than or equal to 110 mmHg.[1]	1.2	I
Admit women with a SBP greater than or equal to 170 mmHg with or without DBP greater than or equal to 110 mmHg for urgent assessment and management.[1]	1.2	I
Aim for a sustained and gradual reduction in BP in the control of severe hypertension to a SBP of less than 150 mmHg and DBP 80-100 mmHg.[1]	1.2	Consensus
Dipstick testing is an appropriate screening test.[1] Do a spot urine protein:creatinine ratio (PCR) for confirmation or exclusion of proteinuria when preeclampsia is suspected.[1] It is not necessary to repeat assessment of proteinuria once significant proteinuria is confirmed.[1]	1.3	Consensus
The frequency, intensity and modality of fetal evaluation (including by umbilical artery Doppler) will depend on individual pregnancy characteristics (maternal and fetal).[1]	1.3	Consensus
Administer Betamethasone (Celestone Chronodose®), as two intramuscular (IM) doses of 11.4 mg, 24 hours apart to promote fetal lung maturation and reduce the risk of intraventricular hemorrhage, at gestations below 37 weeks especially where caesarean section is planned.[7] Administration should not delay birth in severe cases of pre-eclampsia/eclampsia.	2.3.3	I
Prompt birth by caesarean section may be indicated following an eclamptic seizure and in cases of severe pre-eclampsia following maternal stabilization.[1]	2.3.5	Consensus
Magnesium sulfate is the anticonvulsant of choice for the prevention and control of eclampsia.[1]	2.3.1 3.2	I
Assess for oliguria (urine output < 80 mLs) at 4 hourly intervals in women with pre-eclampsia and eclampsia in the intrapartum and the immediate postpartum period.[1]	2.3.4	Consensus
Ergometrine (including Syntometrine®) is not recommended in active third stage management.[1]	2.3.5	Consensus
Postnatal women with a BP of less than 150/100 are suitable for discharge and follow-up in the community.[1] This will depend on the woman's clinical factors.	2.3.7 3.7	Consensus

1. Hypertension in pregnancy

Classification of hypertension in pregnancy

The classification of hypertension in pregnancy below is recognised by both SOMANZ and NICE for the purpose of guideline implementation.

Degree of hypertension	Mild	Moderate	Severe
Blood pressure range (mmHg)	140/90 to 149/99	150/100 to 159/109	160/110 or higher

Elevations of both SBP and DBP have been associated with adverse maternal and fetal outcomes.

Treatment of mild to moderate hypertension

There is controversy regarding the need to treat mild to moderate hypertension in women with pre-eclampsia. Antihypertensive therapy does not prevent pre-eclampsia or the associated adverse perinatal outcomes, but it decreases by half the incidence of development of severe hypertension among women with mild hypertension.

Arguments against treatment include that there is little risk to the mother in having relatively mild hypertension for a short time that fetal perfusion is dependent upon adequate maternal BP and that lowering BP suppresses an important sign of the severity or progression of pre-eclampsia. Uncontrolled hypertension is however a frequent trigger for expediting birth and control of hypertension may allow prolongation of pregnancy. In addition, it is possible that treatment of even mild-moderate hypertension may lead to a clinically relevant reduction in the risk of pre-eclampsia and fetal or neonatal death, particularly early pregnancy loss.

In the absence of compelling evidence, treatment of mild to moderate hypertension in the range 140-160 / 90-100 mm Hg should be considered an option.

Treatment of severe hypertension

This guideline recommends that antihypertensive treatment is to be commenced in all women with a SBP greater than or equal to 160 mm Hg and or a DBP greater than or equal to 110 mm Hg because of the risk of maternal intracerebral haemorrhage and eclampsia.[1]

Severe hypertension requiring urgent treatment (SBP 170 mmHg)

This is defined as a SBP greater than or equal to 170 mmHg with or without DBP greater than or equal to 110 mmHg. This represents a level of BP above which the risk of maternal morbidity and mortality is increased. This degree of hypertension requires urgent assessment and management. Increasing evidence exists that cerebral perfusion pressure is altered in pregnant women making them more susceptible to cerebral haemorrhage, posterior reversible encephalopathy syndrome and hypertensive encephalopathy.

The objective in controlling hypertension in pregnancy is for a sustained and gradual reduction in BP to a SBP of less than 150 mmHg and a DBP of 80-100mmHg.

1.1 Medication options for managing mild to moderate hypertension

Target BP should be a SBP of less than 150 mmHg and a DBP of 80-100 mmHg.

Drug	Dose (all oral route)	Comments
Methyldopa	250-750 mg tds	Slow onset of action over 24 hrs. May cause dry mouth, sedation, blurred vision. Use with caution in women with a history of depression.
Labetalol	100-400 mg tds	Bradycardia, bronchospasm, headache, nausea and scalp tingling which usually resolve within 24 hours. Use with caution in women with a history of asthma.
Nifedipine XR (slow release)	20-60 mg bd	Severe headache in first 24 hours. Flushing, tachycardia, peripheral oedema, constipation.
Hydralazine	25-50 mg tds	Flushing, headache, nausea, lupus-like syndrome.

Though angiotensin converting enzyme (ACE) inhibitors and angiotensin receptor blockers are contraindicated in pregnancy, they (along with all the above medications) are compatible with breastfeeding and can therefore be used in the postnatal period.[1]

1.2 Medication options for managing severe hypertension

Treatment objective: Commence treatment promptly aiming for a sustained and gradual reduction in BP to a SBP of less than 150 mmHg and a DBP of 80-100 mmHg. Care should be taken to avoid a precipitous fall in BP after antihypertensive treatment, as this may impair maternal and or placental perfusion with the attendant fetal and maternal consequences.[1]

Medicine	Dose / route	Comments
IV Fluid bolus	Consider administering 250 - 500 mL of crystalloid IV (e.g. Compound Sodium Lactate (Hartman's or sodium chloride 0.9%) over 15 minutes prior to the administration of the first dose of hydralazine.	May be helpful in reducing the risk of maternal hypotension but fetal benefit unclear.
Nifedipine (oral)	Administer 10-20 mg nifedipine stat. Repeat as required after 45 mins (maximum dose 40mg).	Oral medication of choice. Onset of action 30-45 min.

Labetalol (IV)	Bolus dose: • Intermittent bolus dose of 20 mg undiluted, IV, over 2 minutes. • Repeat as required after 10 mins, up to 4 times (max dose 80 mg). Bolus IV labetalol must be administered by medical staff Continuous infusion via syringe pump (undiluted): • Consider if blood pressure still uncontrolled after 4 bolus doses (80 mg). • Start at 20 mg/hr. • Increase infusion rate as required by 20 mg/hr every 20 minutes until the optimum BP is achieved or the maximum rate is reached (160 mg/hr).	Maximum effect within 5 minutes after each dose. Observations: Continuous CTG monitoring. Observations every 5 minutes during bolus doses. Observations every 15 minutes during continuous infusion until stable over one hour, then hourly.
Labetalol (oral)	200 - 400 mg qid / tds.	Consider the oral regime if appropriate.
Hydralazine (IV)	Bolus dose (20 mg hydralazine in 20 mL sodium chloride 0.9%, (1 mg/mL)) • Administer 5 -10 mg (5-10 mL) IV, over 5 minutes. • Repeat dose as required every 20 minutes, until target BP achieved (max dose 30 mg). Note: Bolus IV hydralazine must be administered by medical staff Continuous infusion via syringe pump (40 mg hydralazine in 40 mL sodium chloride 0.9%, (1 mg/mL): • Consider if BP is still uncontrolled after 30 mg IV hydralazine. • Start infusion rate at 10 mg/hr. • Increase infusion rate (if required) by 2 mg/hr, every 20 minutes until the target BP is achieved or maximum rate (20 mg/hr) is reached.	Smooth muscle dilator. Maternal side effects: headache, tachycardia, palpitations, gastrointestinal disturbance, flushing, hypotension. Observations: as per IV labetalol above.

In addition to the antihypertensive regime, admitted women with acute severe hypertension (SBP >170 mmHg) require:

- two large bore (16 G) IV access
- continuous CTG
- indwelling urinary catheter with hourly measurements
- half hourly maternal observations.

1.3 Maternal investigations and fetal surveillance

The following are the recommendations for maternal investigations and fetal surveillance in women with hypertension in pregnancy.

	Maternal investigations	Fetal surveillance
Chronic hypertension	At each visit, assess for proteinuria* If sudden increase in BP or new proteinuria, perform pre-eclampsia blood screen.**	Organise early dating ultrasound in first trimester. US for fetal growth/amniotic fluid index (AFI)/Doppler in 3rd trimester; repeat as indicated.
Gestational hypertension	Assess for proteinuria at each visit. Perform bloods for pre-eclampsia screen 4 weekly **or** as indicated.	US for fetal growth/AFI/Doppler at time of diagnosis - Repeat every 3-4 weeks.

* Urinalysis by dipstick followed by spot urine PCR if ≥1+ proteinuria noted.

Note: once significant proteinuria has been detected, there is no established role for serial testing as the severity or progress of proteinuria should not alter management decisions.

** **Pre-eclampsia blood screen**

- full blood examination (FBE)
- urea, electrolytes and creatinine (UEC)
- liver function (LFT)
- uric acid (UA) +/- coagulation studies if clinically indicated (e.g. if platelets < 100 x10^9/L, abnormal LFT's or falling Hb).

1.4 Transfer of care (pregnancy)

Hypertension, of any classification, is an exclusion for midwife and GP (GP affiliate and GP obstetrician) led care. Women developing hypertension during pregnancy are to be referred to a specialist obstetrician for care, as per local procedures, for the remainder of their pregnancy.

2. Pre-eclampsia

2.1 Assessment and investigation

Initial assessment and investigations (should be performed in hospital):

Maternal assessment

- Take a thorough history, with particular enquiry about pre-eclampsia symptoms (e.g. headache, visual disturbance, epigastric or right upper quadrant pain).
- Vital signs: BP, pulse rate (PR), respiratory rate (RR) and temperature. [Note: correct BP cuff size is important].
- General examination, including abdominal palpation (fetal lie, presentation, size) and neurological examination.

Maternal investigations

- Urinalysis +/- mid-stream urine and spot urine protein: creatinine ratio (if FWT ≥ 1+ proteinuria).
- Pre-eclampsia biochemical screen (FBE, UEC, LFT, UA +/- clotting).

Fetal assessment (depending on gestational age) may include:

- CTG (> 28 weeks gestation).
- Ultrasound:
  - Fetal biometry
  - Amniotic Fluid Index (AFI)
  - Fetal Doppler studies (including umbilical artery, middle cerebral artery +/- ductus venosus)
  - Biophysical profile (BPP).

Ongoing outpatient maternal and fetal surveillance

	Maternal investigations	Fetal surveillance
Pre-eclampsia	Assess for proteinuria only at time of diagnosis and do not repeat once significant proteinuria is confirmed. Perform weekly pre-eclampsia bloods (or more frequently if indicated) Weekly pregnancy care clinic.	US for fetal growth/AFI/Doppler at diagnosis - Repeat every 2-3 weeks - If IUGR is noted, weekly AFI and Dopplers should be performed with fortnightly growth scans. CTG twice weekly.

Should investigation and surveillance need to be more intensive and frequent than the above recommendations, based upon gestation, severity and rate at which the condition progresses, inpatient admission is likely to be warranted. Women diagnosed with pre-eclampsia who have outpatient monitoring

need to be educated regarding the progressive nature of pre-eclampsia and present promptly for assessment should she develop severe features.

2.2 Transfer of care

Admitted women with pre-eclampsia, including those on magnesium sulfate, may require transfer to another hospital so as to optimise the outcome for either or both mother and fetus. A decision regarding transfer is largely dependent on gestation, maternal condition, staffing level, site capacity and resources. Any such decision is to be made in consultation with senior medical staff at the respective transferring and receiving hospitals.

2.3 Management of pre-eclampsia

Hypertension should be controlled in women with pre-eclampsia as per the recommendations above for management of hypertension in pregnancy

In labour, regional anaesthesia can aid the lowering of blood pressure and should be taken into account when administering antihypertensives.

2.3.1 Seizure prophylaxis

Magnesium sulfate ($MgSO_4$) is recommended for seizure prophylaxis in women with pre-eclampsia.

Refer: **Magnesium sulfate (MgSO4) administration (Maternity)**.

2.3.2 Intrapartum - blood tests in severe preeclampsia

Consider intermittent pre-eclampsia blood tests in labouring women with severe pre-eclampsia and in those on $MgSO_4$, if appropriate. This can be performed at a frequency based on the woman's clinical circumstance.

2.3.3 Fetal maturation

Betamethasone (Celestone Chronodose®), given as two IM doses of 11.4 mg, 24 hours apart, is indicated to promote fetal lung maturation and reduce the risk of intraventricular hemorrhage in preterm (below 37 weeks) neonates.

The evidence is strongest at gestations below 35 weeks but it is also recommended at gestations below 37 weeks where a caesarean section is planned.[6,7] Administration should not delay birth in severe cases of pre-eclampsia or eclampsia.

Magnesium sulfate for fetal neuroprotection should be considered for all women less than 30 weeks gestation in whom birth is imminent within the proceeding 24 hours.[1,5]

2.3.4 Fluid balance

Careful maternal fluid balance is required in all women with pre-eclampsia.

In **severe pre-eclampsia** maternal fluid retention can lead to severe acute pulmonary oedema. Strict fluid balance is imperative to avoid risk of fluid overload. Fluid input should be restricted to normal requirements, which is usually about 80 mL/hr or 1 mL/kg/hr. Urine output should be measured and recorded every hour, via an indwelling urinary catheter (IDC) with an hourly urometer.

Where urine output is < 80 mLs in total over 4 consecutive hours, medical review is necessary to assess renal function.[1] It is important to know that oliguria in the intrapartum and immediate post-partum period is common and physiological. Fluid therapy is usually unnecessary unless there is evidence of renal impairment (such as a rising serum creatinine).
In the presence of sustained oliguria and renal impairment consider transfer to HDU / ICU for more intensive haemodynamic monitoring. Diuretic use should be avoided in the absence of pulmonary oedema.[1]

2.3.5 Birth plan

Timing of birth
As the only definitive treatment for pre-eclampsia, birth should be considered in the management of all patients with the condition. The timing of birth can be a difficult decision as the prognoses for mother and fetus are generally opposing with prolongation of pregnancy.

At gestations < 34 weeks, stabilization of the maternal condition and delaying birth by 24 – 48 hours for administration of corticosteroids should be considered if the maternal and fetal condition permits.

Expedition of birth is recommended where:

- gestation > 37 weeks
- inability to control hypertension
- severe pre-eclampsia (deteriorating organ function)
- neurological complications (including eclampsia)
- pulmonary oedema
- non-reassuring fetal status.

Mode of birth The mode of birth is dependent on factors such as fetal and maternal condition, gestation, cervical dilatation and anticipated delivery interval. Generally, prompt birth by caesarean section may be indicated following an eclamptic seizure and in cases of severe pre-eclampsia following maternal stabilization. Without these acute emergency situations, induction and / or augmentation of labour should be considered.
Oxytocin (Syntocinon®) 10 units IM or 5 units IV is recommended for active management of the third stage of labour. Ergometrine (including Syntometrine®) should be avoided.

2.3.6 Post birth management

It is reasonable to expect that the woman's condition will steadily improve following birth. However in addition to routine postpartum management, women with hypertensive disease in pregnancy need:

- Blood pressure control with anti-hypertensive therapy (target BP <150/80 -100 mmHg).
- Monitoring of deranged biochemistry.

In situations where magnesium sulfate has been given for seizure prevention the infusion should continue for 24 hours after birth. Strict fluid balance should also be maintained until a good diuresis has occurred.

Debriefing regarding the birth should include counselling about future risk of recurrence in subsequent pregnancies, as well as hypertension and cardiovascular disease risks in later life. Emphasis should be placed on weight management, healthy lifestyle and appropriate referral to obstetric-led care for subsequent pregnancies. Consider reducing antihypertensive(s) if the blood pressure falls below 140/90 and reduce antihypertensive treatment if the blood pressure falls below 130/80 mmHg.

2.3.7 Discharge and follow-up

Suitability for discharge to community care should take into account blood pressure control, evidence of resolving biochemical derangement and usual postpartum issues (e.g. feeding, lochia and pain management). The timing of discharge is to be made in consultation with senior obstetric staff. Women with a blood pressure reading of 149/99 or lower are suitable for discharge and follow-up in the community.

Cases of severe pre-eclampsia, eclampsia or other complicated cases of hypertensive disorders should be reviewed 6-8 weeks post-discharge. This can happen at the outpatient clinic at the hospital or with the woman's GP or specialist obstetrician in their private rooms.

3. Eclampsia

There are four main aspects to care of the woman who sustains eclampsia: resuscitation, prevention of further seizures, control of hypertension and birth.

3.1 Resuscitation

Call for HELP

Protect the woman from harm and move her to the recovery position. These seizures are usually self-limiting.

Consider the need for a Code Pink, MET call or Code Blue according to the clinical situation.

Magnesium sulfate is definitely the anticonvulsant of choice for **treatment** of eclampsia. However, a prolonged, generalized seizure may be due to other intracerebral pathology (e.g. haemorrhage secondary to uncontrolled hypertension) in which case, benzodiazepines are appropriate. Consider intravenous diazepam (2 mg/min to a maximum of 10 mg) or clonazepam (1-2 mg over 2-5 mins).[1]

Following cessation of the seizure:

Check the airway and clear if necessary.
Check for breathing and if present administer oxygen,
Check the respiratory rate, oxygen saturations, BP and pulse rate.
Obtain IV access.

3.2 Prevention of seizures

Magnesium sulfate is the anticonvulsant of choice for the **prevention** of eclamptic seizures.

Monash Health uses magnesium sulfate in pre-mixed IV bags of 25 g $MgSO_4$ in 50 mL water for injection. Following appropriate resuscitation, treatment should be commenced with magnesium sulfate given as a 4g loading dose over 20 minutes, followed by an infusion of 1 g/hr. In the event of further seizure(s), an additional 2 g of magnesium sulfate is to be given IV over 10 minutes for each episode. The magnesium sulphate infusion rate may be increased to 2-3 g/hr.

- Refer **Magnesium sulfate (MgSO4) administration (Maternity)** procedure.

The magnesium sulfate maintenance infusion should be continued for 24 hours following birth or the last eclamptic seizure.

3.3 Control of hypertension

As per 1.1.1 with target BP < 150/80-100 mmHg

3.4 Monitoring and investigations

3.4.1 Maternal monitoring

As per **Magnesium sulfate (MgSO4) administration (Maternity)** procedure.

Additional attention should be given to uterine activity, neurological irritability and signs of coagulopathy or haemorrhage.

Document all observations and fluid balance on the Maternity Intensive Observation and Fluid Balance Chart (MRF30).

3.4.2 Fetal monitoring

When the eclamptic seizure has ceased, and the maternal condition including blood pressure is stable, consider applying a cardiotocograph (CTG) and performing further fetal assessment as required.

3.5 Birth – timing and mode

As per 2.3.5

3.6 Post birth management

As per 2.3.6

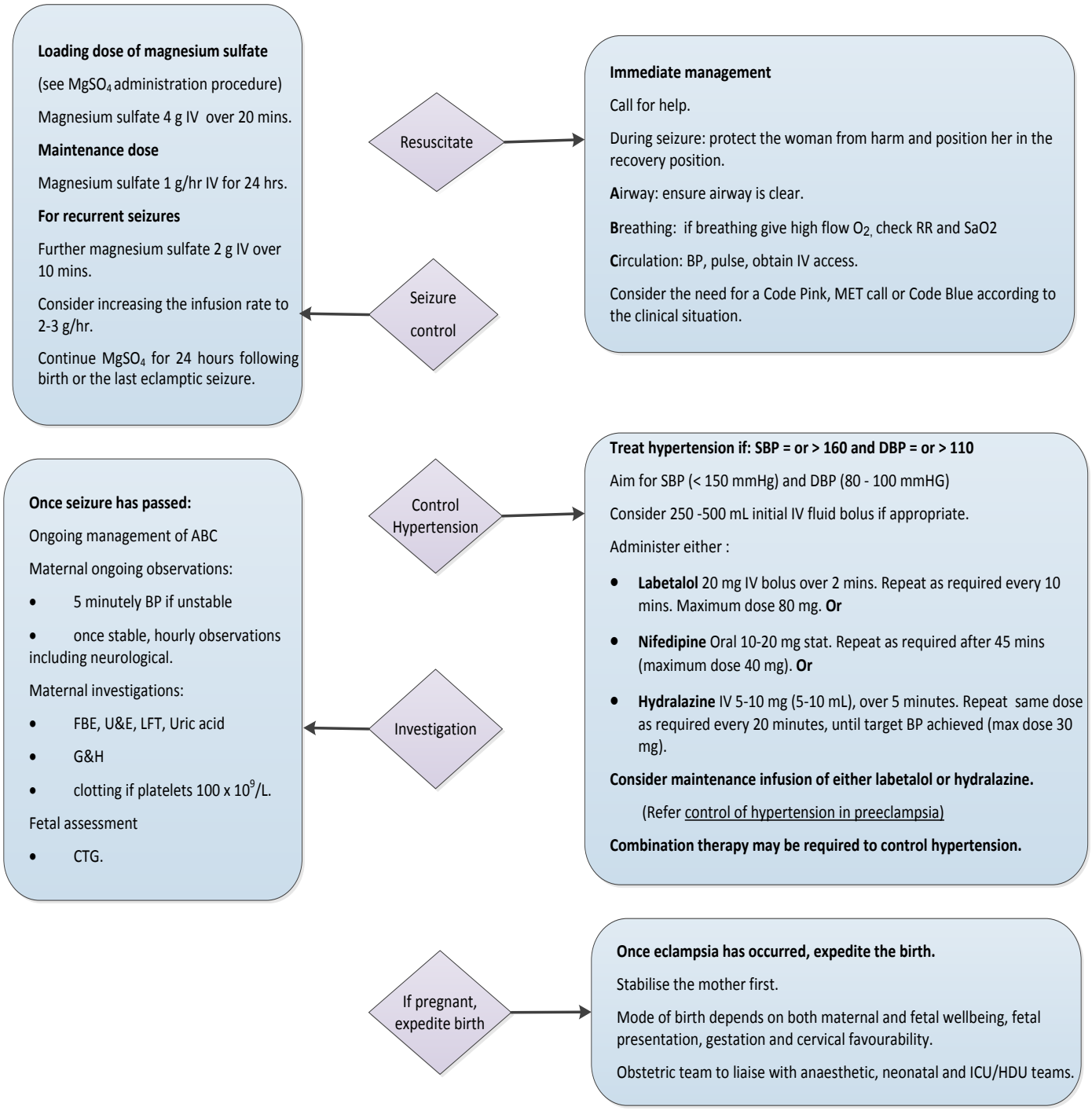
3.7 Discharge and follow up

As per 2.3.7

It is important to consider other causes for seizures in pregnancy after stabilization of the patient. Differential diagnoses for similar presentations include epilepsy, intracranial haemorrhage, meningitis, cerebral venous thrombosis, space-occupying lesions, metabolic disorders, head trauma and drug or alcohol-related issues.

Persistent neurological symptoms merit imaging of the brain and appropriate referral.

4 Eclampsia Flowchart



5 Levels of evidence*[8]		
Level	**Intervention**	**Transfer from RCOG Green-top Guideline, where applicable**
I	A systematic review of level II studies.	1a
II	A randomised controlled trial.	Ib
III-1	A pseudo-randomised controlled trial.	IIa
III-2	A comparative study with concurrent controls: • Non-randomised experimental trial. • Cohort study. • Case-control study. Interrupted time series without a parallel control group.	IIb
III-3	A comparative study without concurrent controls: • Historical control study. • Two or more single arm study. Interrupted time series without a parallel control group.	III
IV	Case series with either post-test or pre-test outcomes.	III
*Refer to full reference for the evidence hierarchy of prognosis, aetiology and screening interventions.		
Consensus:	An additional level of evidence used here, for example, from published guidelines that have involved extensive consultation and deliberation, where specific recommendations have been agreed upon by consensus of the contributors.	IV

6. References:

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Related resources

Eclampsia box contents - Implementation Tool

Keywords or tags

PIH, PET

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Disclaimer

The maternity clinical practice procedures and guidelines have been developed having regard to general circumstances. It is the responsibility of every clinician to take account of both the particular circumstances of each case and the application of these procedures and guidelines. In particular, clinical management must always be responsive to the needs of the individual woman and particular circumstances of each pregnancy.

These procedures and guidelines have been developed in light of information available to the authors at the time of preparation. It is the responsibility of each clinician to have regard to relevant information, research or material which may have been published or become available subsequently. Please check this site regularly for the most current version.