PRE-ECLAMPSIA AND ECLAMPSIA

The New Zealand (NZ) clinical practice guideline (Ministry of Health, 2018) provides an evidence-based summary of best practice in screening, diagnosing and treating hypertension and pre-eclampsia in pregnancy.

This guideline is a CDHB **quick reference guide** to the management of pre-eclampsia and eclampsia. The NZ clinical practice guideline has been used as a key reference throughout this document.

DEFINITIONS AND CLASSIFICATIONS

HYPERTENSION

Systolic blood pressure (sBP) greater than or equal to **140 mmHg**
or diastolic blood pressure (dBP) greater than or equal to **90 mmHg**
as measured on **two or more consecutive occasions at least four hours apart**

Chronic/Pre-existing hypertension

- confirmed before conception or before 20 weeks' gestation

Gestational hypertension

- after 20 weeks' gestation
- none of the abnormalities that define pre-eclampsia
- blood pressure that returns to normal within three months of birth.

For further guidance on the management of pre-existing and gestational hypertension refer to the New Zealand (NZ) clinical practice guideline (Ministry of Health, 2018)

PRE-ECLAMPSIA

The new onset of hypertension (defined as above) which occurs **after 20 weeks' gestation** (in a woman who had normal blood pressure before 20 weeks' gestation) or superimposed on pre-existing hypertension and **one or more** of the following **new** conditions:

Although a rise in baseline blood pressure of 30 mmHg systolic or 15 mmHg diastolic may be of clinical importance it is no longer used to diagnose hypertension

1. Proteinuria

   Significant proteinuria on urinalysis subsequently confirmed by spot urine protein/creatinine ratio ≥ 30 mg/mmol. Proteinuria is **not** essential for a pre-eclampsia diagnosis.

2. Other maternal organ dysfunction

   Renal: creatinine > 90 µmol/L; urine output of < 80 mL/4 hour.

   Liver: elevated aspartate transaminase (AST) (normal range 10-50 u/L) and alanine transaminase (ALT) (normal range 0-30 u/L) – at least twice upper limit of normal ± right upper quadrant or epigastric abdominal pain.

Neurological: hyperreflexia accompanied by clonus, severe headaches, persistent visual disturbances (scotomata, photopsia, blindness), eclamptic seizures, altered mental status, stroke.

Haematological: thrombocytopenia (platelet count below 100 x 109/L), haemolysis.

3. Uteroplacental dysfunction

Placental abruption, fetal growth restriction.

STABLE PRE-ECLAMPSIA

- **Hypertension** is controlled with dBP < 110 and sBP < 160 *and*
- No severe features of the pre-eclampsia

SEVERE/UNSTABLE PRE-ECLAMPSIA

- **Severe hypertension** (dBP ≥ 110 mmHg **or** sBP ≥ 160 mmHg)
- Worsening pre-eclampsia **bloods** (platelet count, AST, ALT, creatinine)
- HELLP syndrome (Haemolysis, Elevated Liver enzymes, and Low Platelet count)
- Worsening signs and symptoms such as:
  - right upper quadrant or epigastric abdominal pain (may be referred to upper back)
  - urine output of < 80 mL/4 hours
  - pulmonary oedema
  - new onset of headaches and visual disturbances
  - eclamptic seizures, altered mental status, stroke

ECLAMPSIA

- A severe manifestation of pre-eclampsia that can occur before, during or after birth.
- A new onset of seizures that either occurs in association with pre-eclampsia OR as the initial presenting feature.
- Seizures that are self-limiting, have no persistent clinical neurological features and are not caused by pre-existing neurological conditions.

INCIDENCE

Pre-eclampsia complicates approximately 3-8% of pregnancies in New Zealand.

Incidence of pre-eclampsia has increased over time as a result of changes in maternal characteristics, such as increased age and weight.

Incidence of eclamptic seizures has declined due to improved antenatal care and prophylactic use of magnesium sulphate.

RISK FACTORS AND PREVENTION

Health professionals should identify risk factors when a woman books for antenatal services, make appropriate referrals and begin preventative therapies.

Risk factors for developing pre-eclampsia (listed in order of relative risk) include:

- Autoimmune diseases such as antiphospholipid antibodies and SLE
- Previous history of pre-eclampsia
- ART (oocyte donation)
- Renal disease
- Chronic hypertension
- Previous history of HELLP
- Pre-existing diabetes
- Family history of pre-eclampsia
- Genetic ancestry (African, Indian, Maori, Pacific)
- Nulliparity
- Multiple gestation
- Change in partner
- Elevated BMI equal to or greater than 35

A full table of risk factors is available from the national guideline here.

Controlling blood pressure level is vital at any stage of care. This will not prevent pre-eclampsia but will reduce the risk of stroke and poor outcomes for the mother.

Women at high risk of developing pre-eclampsia should begin taking low-dose aspirin (100 mg daily nocte) and calcium (1 g elemental intake per day nocte) before 16 weeks' gestation to reduce their risk of developing pre-eclampsia and adverse events such as preterm birth.

PRE-ECLAMPSIA (STABLE/WITHOUT SEVERE FEATURES): MANAGEMENT

AT DIAGNOSIS

- Consultation with obstetric team
- Transfer of care as per referral code 4022
- Admit to secondary/tertiary care for assessment and plan of care, in discussion with woman and LMC

MATERNAL MONITORING

Vital signs

- As per observation schedule in Appendix B
- Document on MEWS chart and escalate accordingly
- Accurate blood pressure monitoring involves:
  - Correct positioning: Rested and sitting 45 degree angle (chair or bed)
  - Appropriate sized cuff at level of heart
  - Phase 5 Korotkoff (disappearance of pulsation sound) for diastolic BP
  - Regular checking with manual sphygmanometer as automated devices may underestimate BP
- Input/output monitoring as per CDHB Fluid Balance Charting Policy

Observe for signs and symptoms

Clinical deterioration can be rapid

Discuss with woman about signs and symptoms of worsening pre-eclampsia

- Signs and symptoms may include:
  - Severe headache
  - Visual disturbances
  - Severe epigastric pain
  - Shortness of breath
  - Retrosternal pressure/pain
  - Nausea/vomiting
  - Sudden swelling of face, hands or feet
  - Hyperreflexia

Laboratory tests

- See Appendix C
- Urine for protein: creatinine ratio (PCR) on admission

FETAL MONITORING

- CTG on admission and then daily if inpatient, more frequent if worsening symptoms
- Ultrasound Scan (USS) for fetal growth and wellbeing at time of diagnosis including plotting on customised grow chart and assessment of umbilical artery dopplers
- Further and then according to CDHB optimal scan frequency guideline

ANTIHYPERTENSIVES

The antihypertensive regimen for acute lowering of blood pressure in women with severe hypertension differs from the regimen for chronic management.

Aim for a target BP below 140/100.

Treatment for hypertensive disorders in pregnancy:

Labetalol: Exclude asthma. 100mg stat then 100-200 mg three-four times per day

Nifedipine: 10-30 mg slow release twice a day

Methyldopa: 500mg stat then 250-500 mg three times per day (not advised postnatal).
Avoid Atenolol, ACE inhibitors or Angiotensin Receptor blocking drugs, and diuretics.

Acute lowering of severe hypertension (dBP ≥ 110 mmHg or sBP ≥ 160 mmHg):

Nifedipine: See appendix D

Labetalol: See appendix E

Hydralazine: See appendix F

TIMING OF BIRTH

- **Before 37 weeks** (up to 36+6): adopt expectant approach. Do not recommend delivery in absence of other maternal or fetal indicators (eg. premature rupture of membranes, preterm labour, vaginal bleeding, deterioration of condition). Manage as inpatient – individualised plan.
- **After 37 weeks** (37+0 and over): Recommend birth. No appreciable benefit in continuing pregnancy after 37 weeks. Negotiate timing with the woman, her LMC and obstetric team.

INTRAPARTUM AND POSTPARTUM

See below (p.8) for intrapartum and postpartum management

SEVERE/UNSTABLE PRE-ECLAMPSIA: MANAGEMENT

Refer to 'quick reference guide' in Appendix A

AT DIAGNOSIS

- Immediate consultation with obstetric team
- Transfer of care as per referral code 4022
- Admit to secondary/tertiary care for assessment and plan of care, in discussion with woman and LMC
- Consider magnesium sulphate to prevent a primary seizure (Appendix G)
- Consider admission to Acute Observation Unit (AOU)

MATERNAL MONITORING

Vital signs

- See Appendix B – increased frequency according to BP/symptoms/magnesium sulphate
- Document on MEWS chart or AOU chart and escalate accordingly
- Observe for worsening symptoms as described above
- Deep tendon reflexes and clonus:
  - As per observation schedule in Appendix B
  - If absent, suspect magnesium toxicity.
  - Check reflexes in the upper limb when epidural/spinal anaesthesia is in situ
  - If hyperreflexia with > 3 beats clonus present after 2 hours of being on a magnesium sulphate infusion consider another repeating loading dose of magnesium – senior doctor to review and confirm dose (see Appendix G)
- Fluid balance:
  - Consider indwelling catheter with hourly measurement bag
  - Fluid restriction total 80-85ml/hour (after replacing any ongoing loss and/or loss measured during birth)
  - In addition to IV fluids, advise the woman to drink according to thirst (unless risk of imminent surgery)
  - Oliguria = less than 80ml over 4 hours. Oliguria is common in pre-eclampsia, and there is no evidence that fluid expansion or maintenance of a specific urine output prevents renal failure (which is rare) or improves pre-eclampsia outcome
- Consider placement of an arterial line before instituting acute control of blood pressure

Laboratory tests

- See Appendix C – adjust frequency if concerned re worsening condition
- Urine for protein: creatinine ratio (PCR) on admission

FETAL MONITORING

- CTG on admission and then daily if inpatient, more frequent if worsening symptoms
- Continuous CTG while on magnesium sulphate
- USS for fetal growth and wellbeing at time of diagnosis including plotting on customised grow chart and assessment of umbilical artery dopplers
- Further USS according to CDHB optimal scan frequency guideline

ANTIHYPERTENSIVES AND ANTICONVULSANTS

- For acute lowering of blood pressure see Appendices C, D and E
- To prevent progression to eclampsia, administer magnesium sulphate. See Appendix G

TIMING OF BIRTH

- **Periviability and before**: careful discussion with woman and with the Maternal Fetal Medicine Unit.
- **Before 34 weeks**: adopt expectant approach. Careful balance of improved perinatal outcome with risk of maternal morbidity. If indication for birth presents, administer corticosteroids for fetal lung maturation and magnesium sulphate for fetal neuroprotection (if < 30 weeks). Not required if already on magnesium sulphate.
- **After 34 weeks**: Recommend birth after woman's condition is stabilised and appropriate senior personnel are present.

INTRAPARTUM AND POSTPARTUM

See below (p.8) for intrapartum and postpartum management.

ECLAMPSIA: MANAGEMENT

- Press red emergency bell to call for local help.
- Press green clinical emergency button (Adult Clinical Emergency Team for CWH). Leave red emergency bell on to advise location.
- Maintain open airway
- Inform senior obstetric anaesthetist, senior obstetrician and if during pregnancy, senior neonatal team
- Prevent maternal injury wherever possible

On termination of seizure:

- Position the woman in left lateral
- Administer oxygen
- Commence/continue continuous oxygen saturation monitoring
- Auscultate lungs (aspiration risk)
- Commence magnesium sulphate to **prevent** further seizures (see Appendix G).

- Prepare for birth (if seizure occurs in pregnancy – ensure stable first even during significant fetal compromise)
- Commence/continue CTG monitoring
- Monitor blood pressure
- Take bloods (FBC, Liver and Renal function, Glucose)
- Insert indwelling urinary catheter
- Ongoing monitoring and treatment as per 'severe/pre-eclampsia' management above

If eclamptic seizure recurs during or after magnesium sulphate:

- Repeat half loading dose – see Appendix G

INTRAPARTUM

- **Antihypertensives**: ongoing therapy, adjusting if necessary for other factors, eg. anaesthesia
- **Maternal monitoring:** at least hourly BP in labour, more frequently for women with severe hypertension. Consider using MEWS as well as partogram. Monitor fluid balance.
- **Fetal heart monitoring**: intrapartum CTG is recommended for all cases of essential hypertension and pre-eclampsia in the RANZCOG Intrapartum Fetal Surveillance Clinical Guideline. However, in the Ministry of Health Hypertension and Pre-eclampsia guideline intrapartum CTG is recommended for severe/unstable pre-eclampsia but *not* when pre-eclampsia is stable without severe features. Choice of CTG or Intermittent Ausculation in *stable* pre-eclampsia will be dependent on woman's wishes and intrapartum risk factors.
- **Mode of birth:** vaginal, unless contraindicated for the woman or the fetus.
- **Induction:** in many cases induction is a safe option.
- **Anaesthesia:** effective epidural anaesthesia may reduce hypertensive response to labour pain and can be used safely for women with lower platelet counts. When platelet count is less than 80 x 10^9/l avoid neuraxial (ie. spinal, epidural or combined spinal epidural anaesthesia) methods of analgesia. Neuraxial anaesthesia is less likely to cause hypotension is women with pre-eclampsia but it may still occur, fluid preloading may not be required. For further evidence around anaesthesia refer to the Ministry of Health Hypertension and Pre-eclampsia guideline
- **Placental birth:** active management of the third stage is clinically indicated due to increased risk of PPH and choice of uterotonic is oxytocin. **Avoid use of Syntometrine® and ergometrine for third stage management , which can lead to fatal cerebral haemorrhage in the context of hypertension.**

POSTPARTUM

Women with pre-eclampsia should be closely monitored postpartum as their blood pressure frequently rises three to five days after giving birth. Although majority of postpartum eclamptic seizures occur during the first 48 hours, later seizures do occur and clinicians should review carefully before discharge.

- Intensive observation should continue on Birthing Suite (AOU) for at least 24 hours with severe pre-eclampsia.
- If on magnesium sulphate, continue infusion for 24 hours

- If PPH occurs:
  - Oxytocin infusion should run at an increased concentration to avoid fluid overload (40 international units of oxytocin in 100ml 0.9% sodium chloride at 25 ml/hour over 4 hours).
  - Avoid use of Syntometrine® and ergometrine except when massive haemorrhage occurs.
  - Re-prioritise fluid replacement over fluid restriction for significant haemorrhage
- Continue close fluid balance monitoring for at least 24 hours. Intravenous fluid restriction should continue until spontaneous diuresis occurs.
- Advise 72 hour minimum stay in secondary/tertiary facility
- Daily BP for 7 days and then at least weekly to 6 weeks
- Monitor bloods (FBC, renal and liver function) the day after birth, and twice weekly until stabilised (may need more frequent monitoring if very unstable)
- Comprehensive discharge summary to GP and LMC including the plan for postnatal management of blood pressure.
- Follow-up appointment at 6 weeks to be arranged in CWH gynaecology outpatients department.
- Monitor disease resolution and antihypertensive therapy:
  - If on methyldopa, consider changing to another antihypertensive, eg. ACE inhibitor
  - Labetalol unless asthmatic or myasthenia gravis.
  - Nifedipine additional therapy if required unless myasthenia gravis .
  - Enalapril may be initiated (on consultant request) for chronic hypertension, ensure normal renal function prior to commencement. Measure serum creatinine 3-5 days after commencement
- Labetalol, nifedipine and enalapril are all considered compatible with breastfeeding. Premature neonates may be more susceptible to absorption of enalapril from breast milk - monitor for signs of reduced neonatal renal output.
- Early-onset pre-eclampsia (< 32 weeks gestation), particularly if associated with IUGR, requires further investigation at 6-8 weeks (inherited and acquired thrombophilia, antiphospholipid syndrome), and renal ultrasound if proteinuria persists. In the event of extreme and fluctuating levels of hypertension, phaeochromocytoma needs to be considered and appropriately investigated.
- All women who have developed pre-eclampsia should be regularly assessed for cardiovascular and renal risk in the long term.
- Assess, address and document women's need for psychological care and support (eg. community organisations, mental health services, life style advice, etc.)

REFERENCES AND RESOURCES

Credit to:

- Ministry of Health (2018) Diagnosis and treatment of hypertension and pre-eclampsia in pregnancy in New Zealand: A clinical practice guideline

Further reading at:

- NZ Apec: https://www.nzapec.com/

APPENDICES

A. Quick Reference Guide: Severe Pre-Eclampsia

B. Observations

C. IV Cannulation and Laboratory Analysis

D. Nifedipine

E. Labetalol

F. Hydralazine

G. Magnesium Sulphate

H. Calcium Gluconate

I. Contents of Pre-Eclampsia Box and Monthly Checklist

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APPENDIX A QUICK REFERENCE GUIDE: SEVERE PRE-ECLAMPSIA

Severe Pre-Eclampsia

GET HELP: alert senior obstetric, midwifery and anaesthetic teams

OBSERVATION	ACTION	CONSIDER
Signs and symptoms	2 x IV access	Corticosteroids
MEWS	Bloods	USS
Reflexes/Clonus	Antihypertensives	Timing of birth
Fluid balance	IDC	Fluid restriction
CTG	MSU/PCR	Neonatal call
	Magnesium sulphate	AOU

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APPENDIX B OBSERVATIONS

PRE-ECLAMPSIA

OBSERVATIONS

- Refer to guideline for full definitions of stable vs unstable pre-eclampsia
- Document on MEWS chart and escalate accordingly. For AOU, use Chart Ref 8707
- Clinical judgement and medical care plan may supersede observation schedule as directed below

OBSERVATION SCHEDULE

	Stable	Unstable	On Magnesium Sulphate
BP	4-6hrly (8 hrly overnight) (At least hourly in labour)	At least hourly (antenatal, intrapartum and postnatal)	Baseline then **every 5 minutes** for loading dose Hourly for maintenance
HR, RR, SpO2			Hourly
Temp	4-8 hourly		
Tendon/Clonus	-	-	10 mins after loading dose commences then hourly
Fetal heart	Daily CTG Consider CTG in labour	At least Daily CTG Continuous CTG in Labour	Continuous CTG

ECG no longer required for loading dose of magnesium sulphate

Fluid balance – for severe/unstable pre-eclampsia

IDC and hourly urine measurements for duration of magnesium infusion and consider for severe pre-eclampsia

Urine output > 80 mLs over 4 hours

Fluid restriction total 80-85 ml/hour (after replacing any ongoing loss and/or loss measured during birth).

In addition to IV fluids, advise the woman to drink according to thirst (unless risk of imminent surgery).

Deep tendon reflexes including clonus

If reflexes absent suspect magnesium toxicity. Prepare calcium gluconate (see Appendix H).

If hyper-reflexia with > 3 beats of clonus present after 2 hours magnesium sulphate infusion refer to senior O&G for consideration of repeat loading dose (see Appendix G)

Check reflexes in the upper limb when epidural/spinal anaesthesia is in situ

Monitor for symptoms

- *Severe headache*
- *Visual disturbances*
- *Severe epigastric pain*
- *Shortness of Breath*
- *Retrosternal pressure/pain*
- *Nausea/vomiting*
- *Sudden swelling of face, hands or feet*
- *Hyperreflexia*

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APPENDIX C IV CANNULATION AND LABORATORY ANALYSIS

PRE-ECLAMPSIA

IV CANNULATION & LABORATORY ANAYLSIS

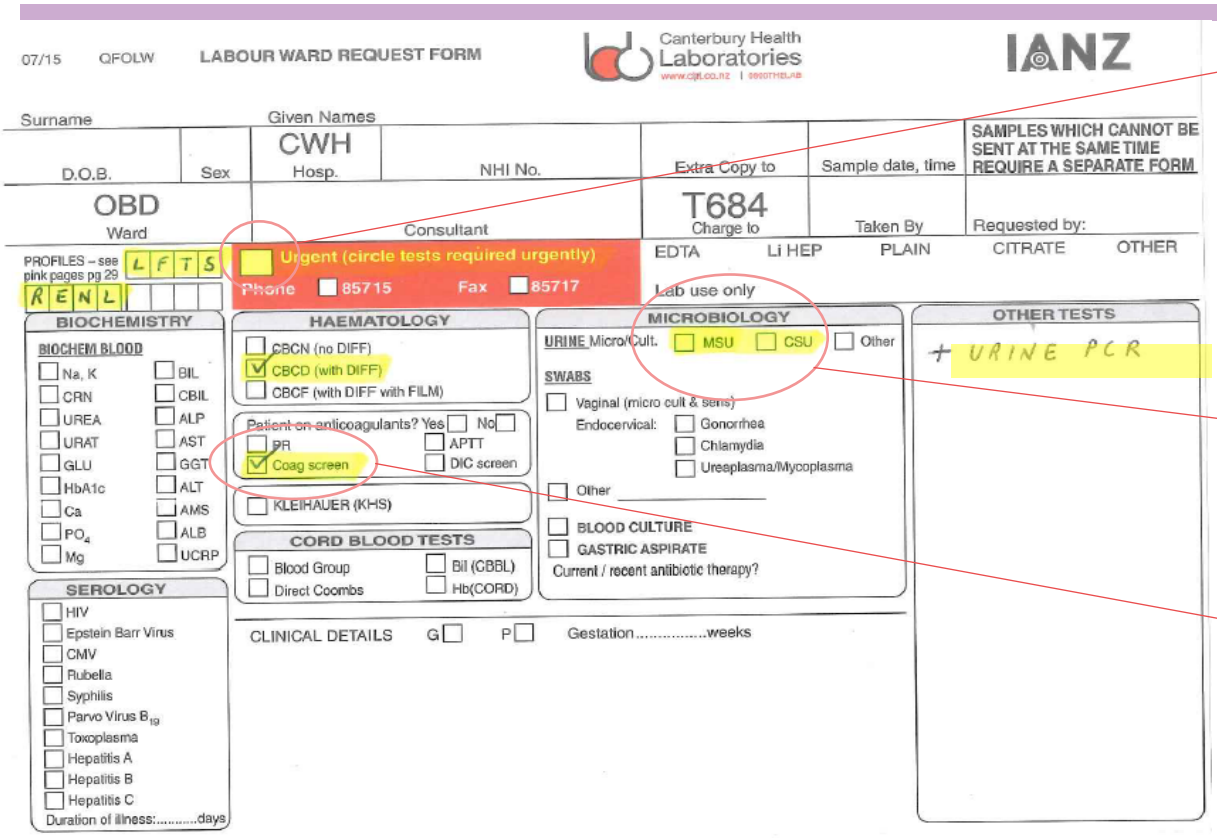
IV ACCESS

- Site two IV cannulas for separate administration of MgSo4 and other IV additives (ie. antihypertensives)

INVESTIGATIONS

TEST	BLOOD TUBE	ORDER OF DRAW
COAG SCREEN* *only if LFT abnormal/low platelets*	2.7mL *Fill to the top	1
LFTs + RENALS**	4.5mL	2
FULL BLOOD COUNT	5mL	3
GROUP & HOLD	6mL	4
URINE PCR URINE CULTURE	*Both tests can be analyzed from one urine collection*	

- Twice weekly if stable
- At least daily if severe/unstable
- Repeat if sudden increase in BP
- *Coagulation screen only if LFT's abnormal or low platelets or placental abruption
- **Liver function tests (inc. AST, ALT) plus Creatinine, Electrolytes
- Once a positive PCR result (> 30mmol) is returned, further PCR testing is not required.
- Analyse cumulative results to identify trends



APPENDIX D NIFEDIPINE

PRE-ECLAMPSIA

NIFEDIPINE

FOR ACUTE LOWERING OF BLOOD PRESSURE IN SEVERE PRE-ECLAMPSIA

CONTRAINDICATIONS

Cardiogenic shock; unstable or acute attacks of angina; myasthenia gravis

POTENTIAL SIDE EFFECTS

Gastro-intestinal disturbance, hypotension, oedema, vasodilation, flushing, palpitation, headache, dizziness, lethargy, muscle weakness;

INDICATION

Start either nifedpine, labetalol or hydralazine in all women with severe pre-eclampsia:

Systolic Blood Pressure **≥ 160 mmHg** and / or
Diastolic Blood Pressure **≥ 110 mmHg**

Aim for a target BP below 140/100 or lower.

DOSAGE

ORAL	**10 mg modified release tablet** **Onset of action: 30-45 mins** **Onset of maximum effect: 30 mins** **Repeat: after 30-45 mins (if needed)** **Maximum: 80mg daily**

APPENDIX E LABETALOL

PRE-ECLAMPSIA

LABETALOL

FOR ACUTE LOWERING OF BLOOD PRESSURE IN SEVERE PRE-ECLAMPSIA

CONTRAINDICATIONS

Asthma: myasthenia gravis

POTENTIAL SIDE EFFECTS

Postural hypotension, tiredness, weakness, headache, dizziness, rash, scalp tingling, difficulty in micturition, epigastric pain, nausea, vomiting

INDICATION

Start either nifedpine, labetalol or hydralazine in all women with severe pre-eclampsia:

Systolic Blood Pressure **≥ 160 mmHg** and / or
Diastolic Blood Pressure **≥ 110 mmHg**

Aim for a target BP below 140/100

DOSAGE

IV BOLUS	**Preparation:**	Use undiluted labetalol from vial (100mg/20mL)
	Administration:	Give initial **20mg (4mL)** bolus over 2 minutes. Onset: 5 minutes. Repeat: 40-80mgs (8mL to 16mL) every 10 minutes (if needed) Maximum: 300mg (60mL).
IV INFUSION	**Preparation:**	Discard **48mL** from a 100mL bag of 0.9% Sodium Chloride (each 100mL bag contains 8mL overage as per advice from manufacturer) Add **200mg** labetalol (40mL) to bag. This makes a 2mg/mL Solution for infusion
	Administration:	Commence labetalol infusion at rate **10mL/hr** (20mg/hr) via IV infusion pump. Increase infusion rate by 10mL/hr every 30 minutes until BP controlled, up to maximum 50mL/hr (100mg/hr). If BP not controlled on 100mg/hr seek medical review.

APPENDIX F HYDRALAZINE

PRE-ECLAMPSIA

HYDRALAZINE

FOR ACUTE LOWERING OF BLOOD PRESSURE IN SEVERE PRE-ECLAMPSIA

CONTRAINDICATIONS

- Cardiac and renal disease

POTENTIAL SIDE EFFECTS

Tachycardia, angina, flushing, hypotension, fluid retention, oedema, gastro-intestinal disturbances, difficulty with micturition, headache, dizziness

INDICATION

Start either nifedpine, labetalol or hydralazine in all women with severe pre-eclampsia:

Systolic Blood Pressure **≥ 160 mmHg** and / or
Diastolic Blood Pressure **≥ 110 mmHg**

Aim for a target BP below 140/100

DOSAGE

IV BOLUS

Preparation:	Hydralazine comes in a vial containing 20mg of lyophilized powder for reconstitution 1. Add **1mL** of 0.9% sodium chloride to reconstitute the vial 2. Add the contents of reconstituted vial of hydralazine to a further **19mL** of 0.9% sodium chloride (total volume = **20mL**) This makes a **1mg/mL** solution of hydralazine for bolus injection
Administration:	Give a **5-10mg (5-10mL)** bolus injection over 3-10 minutes. If fetal compromise give only **5mg (5mL)** bolus over 3-10 minutes Onset: 20 minutes Repeat: every 20 minutes until BP is controlled Maximum: 30mg (30mL) Consider: IV fluid bolus 200-300mLs crystalloid with 1st dose

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APPENDIX G MAGNESIUM SULPHATE

PRE-ECLAMPSIA

MAGNESIUM SULPHATE

✓ PROPHYLAXIS OF CONULSIONS IN SEVERE PRE-ECLAMPSIA
✓ TREATMENT OF ECLAMPTIC CONVULSIONS

CONTRAINDICATIONS

- Cardiac disease
- Acute renal failure
- Myasthenia gravis

POTENTIAL SIDE EFFECTS:

Nausea, vomiting, diarrhoea, thirst, flushing of skin, hypotension, arrhythmias, coma, respiratory depression, drowsiness, confusion, loss of tendon reflexes, muscle weakness

OBSERVATIONS

Refer to Appendix B

MAGNESIUM TOXICITY

Disappearance of deep tendon reflexes is an early sign of magnesium toxicity and presents before respiratory muscles weakness occurs.

IF ANY CONCERN ABOUT TOXICITY, STOP MAGNESIUM SULPHATE.

If signs of toxicity (hypoventilation, arrhythmia, hypotonia) administer **Calcium gluconate** (see appendix H).

Check serum magnesium levels IF serum creatinine >:100micromol/L OR if urine output <100ml over 4 hours. Do not take blood for serum magnesium in arm receiving the infusion.

DOSAGE

	DOSE	DURATION/RATE
Loading *(to prevent eclampsia)*	4 g	10 mins
Maintenance *(for 24 hours following birth/after last seizure, whichever is later)*	1 g	Per hour
Repeat loading *(when seizure occurs during maintenance dose)*	2 g	10 mins
Treatment *(of eclamptic seizures)*	4 g	5-10 mins
Maximum total daily dose	40 g	

PUMP SET UP

SETTING THE AGILIA IV PUMP

Set **maintenance dose** first (1g/hour):
Volume to be infused (VTBI) = 100 mLs
Press OK; press OK again to skip time
Rate = 13 mLs/hr (1 g/hour).
Press OK. Press START

Then set **loading dose** (4g/10min):
Press ◀◀◀**BOLUS** button for **PROGRAMMED BOLUS**
VTBI (vol to be infused): **51 mLs** (4 g). Press OK
Set duration: 10 mins
Press **OK. Rate** will automatically calculate at **306 mLs/hr**
Press OK. Press START
After 10 minutes infusion will default back to 13 mLs/hr

If **repeat loading dose** required:
Press ◀◀◀**BOLUS** button for **PROGRAMMED BOLUS (after maintenance dose is running)**
VTBI (vol to be infused): **25 mLs** (2 g)
Set duration: 10 mins

IV PREPARATION

Pre-mixed bag: 9.86 g Magnesium Sulphate in sodium chloride 0.9% (total volume 128 mLs)

If no premix available: add 4 x 5 mLs vials (2.47 g Magnesium Sulphate per vial) to a 100 mLs bag sodium chloride 0.9% (total volume 128 mLs; total Magnesium 9.88 g)

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APPENDIX H CALCIUM GLUCONATE

PRE-ECLAMPSIA

CALCIUM GLUCONATE

REVERSAL AGENT FOR MAGNESIUM TOXICITY

INDICATIONS

Disappearance of deep tendon reflexes is an early sign of magnesium toxicity and presents before respiratory muscle weakness occurs.

If signs of toxicity (hypoventilation, arrhythmia, hypotonia):

- Call for assistance
- Administer oxygen at 8-12 litres/minute
- Stop magnesium infusion
- Monitor vital signs
- Administer Calcium Gluconate (antagonist to Magnesium Toxicity).
- Check electrolytes, creatinine and magnesium sulphate levels

ADMINISTRATION

CALCIUM GLUCONATE 10%

1g/10mL

- Draw up the whole 10mL ampule **undiluted**
- Volume to be given **IV** via slow push over **10 minutes (1mL/min)**

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APPENDIX I: PRE-ECLAMPSIA BOX CONTENTS AND CHECKLIST

OBSERVATION PACK CONTENTS

- AOU MEWS charts
- Tendon hammer

IV CANNULATION PACK CONTENTS

- Blood Bank test form
- Lab test request form
- Laboratory bag

IV cannulation/phlebotomy pack:

- Tourniquet
- Alcohol swab
- Lidocaine 1% 5 mL
- 1 mL syringe
- Needle 26 g
- Blunt fill needle
- Tegaderm
- 18 g cannula
- Smartsite
- 20 mL syringe
- Blood transfer device
- Blood tubes (pink, purple, green)
- Posiflush
- Green IV cannula label, x2
- Pressure pad

NIFEDIPINE PACK CONTENTS

- Nifedipine 10mg modified release tablets
- Medicine cups

HYDRALAZINE PACK CONTENTS

- Hydralazine (20 mg) vial, x4
- 100 mL bag of 0.9% sodium chloride
- 20 mL 0.9% sodium chloride, x2
- Agilia pump giving set
- 20 mL syringe, x2
- Blunt fill needle, x2
- Alcohol swab
- Drug labels

LABETALOL PACK CONTENTS

- Labetatol (100 mg/20 mL) vial, x4
- 100 mL bag of 0.9% sodium chloride
- Agilia pump giving set
- 20 mL syringe, x2
- Blunt fill needle, x2
- Alcohol swab
- Drug labels

MAGNESIUM SULPHATE PACK CONTENTS

- MgSO4 (40 mmol/128 mL) premixed bag
- Pump giving set
- Alcohol swab

Unconstituted MgSO4 bag

- 10 mmol/5 mL magnesium sulphate (2.5 g/5 mL) vial, x4
- 100 mL bag of 0.9% sodium chloride
- Agilia pump giving set
- 20 mL syringe
- Blunt fill needle
- Alcohol swab
- Drug labels

CALCIUM GLUCONATE PACK CONTENTS

- Calcium gluconate 10% (1 g/10 mL), x2
- 10 mL syringe, x2
- Blunt fill needle, x2
- Alcohol swab, x2

BLADDER CATHETERISATION PACK CONTENTS

- Sterile drape
- Catheterisation pack
- 10 mL water ampule
- 20 mL 0.9% sodium chloride
- Foleys catheter
- 10 mL syringe
- Lubrication jelly
- Urine specimen cup
- Cathfix
- Catheter bag (hourly urine measurement) – in PET BOX

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PRE-ECLAMPSIA

PRE-ECLAMPSIA BOX

MONTHLY CHECKLIST (+ AFTER EACH USE)

ITEM	DATE																		
Guideline																			
Observation pack *(AOU and MEWS chart)*																			
IV cannulation pack																			
Nifedipine pack																			
Hydralazine pack *(including drug expiry)*																			
Labetalol pack *(including drug expiry)*																			
Magnesium sulphate pack *(including drug expiry)*																			
Catheterisation pack																			
Hourly urine meter																			
Scissors																			

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