Pre-eclampsia is a multisystem disease unique to human pregnancy characterised by hypertension and organ system derangement. The disease is responsible for considerable morbidity and mortality complicating 5-8% of pregnancies and remains in the top three causes of maternal morbidity and mortality globally. Deaths are due to intracranial haemorrhage and cerebral
infarction, acute pulmonary oedema, respiratory failure and hepatic failure or rupture. It is the leading cause of fetal growth restriction, intrauterine fetal demise and planned preterm birth (Khan et al 2006; Lewis 2007, Level IV).

This document covers the management of women with pre-eclampsia and eclampsia and the syndrome of haemolysis with elevated liver enzymes and low platelets (HELLP) in the peripartum period which is specifically relevant to anaesthetists. It does not cover prevention, screening, risk factors, pathophysiology, prognosis or long term management.

1. DEFINITIONS

1.1 Principles

Pre-eclampsia has many different definitions (ACOG 2002; Brown et al 2000; Chesley 1985; Khan et al 2006; Lewis 2007; National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy 2000; RCOG 2006; Vatten & Skjaerven 2004; WHO 2006). Despite some differences in the detail there are features common to all of these. The most important elements are elevation of blood pressure plus the additional involvement of one or more organ systems. In addition there is a common definitional requirement for the condition to resolve at some time in the postpartum period, i.e. it is specifically a complication of pregnancy. Hence there is the rather peculiar quality of the condition that management occurs when the diagnostic criteria have not been fulfilled. This specifically distinguishes pre-eclampsia from chronic pre-existing hypertension and gestational hypertension. From a management perspective clinicians should always be alert to the possibility of alternative diagnoses. The importance of defining levels of blood pressure and other objective measures of proteinuria, biochemical abnormalities and seizures lies with guiding therapy and as an aid in decision-making regarding the timing of the birth. Ending the pregnancy and removing the placenta is currently the only definitive way of curing the condition.

Terms that have been used in the past such as pregnancy induced hypertension (PIH) and pre-eclamptic toxaemia (PET) must now be considered to be outmoded.

1.2 Australasian definition

In Australian and New Zealand, the International Classification of Disease which is published and regularly updated by the World Health Organisation is adapted for local conditions and is currently ICD-10-AM (NCCH 2008). This classification is used for clinical coding purposes and may be relevant from a financial and international research perspective. However, for practical clinical purposes in our region, an appropriate definition is that of the Australasian Society for the Study of Hypertension in Pregnancy (Brown et al 2000). This defines pre-eclampsia as hypertension arising after 20 weeks gestation with subsequent resolution of the disease by three months postpartum and with the following specific features:
systolic blood pressure (SBP) ≥ 140mmHg and/or diastolic blood pressure (DBP) (Korotkoff V) ≥ 90mmHg

plus one or more of:

- proteinuria >0.3g/24 hours
- renal insufficiency
- liver disease
- neurological problems
- haematological disturbances
- fetal growth restriction

In clinical practice the spot urinary protein:creatinine ratio is also frequently measured. This is based on the principle that the daily excretion rates of protein and creatinine are similar. Normal values are defined as ≤ 30mg/mmol (Cote et al 2004; Leanos-Miranda et al 2007; Price et al 2005). In addition, serum urate levels are also often elevated in pre-eclampsia. Hyperuricemia has an association with perinatal complications and although elevated levels have not predicted adverse maternal outcomes it is frequently measured (Cnossen et al 2006; Rowe 2008).

Severe pre-eclampsia is a term applied to a condition with marked elevation of blood pressure (SBP ≥160mmHg, DBP ≥110mmHg) and extreme derangements of organ function. These may include central nervous system problems of seizures (eclampsia), impaired conscious state and visual disturbances, renal dysfunction (urinary protein ≥5g protein/24 hours) and haematological complications. HELLP syndrome is considered a variant of severe pre-eclampsia. Preterm pre-eclampsia is often severe and associated with abnormalities of placentation and intrauterine growth restriction. This is summarised in Table 1, based on various sources (ACOG 2002; Brown et al 2000; RCOG 2006; Sibai et al 1986).
### Table 1: Pre-eclampsia - definition

<table>
<thead>
<tr>
<th></th>
<th>MILD PRE-ECLAMPSIA</th>
<th>SEVERE PRE-ECLAMPSIA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hypertension</strong></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>OR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertensive crisis</td>
<td>nil</td>
<td>≥160 mmHg and/or</td>
</tr>
<tr>
<td></td>
<td>SBP ≥160 mmHg</td>
<td>≥110 mmHg</td>
</tr>
<tr>
<td></td>
<td>DBP ≥110 mmHg</td>
<td></td>
</tr>
<tr>
<td><strong>AND one or more of</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CENTRAL NERVOUS SYSTEM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seizures (eclampsia)</td>
<td>nil</td>
<td>✓</td>
</tr>
<tr>
<td>Headache</td>
<td>nil</td>
<td>✓</td>
</tr>
<tr>
<td>Visual disturbances</td>
<td>nil</td>
<td>✓</td>
</tr>
<tr>
<td>Papilloedema</td>
<td>nil</td>
<td>✓</td>
</tr>
<tr>
<td>Clonus</td>
<td>nil</td>
<td>✓</td>
</tr>
<tr>
<td><strong>GASTROINTESTINAL SYSTEM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liver tenderness</td>
<td>nil</td>
<td>✓</td>
</tr>
<tr>
<td>Nausea and vomiting</td>
<td>nil</td>
<td>✓</td>
</tr>
<tr>
<td>Epigastric pain</td>
<td>nil</td>
<td>✓</td>
</tr>
<tr>
<td>Elevated Liver enzymes(ALT)</td>
<td>≥40 iu/l</td>
<td>≥70 iu/l</td>
</tr>
<tr>
<td><strong>HAEMATOLOGICAL SYSTEM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Platelets (thrombocytopenia)</td>
<td>≤150 x 10⁹/ l</td>
<td>&lt;100 x 10⁹/ l</td>
</tr>
<tr>
<td>Haemolysis (visualised on blood film, LDH or elevated total bilirubin or falling haematocrit or bleeding diathesis)</td>
<td>nil</td>
<td>✓</td>
</tr>
<tr>
<td>Disseminated Intravascular Coagulation</td>
<td>nil</td>
<td>✓</td>
</tr>
<tr>
<td><strong>CARDIORESPIRATORY SYSTEM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulmonary oedema</td>
<td>nil</td>
<td>✓</td>
</tr>
<tr>
<td><strong>RENAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proteinuria</td>
<td>0.3g/24 hours, 1+ protein on dipstick (0.3g/l)</td>
<td>&gt; 5g/24 hours. 3+ on dipstick</td>
</tr>
<tr>
<td>Protein/creatinine ratio</td>
<td>0.03g/mmol (equiv to 0.3g/24 hours)</td>
<td>&gt;0.5g/mmol</td>
</tr>
<tr>
<td>Urine output</td>
<td>normal</td>
<td>&lt;500ml/24 hour</td>
</tr>
<tr>
<td><strong>UTEROFETAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fetal/placental compromise</td>
<td>Non-reassuring CTG/IUGR with absent UA Doppler velocimetry - absent or reversed end diastolic flow</td>
<td></td>
</tr>
</tbody>
</table>

### 1.3 Diagnostic challenge

Hypertension in pregnancy can be caused by a variety of different pathologies and it is important to consider other aetiologies. These include renal disease, acute fatty liver and cholestasis of pregnancy, haemolytic uraemic syndrome (HUS)/thrombotic thrombocytopenic purpura (TTP), phaeochromocytoma, drug usage such as cocaine and amphetamines, and cardiovascular disease such as coarctation, subclavian stenosis, aortic dissection and vasculitis. Under extremely rare circumstances pre-eclampsia...
may develop prior to the arbitrary cut-off of 20 weeks gestation in the setting of hydatidiform mole, multiple pregnancies, fetal or placental abnormalities, antiphospholipid syndrome or severe renal disease (Broekhuizen et al 1983; Brown et al 2000).

2. ORGANISATIONAL ASPECTS

2.1 Multidisciplinary team approach

The importance of a multidisciplinary team approach to the management of pre-eclampsia has been highlighted in many recent publications. A common message is the importance of early referral and involvement of the anaesthetist. This highlights the importance of giving the anaesthetist as much time as possible to stabilise the patient prior to delivery (Lewis 2007, Level IV; Rowe 2008).

2.2 Maintenance of clinical skills

In the most recent Confidential Enquiries into Maternal and Child Health (CEMACH), the maintenance of clinical skills was placed in the top ten recommendations highlighting its importance in reducing morbidity and mortality. Particular emphasis was placed on all clinical staff undertaking regular written, documented and audited training for the early recognition and management of severely ill pregnant women and impending maternal collapse (Lewis 2007, Level IV).

2.3 Establishment of an early warning scoring system

The use of an obstetric early warning chart has been proposed as an important clinical tool which may allow for more timely recognition of those women who are developing a critical illness (Lewis 2007). Widespread adoption of generic reportable parameters also allows benchmarking both nationally and internationally for the outcomes in women with pre-eclampsia (Thornton et al 2007, Level IV).

3. REDUCTION OF HIGH BLOOD PRESSURE

3.1 Non-severe hypertension

Non-severe hypertension is defined as BP 140-159/90-109 mmHg. In a recent systematic review there were no clear differences when antihypertensive intervention was compared with placebo or with no intervention or when two anti-hypertensives were compared. Due to the risk of haemorrhagic stroke in the presence of systolic hypertension however, most guidelines recommend lowering of non-severe blood pressure to levels of SBP 140-150/DBP 90-100 (Martin et al 2005). Thresholds vary depending on the existence of co-morbidities.

Safe agents include methyldopa, labetalol, nifedipine and some β-adrenoceptor blockers (metoprolol, pindolol, propranolol). Atenolol is not recommended due to fetal growth restriction. Angiotensin converting enzyme
inhibitors (ACE-I) and angiotensin type II receptor blockers are contraindicated (Abalos et al 2006, Level I; Podymow & August 2008, Level IV; Rowe 2008, Level IV).

3.2 Severe hypertension

Severe hypertension is defined as systolic $\geq 160$ mmHg or diastolic $\geq 110$ mmHg. Based on maternal mortality reports this degree of hypertension if left untreated is associated with an increased risk of intracerebral haemorrhage (Lewis 2007, Level IV). Reducing severe levels of hypertension decreases the risk of death (Podymow & August 2008, Level IV).

Drugs that can be safely used include labetalol, nifedipine and hydralazine. There are different formulations of each of these and they change over time including availability for different routes of administration. The choice should be made on clinician familiarity and experience with a particular agent. Particular care should be taken to avoid precipitous falls in blood pressure which may induce maternal or fetal complications as a result of falling below critical perfusion thresholds. Blood pressure should be lowered to levels of SBP 140-150/DBP 90-100 at a rate of 10-20 mmHg every 10-20 minutes. Consideration should also be given to the extent of placental transfer of the administered drug and the direct effect of the agent and any metabolites.

There is extensive experience with the safety and efficacy of intravenous hydralazine. This is usually administered by intermittent bolus of 5mg intravenously (IV) or intramuscularly (IM) and repeated as necessary; it has an onset of action of 10-15 minutes. Continuous infusion of 0.5-10.0 mg/hr is also typically employed in more refractory cases. The use of hydralazine is often accompanied by maternal tachycardia. It has been noted however that there is an absence of robust trials comparing hydralazine with intravenous labetalol or oral nifedipine. These latter agents may be preferable due to reduced maternal and fetal complications (Magee et al 2003, Level I). Labetalol should be avoided in women with severe asthma. Drugs that should be avoided for the reduction of blood pressure are diazoxide, ketanserin, nimodipine and magnesium sulphate (MgSO4) (Duley et al 2006, Level I). Continuous fetal heart rate monitoring should be employed until the BP is stable (Rowe 2008).

Sodium nitroprusside is rarely used in pregnancy and cannot be recommended for routine use due to known adverse effects of hypotension, paradoxical bradycardia in women with severe pre-eclampsia and the unknown risk of fetal cyanide toxicity. It should be viewed as a last resort to be used in situations of life threatening hypertension immediately prior to delivery and in circumstances where clinicians are very familiar with its use (Podymow & August 2008, Level IV).
4. TREATMENT AND PREVENTION OF SEIZURES (ECLAMPSIA)

4.1 Treatment of seizures and prevention of recurrent seizures

MgSO₄ is the treatment of choice for treatment of eclampsia (Duley & Gülmezoglu 2000, Level I; Duley & Henderson-Smart 2003b; 2003c, Level I). MgSO₄ reduces mortality when compared with diazepam (Duley & Henderson-Smart 2003b, Level I). MgSO₄ is superior to diazepam, phenytoin and lytic cocktail (chlorpromazine, promethazine, pethidine) in reducing significantly the risk of seizure recurrence (Duley & Gülmezoglu 2000, Level I). Morbidity related to pneumonia, mechanical ventilation and admission to an intensive care unit are significantly reduced with the use of MgSO₄ compared with phenytoin (Duley & Henderson-Smart 2003c, Level I). Both IV and IM routes of administration have been used effectively. The regimen used in the Collaborative Eclampsia Trial which is the largest randomised controlled trial (RCT) in this area was MgSO₄ 4 or 5g IV over 5 minutes, followed by an infusion of 1g/hr for 24 hr. If recurrent seizures occurred MgSO₄ 2g IV was given (Collaborative Eclampsia Trial Group 1995, Level II).

4.2 Prevention of seizures

MgSO₄ is recommended as prophylaxis for eclampsia in women with severe pre-eclampsia (Duley et al 2003a, Level I). Compared with placebo or no treatment, the use of MgSO₄ more than halved the risk of eclampsia and the number needed to treat (NNT) to prevent one seizure in this group of women was 50. MgSO₄ was also advantageous in reducing the first seizure when compared with other agents.

There is controversy regarding the use of MgSO₄ in mild (non-severe) disease. The NNT was approximately 100 and side effects were more common in the MgSO₄ group although none were life threatening (Duley et al 2003a, Level I). There was also an increase in the caesarean births in the MgSO₄ group.

When MgSO₄ was selectively administered only to women with severe pre-eclampsia instead of to all women with gestational hypertension, there were more women with eclampsia who then required general anaesthesia and experienced adverse neonatal outcomes compared with their historical control (Alexander et al 2006, Level III-2).

4.3 Clinical practice issues related to MgSO₄

There are several clinical practice points that have been identified via a number of large scale clinical trials:

1. MgSO₄ does not reverse or prevent the progression of the disease, nor does it significantly lower blood pressure and it is not recommended as an antihypertensive agent (Abalos et al 2007, Level I; Duley et al 2006, Level I; Podymow & August 2008; Rowe 2008).

2. Patient safety and clinical effectiveness are enhanced when hospitals, health centres, and emergency transport vehicles have guidelines for the safe use of MgSO₄.
3. Monitoring of MgSO₄ should utilise clinical parameters of urinary output, respiratory rate, oxygen saturation and patellar reflexes. Serum magnesium levels should be measured if toxicity is suspected and is most apparent with levels of >3.5 mmol/L. Features of toxicity include suppression or loss of patellar reflexes, respiratory depression, drowsiness and ultimately loss of consciousness. Toxicity is particularly likely in the presence of significant renal insufficiency. The drug treatment for MgSO₄ toxicity is 10% calcium gluconate (1g) 10ml over 10 minutes.

5. ADDITIONAL THERAPIES FOR HAEMATOLOGICAL AND/OR HEPATIC COMPLICATIONS

5.1 Corticosteroids for HELLP

HELLP is a severe form of pre-eclampsia. The exact levels of biochemical and haematological values and criteria that are used to make the diagnosis are debated in the literature. The most widely used classifications are those of Sibai and Martin (Sibai et al 1986; Martin et al 1991). Common to both are evidence of haemolysis as evidenced with raised lactate dehydrogenase (LDH), elevated liver transaminases, plus a platelet count of <100x10⁹/L.

A systematic review of five underpowered studies and only a small number of women (170) concluded that there was insufficient evidence to either refute or support adjuvant corticosteroid use. All included studies used an initial intravenous dose of 10mg dexamethasone (Matchaba & Moodley 2004, Level I). Consistent with observational studies, dexamethasone was shown to significantly increase the platelet count. This however did not translate to improvement in outcomes and the clinical relevance of this is unclear. Based on the available evidence, it is also unclear whether administration of dexamethasone to increase platelet count to generate a number at which one could safely undertake regional anaesthesia is beneficial or harmful (O’Brien et al 2002, Level IV).

Postpartum use of dexamethasone was compared with placebo in a well designed RCT and found no difference in key maternal morbidity and mortality indices and no difference in use of blood products between the two groups. The finding did not support the use of dexamethasone in the postpartum period (Katz et al 2008, Level II).

5.2 Platelet transfusions and other therapies

A significant decrease in platelet numbers may be associated with abnormal bleeding. The use of platelet transfusions should be guided by local practice and with consideration of the platelet count, any signs of haemorrhage and the clinical context. There are currently no formal recommendations regarding the use of platelet transfusions in obstetrics in our region. However, in the non-obstetric population a level of <50x10⁹/L is considered significant in the context of surgery or major haemorrhage (NHMRC 2001).

Other interventions aimed at limiting the disease such as plasma exchange or plasmapheresis have been described but require further investigation before
any recommendation can be made about their potential benefit or harm (Rowe 2008).

6. INTRAVENOUS FLUIDS

The appropriate use of intravenous fluids in terms of both fluid type and quantity may influence morbidity and mortality. In the extreme, acute pulmonary oedema is a leading cause of death in women with pre-eclampsia and a frequent cause for admission to intensive care (Sriram & Robertson 2008, Level IV). In observational studies the use of either crystalloid or colloid solutions has been associated with transient improvements in maternal cardiovascular system parameters. However in one large trial (Ganzevoort et al 2005, Level II) and a systematic review (Duley et al 1999, Level I), volume expansion demonstrated no advantages compared with no plasma volume expansion.

Also, with the available evidence the use of intravenous fluids to increase plasma volume or treat oliguria in a woman with normal renal function and stable serum creatinine levels cannot be recommended (Duley et al 1999, Level I).

7. SPECIFIC CLINICAL CONTEXTS

7.1 Regional blockade

Coagulopathy in pre-eclampsia is usually due to thrombocytopenia and less commonly disseminated intravascular coagulation (DIC). Studies investigating coagulation in women with pre-eclampsia using thromboelastography (TEG) found that if the platelet count was greater than 100x10^9/L there were no abnormalities of coagulation detectable by TEG (Sharma et al 1999). Platelet counts of <100x10^9/L in women with severe pre-eclampsia were associated with hypocoagulation and should prompt further investigation of coagulation status with activated partial thromboplastin time (APTT), prothrombin time (PT) and fibrinogen levels.

Based on current evidence it is not possible to be definitive regarding a lower limit of the platelet count below which there is likely to be an increased risk of haematoma. Current standards of practice have been drawn indirectly from a number of sources using a variety of outcome measures including the lower limit of TEG maximal amplitude in healthy pregnant women and findings in women with severe pre-eclampsia with platelet counts <100x10^9/L. A common conclusion of this work has been that a platelet count >75x10^9/L in the absence of other coagulation abnormalities would not be expected to be associated with increased likelihood of regional anaesthetic complications in the setting of pre-eclampsia (Dyer et al 2008; Orlikowski et al 1996; Sharma et al 1999). Fortunately, the reported incidence of haematoma complications is generally extremely low at approximately 1:170,000 (Ruppen et al 2006, Level IV) which renders evaluation of causative factors problematic. It is noted that the majority of patients with reported spinal haematoma had haemostatic abnormalities and it is likely that the combined effect of various pathologies and drug induced effects may be
unpredictable (Horlocker & Wedel 2000, Level IV). Any difference between different techniques and their relative safety has not been adequately studied, but it is noted that the added presence of an epidural catheter may complicate management in relation to timing of thromboprophylaxis. This topic is covered in more detail elsewhere.

7.2 Analgesia for labour

Lumbar epidural analgesia in women with pre-eclampsia is appropriate in the absence of contraindications (Lucas et al 2001, Level II). It has been usefully employed to not only reduce pain-mediated hypertensive responses but also the presence of a functioning epidural catheter enables the rapid titration of block extension for caesarean section if required (Moore et al 1985, Level III-3; Newsome et al 1986, Level II).

If regional analgesia is contraindicated, intravenous opioid analgesia has been employed to good effect (Head et al 2002, Level II; Lucas et al 2001, Level II).

7.3 Anaesthesia for caesarean birth

Regional anaesthesia is the preferred method for caesarean section in women with pre-eclampsia (Visalyaputra 2005, Level II). All of the usual considerations for contraindications to regional blockade and preparation for anaesthesia and surgery, including fasting, aspiration prophylaxis and uterine displacement should apply. These topics are covered elsewhere.

Single shot spinal, combined-spinal epidural (CSE), with and without epidural volume extension (EVE) and epidural anaesthesia have all been effectively employed. There is no basis at this time to assert that one technique has clear advantages over the others.

Doses of regional anaesthetic drugs are the same in women with pre-eclampsia as they are in healthy pregnant women. Hypotension occurring during regional anaesthesia is less common in women with pre-eclampsia than in healthy women, and has been successfully managed with intravenous ephedrine (5mg/bolus) or phenylephrine (50-100μg/bolus) (Aya et al 2003, Level III-2; Berends et al 2005, Level II; Visalyaputra et al 2005, Level II). Management of hypotension during anaesthesia for caesarean birth is covered in more detail elsewhere.

The use of adrenaline containing local anaesthetic solutions for epidural boluses to provide surgical anaesthesia appears to be safe and is widely used to minimise systemic absorption of local anaesthetic drugs. There has been a single case report of a hypertensive crisis with absorbed adrenaline, emphasising the need for close observation of these patients (Hadzic et al 1995).
7.4 General anaesthesia

General anaesthesia may be necessary in a small number of cases for a variety of reasons including coagulopathy, pulmonary oedema or eclampsia. Pulmonary oedema with underlying systolic dysfunction may indicate peripartum cardiomyopathy and consideration should be given to concurrent valvular pathology. There is little evidence to guide practice in the area of anaesthesia choice for women in the post eclamptic period. Some groups have advocated general anaesthesia if symptoms and signs of cerebral oedema are present or who have had depressed levels of consciousness prior to caesarean birth. If however the woman is stable with a normal level of consciousness and no neurological deficits, regional anaesthesia is an acceptable choice (Dyer et al 2007).

If general anaesthesia is used particular attention and extreme vigilance should be given to ablating the potentially fatal hypertensive response to intubation as this has been identified as a cause of direct maternal death (Lewis 2007, Level IV). Many drugs have been used for this purpose including alfentanil, fentanyl, magnesium sulphate, intravenous lignocaine and esmolol. However, there have been insufficient appropriately controlled comparative trials to come to any meaningful conclusions as to which agent may be better. It has been recommended that the clinician use the technique with which they are most familiar (Dyer et al 2003, Level II; Wallace et al 1995, Level II). Care must also be taken to avoid complications on emergence from anaesthesia including aspiration and acute pulmonary oedema.

The effect of MgSO₄ to potentiate nondepolarising muscle relaxants is well known and monitoring of neuromuscular function by peripheral nerve stimulation may be useful for dose titration.

7.5 Monitoring

Direct access to the arterial circulation allows continuous blood pressure recording and facilitates repeated blood sampling for assessment of respiratory function, electrolytes, acid-base balance and haematological and liver abnormalities (Frezza & Mezghhebe 1998; Mandel & Dauchot 1977; Slogoff et al 1983). Central venous catheters are not commonly used and pulmonary artery catheters are rarely used. There is little experience with transoesophageal echocardiography (TOE) in this setting and the real time application of transthoracic echocardiography (TTE) must be considered experimental at this stage.

8. USE OF OXYTOCIC AGENTS

The management of life threatening postpartum haemorrhage in the setting of severe pre-eclampsia is a particularly difficult situation where the benefits of administering oxytocics may outweigh the risks. The use of ergometrine has been associated with hypertensive crises and death in women with pre-eclampsia. Ergometrine and Syntometrine® (syntocinon 5 IU+ 500ug ergometrine) should not be used for uterine contraction (Lewis 2007, Level IV).
9. POSTPARTUM MANAGEMENT

9.1 Continuing critical care management

Ongoing management of women with severe pre-eclampsia requiring intravenous infusions such as MgSO₄ and hydralazine should be with adequately trained staff in the appropriately monitored setting (Lewis 2007, Level IV).

9.2 Analgesia

Non steroidal anti-inflammatory agents (NSAIDs) are frequently used for analgesia after childbirth. As a class, these agents have well-documented adverse effects and contraindications. Caution should be applied particularly in situations of renal insufficiency, intravascular volume depletion and coagulopathy. There have also been specific case reports of hypertensive crises in women with pre-eclampsia (ADRAC 2003, Level IV).

9.3 Thromboprophylaxis

Thromboprophylaxis should be considered for all women with pre-eclampsia with consideration given to timing of agents in relation to regional anaesthesia. This is considered in more detail elsewhere.

9.4 Discontinuation of intravenous MgSO₄

Based on the findings of the Collaborative Eclampsia Trial (1995) MgSO₄ infusion has commonly been continued for 24 hours postpartum. However, in a recent study of women with mild pre-eclampsia the MgSO₄ infusion was continued for only 12 hours postpartum and there was no difference in the clinical course compared to those women who received MgSO₄ for 24 hours (Ehrenberg & Mercer, Level II). Using clinical assessment rather than time, Isler et al (2003) suggested several parameters for consideration of cessation including: absence of headache, visual changes and epigastric pain, sustained blood pressure of less than 150/100 without antihypertensive therapy, and a spontaneous diuresis >100 ml/hr for no less than 2 hours.

9.5 Management of acute pulmonary oedema (APO)

Pulmonary oedema may occur in up to 2.9% of women with pre-eclampsia with only 30% of cases occurring prior to birth (Norwitz et al 2002). In addition to the usual goals of management of stabilisation of the woman and expediting resolution of the APO, consideration needs to be given to delivery of the fetus if APO occurs in the antenatal period.

The usual investigations and monitoring techniques should be employed. Treatment follows similar practices to those employed in the non-obstetric population. Oxygen saturation monitoring and oxygen supplementation either via non-invasive ventilation devices or intubation and ventilation are used depending on the severity of the respiratory compromise. Intravenous frusemide (bolus 20-40mg over 2 minutes) is used to promote diuresis, with
repeated doses of 40-60mg after approximately 30 minutes if there is inadequate diuretic response (maximum dose 120mg/hour). Intravenous morphine 2-5mg, fluid restriction and strict fluid balance and positioning such that the head is elevated and antenatal uterine displacement is maintained, should also be used (Barton & Sibai 1992; Sciscione et al 2003).

9.6 Management of oliguria in the immediate postpartum period

Oliguria in the postpartum period is multifactorial and in the presence of normal renal and respiratory function generally requires no treatment. The use of frusemide or low dose dopamine for the management of oliguria in a woman with normal renal function is not recommended (Keiseb et al 2002, Steyn & Steyn 2007, Level I).

9.7 Management of severe hypertension in the immediate postpartum period

Deaths due to severe hypertension and morbidity from stroke occur in the postpartum period. Whilst it is clear that antenatal hypertension may persist in the postpartum period it is unclear what leads to new onset hypertension in this period. Commonly used drugs in this situation include hydralazine, nifedipine, frusemide and methyldopa (Magee & Sadeghi 2005, Level I; Podymow & August 2008).

9.8 Implications of interventions related to breastfeeding

Ideal drugs have low milk:maternal plasma ratios. Satisfactory drugs in this group include methyldopa, β-adrenoceptor blockers with high plasma protein binding e.g. oxprenolol, ACE inhibitors (captopril, enalapril), and some dihydropyridine calcium channel blockers (nifedipine) (Magee & Sadeghi 2005, Level I). MgSO₄ is excreted in the breast milk but is safe for breast fed infants (Idama & Lindow 1998).

KEY MESSAGES

1. MgSO₄ is the first line drug treatment for seizures (eclampsia) and for recurrent seizures (Level I).

2. MgSO₄ should be used for seizure prophylaxis in women with severe pre-eclampsia (Level I).

3. MgSO₄ should be considered for seizure prophylaxis in women with mild pre-eclampsia (Level 1).

4. Severe hypertension is defined as systolic ≥160 mmHg or diastolic ≥110mmHg and should be treated (Level III-2).

5. Elevated blood pressure should be lowered to levels of systolic blood pressure 140-150 mmHg and diastolic blood pressure 90-100 mmHg at a rate of 10-20 mmHg every 10-20 minutes. Reducing severe levels of hypertension decreases the risk of death (Level IV).
6. Antihypertensive drugs that can be safely used include labetalol, nifedipine and hydralazine. The choice should be made on clinician familiarity and experience with a particular agent (Level I).

7. Drugs that should be avoided for the reduction of blood pressure are diazoxide, ketanserin, nimodipine, MgSO₄ (Level I) and sodium nitroprusside (Level IV).

8. Acute pulmonary oedema is a significant case of morbidity and mortality in pre-eclampsia. Intravenous fluid management should be monitored very closely (Level II).

9. In the absence of other coagulation abnormalities the risk of haematoma associated with regional anaesthesia with platelet counts >75x10⁹/L is very low.

10. Lumbar epidural analgesia in the absence of contraindications is beneficial during labour as it limits hypertensive responses to pain and provides ready opportunity for block extension for caesarean section (Level II).

11. Regional blockade is the preferred method of anaesthesia for caesarean section (Level II). There is currently insufficient evidence to support any specific type.

12. When general anaesthesia is required measures should be taken to ensure the intubation response is ablated (Level II).

13. Ergometrine should be avoided due to its propensity to cause a hypertensive crisis (Level IV).

14. A multidisciplinary team approach needs to be adopted when managing a woman with pre-eclampsia and it is important for the anaesthetist to be given as much time as possible to stabilise the woman prior to delivery.

REFERENCES


