



CLINICAL PRACTICE GUIDELINE

**THE DIAGNOSIS AND MANAGEMENT OF SEVERE
PRE-ECLAMPSIA AND ECLAMPSIA**

Institute of Obstetricians and Gynaecologists,
Royal College of Physicians of Ireland
and the
Clinical Strategy and Programmes Division,
Health Service Executive

Contents

1.0	Revision History	3
2.0	Abbreviations	3
3.0	Key Recommendations	3
4.0	Purpose and Scope.....	4
5.0	Background and Introduction	4
6.0	Methodology	5
7.0	Clinical Guideline	6
7.1	Diagnosis of Pre-eclampsia.....	6
7.2	Diagnosis of superimposed pre-eclampsia	7
7.3	Diagnosis of severe pre-eclampsia	7
7.4	The Management of Severe Pre-eclampsia	8
7.4.1	General Measures	8
7.4.2	Basic Investigations	8
7.4.3	Monitoring	8
7.4.4	Fluid Management.....	9
7.4.5	HELLP syndrome.....	11
7.4.6	Thromboprophylaxis.....	11
7.4.7	The Treatment of Severe Hypertension.....	12
7.4.8	The Treatment and Prevention of Eclampsia	14
7.4.9	Delivery	17
7.4.10	Stabilisation before Transfer.....	17
7.5	Postnatal Management	18
7.5.1	Immediate post natal care	18
7.5.2	Postnatal review	19
8.0	References.....	20
9.0	Implementation Strategy	20
10.0	Qualifying Statement.....	20
11.0	Appendices	22
	Appendix 1: Neurological monitoring	22

1.0 Revision History

Version No.	Date	Modified By	Description
1.0	09/11		
2.0	11/03/16	Louise Kenny	

2.0 Abbreviations

ABC	Airway, Breathing, Circulation
AVPU	Alert, Voice, Pain, Unresponsive scale
BP	Blood Pressure
CVP	Central Venous Pressure
GCS	Glasgow Coma Scale
HDU	High Dependency Unit
HELLP	Haemolysis Elevated Liver Enzymes and Low Platelets
IMEWS	Irish Maternity Early Warning Score
MAP	Mean Arterial Pressure
PCR	Protein Creatinine Ratio

3.0 Key Recommendations

- Women with severe pre-eclampsia should be nursed in a HDU setting with one to one midwifery care and all monitoring should be documented using IMEWS (Irish Maternity Early Warning Score) on HDU charts.
- Labetalol should be used as the first line antihypertensive, followed by hydralazine where labetalol is contraindicated or ineffective at controlling blood pressure.

- Nifedipine is a potent antihypertensive and should never be given sublingually.
- The aim of antihypertensive treatment is to keep the systolic blood pressure below 160 mmHg and the MAP < 125 mmHg.
- Cases of severe pre-eclampsia should be given magnesium sulphate to prevent seizures.
- Following delivery, the patient should be fluid restricted in order to wait for the natural diuresis.
- A platelet transfusion is recommended prior to Caesarean section or vaginal delivery when the platelet count is < 20 x 10⁹ ml.
- Methyldopa should be avoided postnatally.
- All women with severe pre-eclampsia should return to the hospital for post-natal review within 12 weeks of delivery to debrief, complete any outstanding investigations and plan for the next pregnancy.

4.0 Purpose and Scope

The purpose of this guideline is to improve the management of severe pre-eclampsia and eclampsia. These guidelines are intended for healthcare professionals, particularly those in training who are working in HSE-funded obstetric and gynaecological services. They are designed to guide clinical judgement but not replace it. In individual cases a healthcare professional may, after careful consideration, decide not to follow a guideline if it is deemed to be in the best interests of the woman.

5.0 Background and Introduction

Hypertensive disorders of pregnancy remain a leading cause of maternal and neonatal morbidity and mortality. This guideline summarises the existing evidence and provides a reasonable approach to the diagnosis, evaluation, and treatment of the severe pre-eclampsia and eclampsia in an Irish context.

6.0 Methodology

Medline, EMBASE and Cochrane Database of Systematic Reviews were searched using terms relating to 'pre-eclampsia', 'pregnancy induced hypertension', 'proteinuric gestational hypertension', 'gestational proteinuria', 'hypertension and pregnancy' and 'eclampsia'.

Searches were limited to humans and restricted to the titles of English language articles published between 2000 and 2015.

Relevant meta-analyses, systematic reviews, intervention and observational studies were reviewed.

Guidelines reviewed included:

Hypertension in Pregnancy. Report of the American College of Obstetricians and Gynecologists' Task Force on Hypertension in Pregnancy. 2013. ISBN 978-1-934984-28-4.

The National Institute of Health and Clinical Excellence (NICE) Clinical Guideline on Hypertension in Pregnancy: the management of hypertensive disorders of pregnancy. August 2010. Available at:
<https://www.nice.org.uk/guidance/cg107/resources/guidance-hypertension-in-pregnancy-pdf>

The Clinical Practice Guideline of the Canadian Hypertensive Disorders of Pregnancy Working Group. Pregnancy Hypertension
([http://www.pregnancyhypertension.org/article/S2210-7789\(14\)00004-X/fulltext](http://www.pregnancyhypertension.org/article/S2210-7789(14)00004-X/fulltext))

The classification, diagnosis and management of the hypertensive disorders of pregnancy: A revised statement from the ISSHP. Tranquilli AL, Dekker G, Magee L, Roberts J, Sibai BM, Steyn W, Zeeman GG, Brown MA. Pregnancy Hypertens. 2014 Apr;4(2):97-104. doi: 10.1016/j.preghy.2014.02.001. Epub 2014 Feb 15. PubMed PMID: 26104417.

The principal guideline developers were Dr Clare O'Loughlin and Professor Louise Kenny.

The guideline was reviewed by: Professor Brian Cleary (Pharmacy, Rotunda), Ms Fiona Dunlevy (Dietician, CWIUH), Dr Maeve Eogan (Obstetrician, Rotunda), Professor John Higgins (Obstetrician, CUMH), Dr Mairead Kennelly (Obstetrician, CWIUH), Ms Oonagh McDermott (HSE Programme), Dr Keelin O'Donoghue (Obstetrician, CUMH), Dr Caoimhe Lynch (Obstetrician, CWIUH), Ms Cinny Cusack (Physiotherapy, Rotunda), Dr Maire Milner (Obstetrician, OLOL), Dr Meabh Ni Bhuinneain (Obstetrician, Mayo), Vicky O'Dwyer (JOGS), Dr Liz Dunn (Obstetrician, Wexford) and Dr Eddie O'Donnell (Obstetrician, Waterford), Professor Michael Turner (Clinical Lead, O&G Programme & CWIUH).

7.0 Clinical Guideline

7.1 Diagnosis of Pre-eclampsia

Pre-eclampsia is a multi-system disorder unique to human pregnancy characterised by hypertension and involvement of one or more other organ systems and/or the fetus. Raised blood pressure is commonly, but not always, the first manifestation. Proteinuria is the most commonly recognised additional feature after hypertension but should no longer be considered mandatory to make the clinical diagnosis.

In line with the majority of international guidelines, a diagnosis of pre-eclampsia can be made when hypertension arises after 20 weeks' gestation and is accompanied by one or more of the following signs of organ involvement:

- **Proteinuria:** spot urine protein/creatinine ratio (PCR) >30 mg/ mmol (0.3mg/mg) or >300mg/day or at least 1g/L ('2 +') on dipstick testing.
OR in the absence of proteinuria
- **Other maternal organ dysfunction:**
 - **Renal insufficiency:** serum or plasma creatinine >90µmol/L
 - **Haematological involvement:** Thrombocytopenia (<100,000 /µL), haemolysis or disseminated intravascular coagulation (DIC)
 - **Liver involvement:** Raised serum transaminases, severe epigastric and/or right upper quadrant pain
 - **Neurological involvement:** eclampsia, hyperreflexia with sustained clonus, persistent new headache, persistent visual disturbances (photopsia, scotomata, cortical blindness, posterior reversible encephalopathy syndrome, retinal vasospasm), Stroke
 - **Pulmonary oedema**
- **Uteroplacental dysfunction** (fetal growth restriction)

Rarely, pre-eclampsia presents before 20 weeks' gestation; usually in the presence of a predisposing factor such as hydatidiform mole, multiple pregnancy, fetal triploidy, severe renal disease or antiphospholipid antibody syndrome.

7.2 Diagnosis of superimposed pre-eclampsia

Superimposed pre-eclampsia is diagnosed when a woman with chronic hypertension or pre-existing proteinuria develops one or more of the systemic features of pre-eclampsia after 20 weeks' gestation. Worsening or accelerated hypertension should increase surveillance for pre-eclampsia but it is not diagnostic.

In women with pre-existing proteinuria, the diagnosis of superimposed pre-eclampsia is often difficult as pre-existing proteinuria normally increases during pregnancy. In such women, substantial increases in proteinuria and hypertension should raise suspicion of pre-eclampsia and therefore justifies closer surveillance. However, a diagnosis of superimposed pre-eclampsia requires the development of other maternal systemic features of pre-eclampsia.

7.3 Diagnosis of severe pre-eclampsia

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

1. Eclampsia
2. Severe hypertension e.g. a systolic blood pressure over 160mmHg[†] with at least + proteinuria
3. Moderate hypertension e.g. a 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 $100 \times 10^9/l$
 - alanine amino transferase rising to above 50iu/l
 - creatinine >100mmol/l

[†]average of 3 readings over 15 minutes

^{††} at least “++” proteinuria OR PCR $\geq 30\text{mg}/\text{mmol}$ or 0.3g in 24 hours

7.4 The Management of Severe Pre-eclampsia

7.4.1 General Measures

The woman should be managed in a quiet, well lit room in a high dependency care type situation. Ideally there should be one to one midwifery care. After initial assessment, IMEWS HDU charts (see appendix 2) should be commenced to record all physiological monitoring and investigation results. All treatments should be recorded.

The consultant obstetrician on duty should be informed, so that they can be involved at an early stage in management. This should be documented in the notes.

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

7.4.2 Basic Investigations

Blood should be sent for:

- Urea, creatinine, urate and serum electrolytes
- Liver function tests
- Full Blood count
- Clotting screen
- Group and save serum

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 or deteriorating haematological and/or biochemical parameters, more frequent testing may be required e.g. every 4-8 hours.

7.4.3 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, Central Venous Pressure (CVP) and arterial lines should be measured continuously and charted with the blood pressure.

Neurological assessment should be performed hourly using either AVPU or GCS (see Appendix 1 for details regarding these scales).

Fetal well-being 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.

7.4.4 Fluid Management

Antenatal Fluid Management

Careful fluid balance is aimed at avoiding fluid overload. Total input should be limited to 80ml/hour. If syntocinon is used it should be at high concentration (30 units in 500mls) and the volume of fluid included in the total input. Oliguria at this point should not precipitate any specific intervention except to encourage early delivery.

Anaesthesia and fluid administration

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. 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. Caution is needed when removing an epidural in the post-natal period as rebound hypertension can occur.

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

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.

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) should be restricted to 80 ml/hour. Fluid restriction will usually be continued for the duration of magnesium sulphate 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:

- 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. Colloid should then be given as below if a diuresis of >200mls in the next hour occurs.

or

- 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 then 20mg of i.v. furosemide should be given. If a diuresis in excess of 200 ml occurs in the next hour the fluid should be replaced with 250ml of colloid over 1 hour in addition to baseline fluids.

If the urine output fails to respond to furosemide in either situation, then a discussion with a Renal Physician or a recognized specialist would be appropriate.

If persisting oliguria requiring fluid challenge or frusemide 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 or a recognized specialist. 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.

7.4.5 HELLP syndrome

Prophylactic transfusion of platelets is not recommended, even prior to Caesarean section, when platelet count $>50 \times 10^9/L$ and there is no excessive bleeding or platelet dysfunction.

Consideration should be given to ordering blood products, including platelets, when the platelet count is $<50 \times 10^9/L$, when the platelet count is falling, and/or there is coagulopathy.

Platelet transfusion is recommended prior to Caesarean section or vaginal delivery when platelet count is $<20 \times 10^9/L$.

7.4.6 Thromboprophylaxis

Prior to delivery:

Women with pre-eclampsia are at increased risk of thromboembolic disease. All patients should have anti-embolic stockings and/or Flowtrons and/or heparin whilst immobile.

Following delivery:

- Low molecular weight heparin (dose adjusted on early pregnancy weight) should be given daily until the patient is fully mobile. Extended thromboprophylaxis may be required if the patient has multiple risk factors. Please refer to the Clinical Practice Guideline (2013) "Venous Thromboprophylaxis in Pregnancy". (<http://hse.ie/eng/about/Who/clinical/natclinprog/obsandgynaeprogramme/vte.pdf>)
- Low molecular weight heparin should not be given until 4-6 hours after spinal anaesthesia.
- An epidural catheter should be left in place for at 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.

7.4.7 The Treatment of Severe Hypertension

Systolic blood pressure ≥ 160 mm Hg requires prompt treatment.

The aim of stabilisation of blood pressure is to reduce the blood pressure to $<160/105$ mmHg in the first instance mean arterial pressure (MAP)[†] <125 mmHg 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.

[†] MAP = diastolic pressure + $1/3$ (systolic minus diastolic pressure)

FIRST CHOICE AGENT: LABETALOL

Labetalol is the first line therapy for the treatment of severe hypertension in pre-eclampsia (Duley et al, 2013). If intravenous access is unavailable (for example, in the community) and the woman can tolerate oral therapy, an initial 200mg oral dose can be given. This should lead to a reduction in blood pressure in about half an hour. A second oral dose can be given after 30 minutes if needed.

In a hospital setting, labetalol should be given intravenously. Blood pressure control should be achieved by repeated boluses of labetalol 50mg followed by a labetalol infusion.

Bolus infusion is 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, to a maximum dose of 200mg, at 10 minute intervals.

Following a response to bolus doses, or as initial treatment in moderate hypertension, a labetalol infusion should be commenced. The infusion should be started at a rate of 20mg per hour via a syringe pump (this can be administered by giving the undiluted 5mg/ml solution at a rate of 4ml/hour via a syringe pump. The infusion rate should be doubled every 30 minutes until a satisfactory reduction in blood pressure has been obtained or a dosage of 32ml (160mg)/hour is reached. Occasionally, higher doses may be needed.

Contraindications to labetalol: severe asthma, use with caution in women with pre-existing cardiac disease. If intravenous 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. The use of a second line antihypertensive should always be discussed with a senior obstetrician.

SECOND CHOICE AGENTS:

The choice of second line agent should be determined by the clinical situation (i.e. suitability of oral or i.v. therapy, proximity of delivery) and the preference of the senior obstetrician (Duley et al, 2013). CAUTION: The use of a second line agent (hydralazine or nifedipine) can cause precipitous drops in blood pressure, particularly if magnesium sulphate therapy is also being administered.

HYDRALAZINE

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

Hydralazine is given as a bolus infusion 2.5 mg, dissolved in 10 mls of water for injection, over 5 minutes. The blood pressure should be measured every 5 minutes during this time. This dose can be repeated every 20 minutes to a maximum dose of 20 mgs. This may be followed by an infusion of 40mg of hydralazine in 40 mls of sodium chloride, which should run at 1-5ml/hr (1-5mg/hr). However, if the labetalol infusion is continued a hydralazine infusion may not be required as the blood pressure will probably settle with bolus doses.

Contraindications to hydralazine: hypersensitivity to hydralazine, severe tachycardia and heart failure with a high cardiac output e.g. in thyrotoxicosis, idiopathic SLE and related diseases.

NIFEDIPINE

Nifedipine should NOT be given sublingually to a woman with hypertension. Profound hypotension can occur with concomitant use of nifedipine and parenteral magnesium sulphate and therefore nifedipine should be prescribed with caution in women with severe pre-eclampsia.

Oral nifedipine is currently available in different preparations; capsules, modified release with 12 hour twice daily dose tablets and modified release with a 24 hours, once daily dose tablets. The preferred preparation for use in pregnancy is the modified release with a 24 hours, once daily dose tablets (e.g. Adalat LA). The maximum dose is 90 mg once daily.

NB the proprietary brands of nifedipine vary, check the drug information carefully before prescribing. As different formulations may not be equivalent, patients should be maintained on one brand of sustained releases nifedipine.

Oral nifedipine can be considered if labetalol and/or hydralazine has not adequately controlled blood pressure.

7.4.8 The Treatment and Prevention of Eclampsia

It is appropriate to treat cases of severe pre-eclampsia with magnesium sulphate to prevent seizures. No other agents are appropriate for prophylaxis (Duley L et al, 2010).

MAGNESIUM SULPHATE PROTOCOL

Magnesium sulphate is given as a loading dose followed by a continuous infusion for 24 hours or until 24 hours after delivery - whichever is the later.

The loading dose is 4g magnesium sulphate i.v. over 5 -10 minutes.

The maintenance dose is 1g magnesium sulphate i.v. per hour.

To avoid drug prescription and administration errors, magnesium sulphate should be administered in pre-mixed solutions (Irish Medication Safety Network Safety Alert (2015) "IV Magnesium Sulphate in Obstetrics.")

Pre-mixed magnesium sulphate is available in two preparations:

- Magnesium sulphate 4g in 50ml. This should be administered intravenously over 10 minutes as a loading or bolus dose.
- Magnesium sulphate 20g in 500ml. This should be administered via a volumetric pump at a rate of 25ml/hour (i.e. 1g/hour of magnesium sulphate).

There is no need to measure magnesium levels with the above protocol.

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 and the woman is closely monitored.

Important observations

Formal clinical review should occur at least every 4 hours.

Hourly IMEWS should be recorded with the following additional observations performed:

- i) Continuous pulse oximetry (alert Anaesthetist if O₂ 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 sulphate infusion should be 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.

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, further administration of magnesium sulphate should be reduced or withheld. 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.

The Management of Eclampsia

- Call appropriate personnel - including the resident anaesthetist.
- Remember ABC.
- Give the loading dose of magnesium sulphate 4g over 5-10 minutes intravenously and
- start an infusion of magnesium sulphate (see above).
- Diazepam may be administered if the fitting continues at the discretion of the anaesthetist 5-10 mg intravenously.
- Once stabilised the woman should be delivered.
- Oximetry should be instituted if not already in place.

Management of recurrent fits

- Give a further bolus dose of magnesium of 2g and increase the rate of infusion of magnesium to 1.5g / hour. Continue observations and consider

the need for ventilation. If two such boluses do not control seizures, then other methods should be instituted such as the administration of conventional anticonvulsants.

- Send blood for magnesium levels aiming for a level of 1.97-3.28 mmol/l (4.8-8.4mg/dl). Hospitals use different units for measuring magnesium. Check which units your hospital uses.
- It is essential to consider other causes of seizures. It may be appropriate to organise cranial imaging scan when the woman is stabilised.

7.4.9 Delivery

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.

For pregnancies less than 34 weeks' gestation, steroids should be given. The benefits of steroid administration to the fetus peak between 48 hours and 6 days. However, even if delivery is planned for within 24 hours, steroids may still be of benefit and should be given. After 48 hours, further consideration should 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.

The mode of delivery should be discussed with the consultant obstetrician. If gestation is under 34 weeks, induction of labour is unlikely to be successful and consideration should be given to delivery by Caesarean section. After 34 weeks' gestation, vaginal delivery should be considered in a cephalic presentation. 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.

If blood pressure is controlled (150/80-100 mmHg), the second stage should not be limited routinely. An epidural will normally be used. The third stage should be managed with 5 units of i.v. syntocinon NOT ergometrine or syntometrine.

7.4.10 Stabilisation before Transfer

If the mother is very ill and requires a bed in a tertiary unit or the fetus is very premature or potentially compromised (and therefore also needs a tertiary cot) transfer is often considered. In all cases, the decision to transfer an antenatal patient must be made by the consultant obstetrician in the referring centre after

discussion with the consultant obstetrician and neonatologist in the receiving centre.

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.

When the woman is ventilated it is important to ensure ventilatory requirements are stable and oxygen saturations are being maintained.

Blood pressure should be stabilised at <160/105 according to the above protocol.

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.

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

7.5 Postnatal Management

7.5.1 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

Beta blockers (e.g. Atenolol, labetalol), alpha-adrenergic blockers (e.g. doxazocin), angiotensin converting enzyme (ACE) inhibitors (enalapril, captopril) and calcium antagonists (e.g. nifedipine, amlodopine) are all safe to use in a woman who is breast feeding. Diuretic treatment is safe but should be avoided in breastfeeding women. **Methyldopa should not be prescribed postnatally.**

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 < 150/100

Those on treatment should have follow up arranged either for their GP or for a hospital clinic within 2 weeks.

There should be direct communication with the GP via a phone call or discharge note. 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. BP 130/80 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 stopped and no hypertension. 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.

7.5.2 Postnatal review

All patients with severe pre-eclampsia should be offered a hospital appointment within 12 weeks of delivery. Blood pressure and proteinuria assessment should be carried out 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. The recurrence risk of severe pre-eclampsia depends on the gestation and severity of the presentation in the index pregnancy. There are an albeit limited number of modifiable risk factors such as obesity and limited interventions such as aspirin therapy which may improve outcomes in subsequent pregnancies and every opportunity should be taken to encourage women to address these risks.

8.0 References

Duley L, Meher S, Jones L. (2013) "Drugs for treatment of very high blood pressure during pregnancy." Cochrane Database Systematic Review. Jul 31;7:CD001449. doi:10.1002/14651858.CD001449.pub3. Review. PubMed PMID: 23900968.

Duley L, Gülmezoglu AM, Chou D. (2010) "Magnesium sulphate versus lytic cocktail for eclampsia." Cochrane Database Systematic Review. Sep 8;(9):CD002960. doi:10.1002/14651858.CD002960.pub2. Review. PubMed PMID: 20824833.

Institute of Obstetricians and Gynaecologists (2013) "Venous Thromboprophylaxis in Pregnancy". Clinical Practice Guideline no 20. Royal College of Physicians of Ireland and Clinical Strategy and Programmes Directorate, Health Service Executive. (<http://hse.ie/eng/about/Who/clinical/natclinprog/obsandgynaeprogramme/vte.pdf>)

Irish Medication Safety Network, Safety Alert (2015) "IV Magnesium Sulphate in Obstetrics." Available: <http://www.imsn.ie/images/alerts/MgSO4A2015.pdf>

9.0 Implementation Strategy

- Distribution of guideline to all members of the Institute and to all maternity units.
- Distribution to the Directorate of the Acute Hospitals for dissemination through line management in all acute hospitals.
- Implementation through HSE Obstetrics and Gynaecology programme local implementation boards.
- Distribution to other interested parties and professional bodies.

10.0 Qualifying Statement

These guidelines have been prepared to promote and facilitate standardisation and consistency of practice, using a multidisciplinary approach. Clinical material offered in this guideline does not replace or remove clinical judgement or the professional care and duty necessary for each pregnant woman. Clinical care carried out in accordance with this guideline should be provided within the context of locally available resources and expertise.

This Guideline does not address all elements of standard practice and assumes that individual clinicians are responsible for:

- Discussing care with women in an environment that is appropriate and which enables respectful confidential discussion.
- Advising women of their choices and ensure informed consent is obtained.
- Meeting all legislative requirements and maintaining standards of professional conduct.
- Applying standard precautions and additional precautions, as necessary, when delivering care.
- Documenting all care in accordance with local and mandatory requirements.

11.0 Appendices

Appendix 1: 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	= GCS 15
V Responds to voice	= GCS 12
P Responds to pain	= GCS 8
U Unresponsive	= GCS 3