

Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in Aotearoa New Zealand

**Te Tautohu, Te Tumahu i te Toto
Pōrutu me te Pēhanga Toto Kaha i te
Hapūtanga ki Aotearoa**

A clinical practice guideline

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Introduction

Scope and purpose of the guideline

This guideline provides an evidence-based summary of best practice in screening for, diagnosing and treating hypertensive disorders in pregnancy (HDP). HDP covers hypertension, pre-eclampsia and eclampsia. Using this guideline will help standardise the approach to diagnosing and managing HDP to improve the outcomes for women/pregnant people and their babies.

The guideline covers recommendations for:

- identifying pregnant women/people in Aotearoa New Zealand who have an increased chance of developing HDP
- diagnosing and treating pregnant women/people who have these conditions
- following up with them after birth.

The guideline should be read in conjunction with the *Ngā Paerewa: Health and disability services standard 8134:2021 (Ngā Paerewa)* (Standards New Zealand and Ministry of Health 2021) and the corresponding sector guidance for birthing units and district health board (DHB) in-patient / private hospital services. *Ngā Paerewa* provides a suite of information about best-practice maternity service provision.

Users of the guideline

Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in New Zealand: A clinical practice guideline is written for all health practitioners involved in pregnancy, birth and postpartum care in Aotearoa New Zealand. Health practitioners should use this guideline to support their clinical judgement, knowledge and expertise in order to provide a timely, consistent and effective approach to treating HDP.

Pregnant women/people and their whānau can use the guideline to learn more about how HDP are detected, treated and managed.

The need for the guideline

Pre-eclampsia complicates approximately 3–8 percent of pregnancies in Aotearoa New Zealand (Ministry of Health 2021b), while HDP as a whole affects up to 10 percent of pregnancies (4–5 percent nulliparous, 2–3 percent in low-risk multipara and up to 20 percent in pregnant women/people with major risk factors) (Kenny et al 2014).

Chronic hypertension, gestational hypertension and pre-eclampsia rates have increased over time as a result of changes in women/people's characteristics of (such as their age and pre-pregnancy weight), whereas the eclampsia rate has declined following widespread antenatal care and use of prophylactic treatments like magnesium sulphate (Hutcheon et al 2011; Steegers et al 2010).

Between 1 September 2018 and 31 August 2019, HDP accounted for 31.2 percent of maternal admissions to a high-dependency unit or an intensive care unit (PMMRC 2021). HDP have been linked with acute and long-term morbidity in mothers and babies (Lisonkova et al 2014; Habli et al 2007; Mendola et al 2015; Zhang et al 2003).

Eclampsia is preventable through early detection and management of pre-eclampsia. However, practices in diagnosing and treating pregnant women/people with HDP vary throughout Aotearoa New Zealand. The proportion of pregnant women/people admitted to hospital with eclampsia, which is an indicator of severe maternal morbidity, also varies by ethnicity and across district health boards (DHBs) (Zhang et al 2003).

Te Tiriti o Waitangi

Health practitioners can acknowledge Te Tiriti o Waitangi by practically applying its principles as articulated by the courts and the Waitangi Tribunal.¹ Applying the principles to maternity service delivery is vital to enabling Māori to express their mana² and ensures Māori receive high-quality, culturally safe care and achieve equitable health outcomes.

Using the principles to work effectively and respectfully with Māori requires maternity services and health practitioners to demonstrate the principles of Te Tiriti in their day-to-day practice with Māori. The principles provide the framework for maternity providers and health practitioners providing maternity services to Māori. *Ngā Paerewa* (in particular, **1.1 Pae ora healthy futures**) supports the process of applying the principles to maternity services.

The Waitangi Tribunal concluded that the persistent health inequities that Māori experience were the consequence of the failure to apply the principles of Te Tiriti at the structural, organisational and health practitioner levels of the health and disability sector. Giving effect to Te Tiriti requires health practitioners to know the principles of Te Tiriti and

¹ These principles and their application can be found in: Waitangi Tribunal. 2019. Hauora: Report on Stage One of the Health Services and Outcomes Kaupapa Inquiry. Wellington: Waitangi Tribunal. URL: https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_152801817/Hauora%20W.pdf (accessed 2 February 2022).

² For more information on Te Tiriti o Waitangi and the health and disability system, see the Ministry of Health's framework for Te Tiriti, which expresses four goals of Te Tiriti in terms of mana. URL: www.health.govt.nz/system/files/documents/pages/whakamaua-tiriti-o-waitangi-framework-a3-aug20.pdf (accessed 2 February 2022).

to capably apply these in partnership with Māori in their day-to-day maternity clinical practice.

On its webpage Treaty of Waitangi principles (Ministry of Health 2020b), the Ministry of Health (the Ministry) applies principles of Te Tiriti to the day-to-day work of the primary health care system. These same principles can be described in relation to maternal health care as follows.

- **Tino rangatiratanga:** Health practitioners support the right of Māori to receive effective maternity care, conceptualising the decisions of the pregnant woman/person as a continuation of a much older, Māori, collective-endorsed practice of self-determining one's own health and wellbeing and that of the whānau.
- **Equity:** Health practitioners can contribute to equitable maternity health outcomes for Māori by ensuring that at a minimum maternity outcomes match those of other New Zealanders. Equitable maternity outcomes will be achieved when health practitioners implement the clinical guideline's recommendations in ways that give effect to the principles of Te Tiriti, relevant professional competencies and *Ngā Paerewa*.
- **Active protection:** Health practitioners share evidence-based information about maternity outcomes so that Māori can make informed decisions and prepare themselves to uphold their tikanga or cultural practice (for example, karakia, rongoā, support people). Health practitioners actively support Māori to make decisions that are best for them.
- **Options:** Health practitioners ensure Māori have maternity care that enables them to uphold their tikanga or cultural practice regardless of where the birth takes place. Processes must complement a Māori woman/person's mana or inherent authority and dignity, support their tikanga or cultural practice and be culturally safe as defined by Māori.
- **Partnership:** Health practitioners work in partnership with Māori, including a woman/person's whānau, if requested. A partnered approach to the process and decision-making ensures Māori can enact their rangatiratanga or self-determine their futures while exercising mana motuhake or authority over their bodies and reproductive health.

Equity

In Aotearoa New Zealand, people experience differences in health outcomes that are not only avoidable but unfair and unjust (Ministry of Health 2019). Differences in the structural determinants of health and wellbeing – for example, disadvantages in income, employment, education and housing as well as multiple forms of discrimination – negatively impact people's health, but people have little control over them.

Health inequities, like inequitable maternity outcomes, are not about people; instead, they are the result of avoidable structural determinants in our communities (Toi Te Ora Public Health 2021). When health practitioners understand the structures that create inequitable maternity outcomes, they can use different approaches and resources to achieve equity. Achieving equitable maternity outcomes for Māori and other population groups that experience inequities that are unfair and unjust happens when service providers and health practitioners:

- understand the structures that create disadvantage for Māori and other population groups
- are supported to implement the consensus guideline recommendations in ways that give effect to the principles of Te Tiriti and the rights of the other population groups, as well as meeting professional competencies and the requirements of *Ngā Paerewa*.

Health practitioners should also be aware that many peoples in Aotearoa New Zealand conceptualise anatomy, pregnancy, gender, sexuality, reproduction, contraception and birth in different ways according to their world views. For this reason, health practitioners should use proven health literacy practices to communicate effectively with everyone who is using their services (Ministry of Health 2015).

For sector guidance, see *Ngā Paerewa* Standard 1.4 E whakautetia ana ahau | I am treated with respect, criteria 1.4.2).

Recommendations

- Health practitioners should show awareness for the fact that different cultures and religions conceptualise anatomy, pregnancy, sex, birth and the postpartum period in different ways and should adapt their language and approach accordingly.
- Maternity service providers should ensure that pregnant women/people with HDP and their partners and whānau have culturally safe opportunities for discussing, reflecting and debriefing where necessary after the event or antenatally in the next pregnancy.
- Maternity service providers should monitor HDP by severity and ethnicity so that they can monitor equity, identify variations in outcome and then identify and implement areas for quality improvement based on this analysis.

Definitions and classifications

In this guideline, **hypertensive disorders in pregnancy (HDP)** are classified in line with the 2014 revised International Society for the Study of Hypertension in Pregnancy statement (Tranquili et al 2014). HDP includes:

- chronic/pre-existing hypertension
- gestational hypertension
- pre-eclampsia (de novo or superimposed on chronic hypertension)
- eclampsia
- HELLP syndrome.

These conditions are discussed in more detail below.

A rise in baseline blood pressure of 30 mmHg systolic or 15 mmHg diastolic is no longer used to diagnose hypertension.

Hypertension: Systolic blood pressure (sBP) ≥ 140 mmHg, or diastolic blood pressure (dBP) ≥ 90 mmHg, as measured on two or more consecutive occasions at least four hours apart.

Chronic/pre-existing hypertension: Hypertension is confirmed before conception or before 20 weeks of gestation with or without a known cause, as measured on two or more consecutive occasions at least four hours apart.

Gestational hypertension: New onset hypertension occurs after 20 weeks' gestation (in a woman/person who had normal blood pressure before 20 weeks' gestation) and:

- sBP ≥ 140 mmHg, **or** dBP is ≥ 90 mmHg
- the woman/person has none of the abnormalities that define pre-eclampsia
- their blood pressure returns to normal within three months after giving birth.

Proteinuria is not essential for a pre-eclampsia diagnosis.

Pre-eclampsia: The new onset of hypertension occurs after 20 weeks' gestation (in a woman/person who had normal blood pressure before 20 weeks' gestation) or is superimposed on pre-existing hypertension and **one or more** of the following also develop as new conditions:

1. proteinuria – spot urine protein: creatinine ratio ≥ 30 mg/mmol
2. other maternal organ dysfunction:
 - renal insufficiency (creatinine >90 $\mu\text{mol/L}$, urine output of <80 mL over four hours)
 - liver involvement – elevated transaminases (aspartate transaminase (AST) and alanine transaminase (ALT)) – at least twice upper limit of normal \pm right upper quadrant or epigastric abdominal pain)
Note normal ranges are ALT 0–30 u/L and AST 10–50 u/L
 - neurological complications (common examples are hyperreflexia when accompanied by clonus, severe headaches and persistent visual scotomata; other examples are eclampsia, altered mental status, blindness, stroke)
 - haematological complications (thrombocytopenia – platelet count below $100 \times 10^9/\text{L}$, haemolysis)
3. uteroplacental dysfunction (for example, fetal growth restriction, abruption).

Each of the following is a feature suggestive of **severe pre-eclampsia**.

- Severe hypertension (dBP ≥ 110 mmHg or sBP ≥ 160 mmHg) despite antihypertensive treatment
- Deteriorating clinical condition including:
 - a) impaired liver function not responding to treatment and not accounted for by alternative diagnosis – elevated transaminases (AST and ALT) – at least twice the upper limit of normal \pm right upper quadrant or epigastric abdominal pain (may be referred to upper back)
Note normal ranges are ALT 0–30 u/L and AST 10–50 u/L
 - b) progressive renal insufficiency (serum creatinine >90 $\mu\text{mol/L}$ or doubling of serum creatinine concentration in the absence of other renal disease, urine output of <80 mL over four hour)
 - c) worsening thrombocytopenia (platelet count less than $100 \times 10^9/\text{L}$)
 - d) pulmonary oedema
 - e) HELLP syndrome: elements include haemolysis, elevated liver enzymes and low platelet count
 - f) eclampsia: new onset of seizures occurs in association with pre-eclampsia and can occur before, during or after birth. It can be a presenting feature of pre-eclampsia in some pregnant women/people
- Worsening fetal growth restriction (with associated oligohydramnios or abnormal doppler).

✓ Eclamptic seizures are self-limiting, have no persistent clinical neurological features and are not caused by pre-existing neurological conditions.

- ✓ In a pregnant woman/person with pre-eclampsia, the presence of any of the following is an indicator of HELLP:
 - maternal platelet count of less than $100 \times 10^9/L$
 - elevated transaminases (elevated blood concentrations of liver enzymes to twice the normal concentration or more)
 - microangiopathic haemolytic anaemia with red cell fragments on blood film.

Clinical practice recommendations

This section sets out the evidence-based recommendations and practice points for this guideline. The structure follows the course of pregnancy with four groups of recommendations:

1. Pre-conception counselling
2. Antenatal
3. Intrapartum
4. Postpartum.

Alongside each recommendation is an indication of its strength and a grade for the quality of the evidence that informed it.

Pre-conception counselling recommendations

Where any woman/person has a history of pre-eclampsia or hypertension in pregnancy or chronic hypertension, offer pre-conception counselling.	Strong recommendation; low-quality evidence
Where any woman/person who wants to become pregnant is on antihypertensive medicines, discuss changing from an angiotensin converting enzyme (ACE) inhibitor to an alternative medication, if applicable.	Strong recommendation; low-quality evidence
If anti-hypertensives are substituted as a result of pregnancy, ensure that appropriate monitoring is available and blood pressure remains controlled.	Good practice recommendation

Antenatal recommendations

As early as possible in the pregnancy or when the woman/person books for antenatal services, identify risks for HDP as part of the full health assessment (see table 1: Risk	Strong recommendation; low-quality evidence
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ratio for developing pre-eclampsia in a woman/person with pre-existing risk factors below).	
Refer pregnant women/people with pre-existing hypertension for consultation with an obstetrician, ideally before 16 weeks' gestation.	Strong recommendation; low-quality evidence

Aspirin	
Recommend low-dose aspirin (100 mg daily) in pregnant women/ people with a major risk factor for developing pre-eclampsia and commence between 12- and 16-weeks' gestation.	Strong recommendation; moderate-quality evidence
Recommend the woman/person take aspirin at bedtime or in the evening.	Good practice recommendation
Consider stopping low-dose aspirin around 36 weeks' gestation.	Weak recommendation; very low-quality evidence
Calcium	
Consider supplementation with calcium for pregnant women/people who have a major risk factor for pre-eclampsia, particularly those with low dietary intake of calcium, from booking to birth (1.5–2.0 g oral elemental calcium is recommended).	Strong recommendation; moderate-quality evidence
Predictive Testing	
Tools that combine different biochemical markers and uterine artery Doppler for predicting pre-eclampsia are not currently recommended for routine use. <i>The use of the sFlt-1/PIGF ratio is currently being assessed in the Aotearoa New Zealand context and this recommendation will be reviewed once further evidence is available.</i>	Weak recommendation; very low-quality evidence
Lifestyle	
Give the woman/person specific education around optimal weight gain.	Weak recommendation; very low-quality evidence

Refer to <i>Eating and Activity Guidelines for New Zealand Adults</i> (Ministry of Health 2020a) and <i>Eating for Healthy Pregnant Women</i> (Ministry of Health 2021a).	
Do not offer multi-vitamins, vitamin C, vitamin E or other supplements, such as fish oil or magnesium, for pregnant women/ people at risk of pre-eclampsia.	Strong recommendation; moderate-quality evidence
Do not recommend salt restriction for pregnant people at risk of pre-eclampsia.	Strong recommendation; moderate-quality evidence
Do not recommend bed rest or restriction of physical activity for pregnant women/ people at risk of pre-eclampsia.	Strong recommendation; very low-quality evidence
Pregnant women/people's experiences of antenatal care	
Develop and make available educational tools to help pregnant women/ people understand issues relating to hypertension in pregnancy and pre-eclampsia. These tools should consider the pregnant people's different levels of health literacy, ethnicity, familiar language and demographic diversity.	Strong recommendation; very low-quality evidence
Work is needed to ensure equity of care for all pregnant women/ people, in particular, Māori, Pacific and Asian (Indian) pregnant people who are over-represented in poor obstetric outcomes. Maternity services should collect and report accurate ethnicity information about maternity care and outcomes.	Strong recommendation; very low-quality evidence
Actively involve pregnant women/ people and their whānau and keep both parties informed throughout the health decision-making process.	Strong recommendation; very low-quality evidence
Assess, address and document pregnant women/people's need for psychological care and support following a severe HDP.	Strong recommendation; very low-quality evidence
Offer a referral to support agencies to all pregnant women/people with pre-eclampsia, for example, social support agencies and Māori or Pacific providers, including postnatally.	Good practice recommendation
Assess and address barriers to effective communication with vulnerable groups of pregnant women/people, for example,	Good practice recommendation

literacy, language, geographical, socioeconomic and cultural barriers.	
Antihypertensives	
Urgently treat all pregnant women/ people with severe hypertension (dBP \geq 110 mmHG or sBP \geq 160 mmHg) with antihypertensives to acutely lower blood pressure. <i>See box 1: Antihypertensive agents for acute lowering of severe hypertension below for target blood pressure levels and acute treatment options.</i>	Strong recommendation; low-quality evidence
Consider antihypertensives for pregnant women/people with gestational hypertension (dBP \geq 90 mmHG or sBP \geq 140 mmHg), especially those with risk factors and/or co-morbidities.	Strong recommendation; very low-quality evidence
As well as taking account of the evidence and clinical experience, consider the choice of antihypertensive medicine in the context of resource availability, the local health care setting and the condition of the individual woman/person.	Strong recommendation; very low-quality evidence
Provide information on antihypertensive medicines, symptoms of pre-eclampsia and when and how to report symptoms. The information should be in plain English or a language the woman/person understands if English is not the first language.	Weak recommendation; very low-quality evidence
First-line antihypertensives to use in treating HDP include labetalol, nifedipine and methyldopa.	Strong recommendation; very low-quality evidence

Table 1: Risk ratio for developing pre-eclampsia in a woman/person with pre-existing risk factors

Pre-existing risk factor	Relative risk/ odds ratio	95% CI
Major risk factors		
Antiphospholipid antibodies / SLE	9.7 ^b	4.3–21.7
Previous history of pre-eclampsia	7.2 ^b	5.9–8.8
ART (oocyte donation) (Masoudian et al 2016) ¹⁶	4.3 ^a	3.1–6.1
Renal disease (Fischer et al 2004)	4.1 ^a	2.2–7.7

Chronic hypertension	3.6 ^a	2.0–6.6
Previous history of HELLP (Chames et al 2003)	3.7 ^a	0.9–16.1
Pre-existing type 2 diabetes	3.6 ^b	2.5–5.0
Family history of pre-eclampsia in mother or sibling	3.3	1.5–7.4
Other risk factors		
Nulliparity	2.9 ^b	1.3–6.6
Multiple pregnancy	2.9 ^b	2.0–4.2
Family history of pre-eclampsia	2.9 ^a	1.7–4.9
Father of baby (born of pregnancy complicated by pre-eclampsia) (Esplin et al 2001)	2.1	1.0–4.3
Genetic ancestry – African (Poon et al 2010)	3.0 ^a	2.0–4.4
– Indian	2.7 ^a	1.3–5.5
– Māori (Anderson et al 2012)	1.5 ^a	1.2–2.0
– Pacific peoples	1.2 ^a	1.0–1.6
Change in partner (Trupin et al 1996)	2.5 ^b	1.8–3.5
Elevated BMI ≥35 (early/pre-pregnancy)	2.5 ^a	1.8–3.2
Maternal age ≥40 (multiparous)	2.0 ^b	1.3–2.9
Maternal age ≥40 (nulliparous)	1.7 ^b	1.23–2.29
Pregnancy interval >10 years	1.8 ^b	1.72–1.94
ART (sperm donation) (González-Comadran et al 2014)	1.6 ^a	1.36–1.95
dBP ≥80 mmHg at booking	1.4 ^b	1.01–1.87
Any artificial reproduction technology (Bellamy et al 2007; Lowe et al 2014)	1.2 ^a	1.10–1.24

a. Adjusted odds ratio.

b. Relative risk. Data from Duckitt and Harrington 2005 unless otherwise referenced.

ART = assisted reproductive technology; BMI = body mass index; CI = confidence interval; SLE = systemic lupus erythematosus.

Acute lowering of severe hypertension

The antihypertensive regimen for acute lowering of blood pressure in pregnant women/people with severe hypertension (dBP \geq 110 or sBP \geq 160 mmHg) differs from the regimen for chronic management.

Target blood pressure levels are:

- dBP from 80-100 mm/Hg
- sBP from 130-150 mmHg.

Box 1: Antihypertensive agents for acute lowering of severe hypertension

Start one of these regimens in all pregnant women/people with severe hypertension (dBP \geq 110 or sBP \geq 160 mmHg).

Labetalol

Initially 20 mg IV bolus over 2 minutes

Onset of action: 5 minutes

Onset of maximum effect: 10–15 minutes

Repeat with 40–80 mg

Repeat: every 10 minutes (if needed)

Maximum: 300 mg

Nifedipine

Initially 10 mg (use immediate release capsules)

Onset of action: 30–45 minutes

Onset of maximum effect: 30 minutes

Repeat: after 30–45 minutes (if needed)

Maximum: 80 mg daily

Hydralazine

5–10 mg IV bolus over 3–10 minutes (5 mg if fetal compromise)

Onset of action: 20 minutes

Onset of maximum effect: 10–80 mins

Repeat: every 20 minutes

Maximum: 30 mg

Consider IV bolus of crystalloid fluid before or when administering the first IV hydralazine dose (usually 200–300 mL)

Antenatal monitoring	
For pregnant women/people with hypertension in pregnancy, refer to an obstetric specialist for a consultation and full assessment. The specialist should make a plan of who is going to carry out the ongoing care and monitoring of the woman/person and their baby in conjunction with the woman/person and their LMC.	Strong recommendation; very low-quality evidence
For pregnant women/people with hypertension who are managed as outpatients, base the frequency of additional antenatal appointments (from the conventional appointment schedule) on each woman/person's individual needs, the severity of their condition and their preferences.	Strong recommendation; very low-quality evidence
For a pregnant woman/person presenting with features of pre-eclampsia, refer urgently (same day) to an obstetric specialist and a transfer of care (referral code 4022). Consider offering inpatient management. Consider the practical (social and economic) implications of inpatient care from the woman/person's perspective.	Strong recommendation; very low-quality evidence
Evidence shows elevations in serum uric acid (hyperuricaemia) is a poor predictor of pre-eclampsia, and so this is not essential to test.	Good practice recommendation
Testing 24-hour urinary protein is not usually necessary as evidence shows it is no more predictive than a spot protein: creatinine ratio (PCR) test.	Good practice recommendation
Pregnant women/people with a major risk factor for pre-eclampsia should have uterine artery Doppler studies performed at their 20-week anatomy scan. The results of such assessments can be used to plan the schedule for the serial growth assessment.	Good practice recommendation
Make a clear management plan for all pregnant women/people with HDP. The plan should include clinical responsibilities and reflect the pregnant woman/person's preferences.	Good practice recommendation

Table 2: Monitoring requirements for pregnant women/ people with HDP

Maternal and fetal monitoring					
Condition	Care planning	BP monitoring	Bio-physical assessments	Fetal assessment and CTG	Other assessment
Pre-existing/ chronic hypertension	Identify risk factors for pre-eclampsia	Consider more frequent BP measurements and appointments than normal if the pregnant woman/person has any of the risk factors and unstable pre-eclampsia; individualise the decision to the pregnant woman/person		Ongoing fetal assessment ^b for growth. If IUGR detected, follow the SGA pathway	
Gestational hypertension	The obstetric team makes a management plan for ongoing care and monitoring in discussion with the pregnant	Weekly BP (at least)	Proteinuria at least weekly Pre-eclampsia bloods* if sudden increase in BP or new proteinuria	Fetal assessment at time of diagnosis Do not repeat USS in <2 weeks, unless fetal indications ^b	Changes in fetal movements , other signs/symptoms of pre-eclampsia The pregnant woman/person assesses daily as

	woman/person and their LMC				does their maternity carers when they see them
Pre-eclampsia/ expectant management	The obstetric team makes a management plan for ongoing care and monitoring in discussion with the pregnant woman/person and their LMC In hospital care/assessment	4–6 hourly BP (except overnight, when an interval of 8 hours is acceptable)	Twice-weekly pre-eclampsia bloods* Undertake coagulation studies if liver tests are abnormal or there are concerns about possible placental abruption Repeat laboratory investigations more often if there are concerns about the condition of either the woman/pregnant person or the fetus	CTG daily if inpatient	Observe for: <ul style="list-style-type: none"> • symptoms of labour • abdominal pain • vaginal bleeding Observe for symptoms of severe pre-eclampsia (headaches, visual changes, shortness of breath, epigastric pain, retrosternal pressure/pain, nausea, vomiting, hyperreflexia)
Severe pre-eclampsia / eclampsia (hospital inpatient)	In hospital one-on-one care	Hourly BP , respiratory rate, oxygen saturation	At least daily pre-eclampsia bloods* Perform coagulation studies if liver tests are abnormal or there	CTG daily	Fluid restriction 80–85 mL/hour total fluid for severe pre-eclampsia Fluid balance chart

			<p>are concerns about possible placental abruption</p> <p>Repeat laboratory investigations more often if there are concerns about the condition of either the woman/pregnant person or the fetus</p>		
<p>Magnesium sulphate monitoring (high dependency-like setting)</p>	<p>In hospital one-on-one care</p>	<p>BP every 5 minutes at loading dose then hourly during maintenance dose</p>	<p>At least daily pre-eclampsia bloods*</p> <p>Perform coagulation studies if liver tests are abnormal or there are concerns about possible placental abruption</p> <p>Repeat laboratory investigations more often if there are concerns about the condition of either</p>	<p>Continuous CTG</p>	<p>Toxicity monitoring</p> <p>Respiratory rate / SpO₂ hourly</p> <p>Patella reflexes hourly</p> <p>Urine output (>100 mL over 4 hours)</p>

			the woman/pregnant person or the fetus		
Intrapartum pre-eclampsia/eclampsia	In hospital one-on-one care	BP at least hourly		Continuous CTG	Urine output or fluid balance Fluid restriction (replace loss at birth and then 80–85 mL/hour total fluid for severe pre-eclampsia)
Postpartum	Recommend pregnant women/people who have had pre-eclampsia stay in secondary or tertiary facility for at least 72 hours postpartum Base the decision for discharge timing on the individual woman/person and on whether satisfactory monitoring and	4–6 hourly BP (except overnight when an interval of 8 hours is acceptable) while inpatient	Monitor for all signs of pre-eclampsia (including pre-eclampsia bloods) returning to normal but beware of postpartum deterioration and eclampsia	Hospital to send a comprehensive discharge summary to the woman/person's LMC and GP and the woman/person, including postpartum plan of care, monitoring and specific advice on antihypertensive medication	Assess and check BP at home within 24 hours of discharge from a hospital facility. If normal, check at 1 week and approximately weekly thereafter (with case-by-case planning to blood pressure stability and condition severity)

	follow-up care arrangements have been made				
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*Pre-eclampsia bloods = full blood count (including haemoglobin, platelet count), creatinine, electrolytes, liver function tests (albumin, ALT and AST).

- a. Urinalysis by dipstick followed by spot urine PCR if $\geq 2+$ proteinuria. Once significant proteinuria has been detected, there is no established role for serial testing.
- b. Fetal assessment with ultrasound for early dating and fetal growth at the time of diagnosis and repeat if suspected growth restriction on clinical assessment by LMC. Umbilical artery velocimetry and cardiotocography only if fetal growth restriction or distress is suspected.
- c. Educate the pregnant woman/person around the need to contact their LMC urgently if they experiences symptoms of pre-eclampsia/eclampsia or any changes in fetal movements.

ALT = alanine aminotransferase, AST = aspartate aminotransferase, BP = blood pressure, CTG = cardiotocography, IUGR = intrauterine growth restriction, SGA = small for gestational age, SpO2 = peripheral capillary oxygen saturation, USS = ultrasound scan.

Pre-existing/chronic hypertension

(Hypertension confirmed pre-conception or before 20 weeks gestation)

Pre-pregnancy or at first visit

- Change from ACE inhibitors to alternative antihypertensive
- Assess for risk factor for pre-eclampsia
- Initiate calcium
- Initiate aspirin at 12–16 weeks' gestation
- Refer to obstetric team (see referral codes 1014, 1015)
- Educate about signs and symptoms of pre-eclampsia

First-line antihypertensives

- Labetalol
- Nifedipine
- Methyldopa

Maternal monitoring

- Maintain usual schedule of antenatal visits but monitor BP more closely if BP is unstable
- Aim to control hypertension at pre-pregnancy range or lower

Fetal monitoring

If monitoring raises fetal growth concerns:

- conduct USS, AFV, umbilical artery Doppler and CTG if indicated
- follow SGA guidelines for management

Timing of birth

- *Before 37 weeks*: Do not recommend birth unless other maternal or fetal indications support it
- *After 37 weeks*: For pregnant women/people with a low risk of adverse outcomes, consider expectant management beyond 37 weeks with increased monitoring

Intrapartum

- At least hourly BP in labour
- Continue antihypertensives

Postpartum

- If on methyldopa, consider changing to another antihypertensive, for example, ACE inhibitor
- BP at home 24 hours post discharge, then at one week, then approximately weekly thereafter (in line with case-by-case planning according to severity)
- Hospital to send the woman/person's GP and LMC a comprehensive discharge summary

Key for all summaries = ACE = angiotensin converting enzyme; AFV = amniotic fluid volume; ALT= alanine transaminase; AST =aspartate transaminase BP = blood pressure; dBP= diastolic blood pressure; CTG = cardiotocograph; FBC = full blood count; GP = general practitioner; IV = intravenous; LFT = liver function test; LMC= lead maternity carer; sBP= systolic blood pressure SGA = small for gestational age; USS = ultrasound scan.

Gestational hypertension

(New onset of hypertension after 20 weeks' gestation without signs of pre-eclampsia and dBP \geq 90 or sBP \geq 140 mmHg)

At diagnosis

- Spot urine PCR
- Pre-eclampsia bloods
- Prompt referral to obstetric team (see referral code 4009)
- Assess fetal growth/wellbeing (USS, umbilical artery Doppler assessment and CTG if indicated)
- Consider initiating first-line antihypertensives
- Discuss any symptoms of pre-eclampsia with the woman/person and their family

Maternal monitoring

- The obstetric team makes a management plan for ongoing care and monitoring in discussion with the woman/person and their LMC
- Carry out BP and urine dipstick for protein weekly
- If sudden increase in BP or new proteinuria, or other signs of pre-eclampsia, do pre-eclampsia bloods and PCR

Fetal monitoring

- If ultrasound scan monitoring raises fetal growth concerns:
- conduct USS, AFV, umbilical artery Doppler and CTG if indicated
 - follow SGA guidelines for management if diagnosed

Timing of birth

- *Before 37 weeks*: Recommend expectant management; do not recommend birth unless other maternal or fetal indications support it
- *After 37 and before 40 weeks*: Consider expectant management or birth, in discussion with the woman/person and their LMC

Intrapartum

- *At least hourly BP in labour*
- *Continue antihypertensives – adjust if necessary for other factors, for example, neuraxial anaesthesia*

Postpartum

- If on methyldopa, consider changing to another antihypertensive, for example, ACE inhibitor
- BP at home 24 hours post discharge, then at one week, then approximately weekly thereafter (in line with case-by-case planning according to BP stability and condition severity)
- Hospital to send the woman/person's GP and LMC a comprehensive discharge summary

First-line antihypertensives

- Labetalol
- Nifedipine
- Methyldopa

Pre-eclampsia bloods

- FBC
- Electrolytes
- Creatinine
- LFT (incl AST, ALT)
- Coagulation if AST, ALT abnormal/ low platelets

Signs and symptoms of pre-eclampsia

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

Antihypertensives and breastfeeding

- Establish breastfeeding if this is the plan
- Change to compatible antihypertensive, for example, ACE inhibitor
- Very pre-term babies may have an increased risk of adverse effects from antihypertensives

Pre-eclampsia

Hypertension (dBP \geq 90 mmHg or sBP \geq 140 mmHg) + other signs and symptoms
(refer to definitions)

At diagnosis

- Acute referral and transfer to obstetric team (referral code 4022)
- Consider anti-hypertensive treatment to reduce risk of severe hypertension. Aim for target of sBP 140-160 and dBP 90-100 mmHg
- Spot urine PCR
- Pre-eclampsia bloods
- Assess fetal growth/wellbeing (USS, umbilical artery Doppler assessment and CTG if indicated)
- Identify and explain warning signs and symptoms of worsening pre-eclampsia to the woman/person and their family

First-line antihypertensives

- Labetalol
- Nifedipine
- Methyldopa

Maternal monitoring

- In providing hospital care, the obstetric team makes a management plan for ongoing care and monitoring discussion with the woman/person and their LMC, which may include hospital admission
- BP 4–6 hourly (except overnight when an interval of 8 hours is acceptable)
- Clinical deterioration can be rapid
- Twice weekly pre-eclampsia bloods
- Conduct coagulation studies if liver function tests are abnormal, low platelets or concerns about possible placental abruption

Pre-eclampsia bloods

Labetalol

Initially 20 mg IV bolus over 2 minutes
Repeat with 40–80 mg
Onset: 5 minutes Repeat with 40–80 mg
Repeat: every 10 minutes
Maximum: 300 mg

Nifedipine*

Initially 10 mg (immediate release capsules)
Onset: 30–45 minutes
Repeat: after 30–45 minutes (if needed)
Maximum: 80 mg daily

Fetal monitoring

- Follow SGA guidelines for management if diagnosed
- After assessment at the time of diagnosis, do not repeat USS for growth in <2 weeks
- Daily CTG if inpatient

Hydralazine

5–10 mg (5 mg if fetal compromise) IV bolus over 3–10 minutes
Onset: 20 minutes Repeat: every 20 minutes
Maximum: 30 mg (consider IV bolus of crystalloid fluid before or when administering first IV hydralazine dose, usually 200–300 mL)

Timing of birth

- *Before 34 weeks*: Plan an expectant approach. Clear plan developed including level of monitoring and thresholds, to plan birth if condition of woman/person or fetus deteriorates. 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. Consider inpatient management.
- *At 34+0 to 36+6 weeks*: Plan an expectant approach. Offer induction of labour if maternal or fetal indications support delivery (see box 2). Consider inpatient mgmt.
- *After 37 weeks (e.g. 37+0)*: Recommend birth. No appreciable benefit in continuing pregnancy after 37 weeks. The woman/person, her/their LMC and the obstetric team should negotiate the timing and method.

Pre-eclampsia bloods

- FBC
- Electrolytes
- Creatinine
- LFT (incl AST, ALT)
- Coagulation if AST, ALT abnormal/low platelets

Intrapartum

- At least hourly BP in labour
- Continue antihypertensives – adjust if necessary for other factors, e.g. neuraxial anaesthesia
- Fluid balance monitoring

Signs and symptoms of pre-eclampsia

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

Postpartum

- If on methyldopa, consider changing to another antihypertensive, eg, ACE inhibitor
- Continue to monitor for disease resolution, titrate antihypertensives as required
- Advise to stay in secondary/tertiary facility for at least 72 hours (4–6 hourly BP)
- BP at home 24-hour post discharge, then at one week, then approximately weekly thereafter (in line with case-by-case planning according to BP stability and condition severity)
- Hospital to send woman's GP and LMC a comprehensive discharge summary
- Consider 6-week obstetric review

* Care must be taken when using nifedipine in combination with magnesium sulphate, the combination of which can precipitate severe hypotension.

Severe/unstable pre-eclampsia

(See Definitions and Classifications)

At diagnosis

- Acute referral and transfer to obstetric team (referral code 4022)
- Commence antihypertensive treatment, aim for target BP 140/100 mmHg or lower
- Consider magnesium sulphate to prevent a primary seizure
- Admit to secondary or tertiary facility
- Spot urine PCR
- Pre-eclampsia bloods
- Assess fetal growth (umbilical artery Doppler assessment and CTG, if indicated)

Maternal monitoring

- One-to-one midwifery care
- Management plan should include discussion with the anaesthetic and intensive care teams but also with obstetric lead
- Hourly BP and respiratory rate
- Fluid balance chart
- At least daily pre-eclampsia bloods
- Conduct coagulation studies if liver function tests are abnormal or there are concerns about possible placental abruption

Maternal monitoring – magnesium sulphate

- Blood pressure every 5 minutes during bolus dose, then hourly during maintenance dose
- Respiratory rate, O₂ saturation, reflexes hourly
- Urine output (>100 mL over 4 hours)
- Fluid restriction (replace loss at birth and then 80–85 mL/hour total fluid)

Fetal monitoring

- Follow SGA guidelines for management if diagnosed
- After assessment at time of diagnosis, do not repeat growth USS in <2 weeks
- Daily CTG (continuous if on magnesium sulphate or IV antihypertensives)

Timing of birth

- Peri-viability and before: Manage in a tertiary setting with maternal fetal medicine involvement if possible, and with careful discussion with the woman/person
- Before 34 weeks: Adopt expectant approach in a secondary or tertiary centre with resources for maternal and fetal monitoring and critical care of the woman/pregnant person and the baby. 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 stabilising the woman/pregnant person in a centre with appropriate resources for care of the woman/pregnant person and baby

Intrapartum

- At least hourly BP in labour
- CTG
- Continue antihypertensives – adjust if necessary for other factors, for example, effect of magnesium sulphate, neuraxial anaesthesia

Postpartum

- Continue magnesium sulphate for 24 hours
- If on methyldopa, consider changing to another antihypertensive, for example, ACE inhibitor
- Continue to monitor for disease resolution, titrate antihypertensives as required
- Advise to stay in secondary/tertiary facility for at least 72 hours (4–6 hourly BP)
- BP at home 24 hours post discharge, then at one week, then approximately weekly thereafter (in line with case-by-case planning according to BP stability and condition severity)
- Hospital to send the woman/person's GP and LMC a comprehensive discharge summary
- Recommend 6-week obstetric review

Pre-eclampsia bloods

Labetalol

Initially 20 mg IV bolus over 2 minutes
Repeat with 40–80 mg
Onset: 5 minutes Repeat with 40–80 mg
Repeat: every 10 minutes
Maximum: 300 mg

Nifedipine*

Initially 10 mg (immediate release capsules)
Onset: 30–45 minutes
Repeat: after 30–45 minutes (if needed)
Maximum: 80 mg daily

Hydralazine

5–10 mg (5 mg if fetal compromise) IV bolus over 3–10 minutes
Onset: 20 minutes Repeat: every 20 minutes
Maximum: 30 mg (consider IV bolus of crystalloid fluid before or when administering first IV hydralazine dose, usually 200–300 mL)

Magnesium sulphate

To prevent further eclamptic seizures, this anticonvulsant medicine should be administered – see protocol

Pre-eclampsia bloods

- FBC
- Electrolytes
- Creatinine
- LFT (incl AST, ALT)
- Coagulation if AST, ALT abnormal/low platelets

Signs and symptoms of pre-eclampsia

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

* Care must be taken when using nifedipine in combination with magnesium sulphate, the combination of which can precipitate severe hypotension.

Eclampsia

New onset of seizures in association with pre-eclampsia

At diagnosis

- Emergency transfer of care to obstetric team (referral code 4006)
- Immediate airway, breathing, circulation, disability, exposure (ABCDE) management
- BP control of primary importance if severe
- Admit to secondary/tertiary facility
- Pre-eclampsia bloods + coagulation bloods
- Assess fetal growth (umbilical artery Doppler assessment and cardiotocography if indicated)

Treatment

- Only conclusive treatment is birth of the baby but aim to stabilise and monitor if possible if <37 weeks' gestation
- Begin magnesium sulphate – see protocol
- If hypertensive, start antihypertensive, aim for a target BP below 140/100 mmHg

Maternal monitoring

- One-to-one midwifery care
- Management plan should include discussion with the anaesthetic and intensive care teams but also with obstetric lead
- Hourly BP and respiratory rate
- Fluid balance chart
- At least daily pre-eclampsia bloods
- Conduct coagulation studies if liver function tests are abnormal or there are concerns about possible placental abruption

Maternal monitoring – magnesium sulphate

- Blood pressure every 5 minutes during bolus dose, then hourly during maintenance dose
- Respiratory rate, O₂ saturation, reflexes hourly
- Urine output (>100 mL over 4 hours)
- Fluid restriction (replace loss at birth and then 80–85 mL/hour total fluid)

Fetal monitoring

- CTG (continuous if magnesium sulphate running)

Timing of birth

Any gestational age: Recommend birth after stabilising the woman/person and a course of corticosteroids (if $\leq 34+6$ weeks) and magnesium sulphate for neuroprotection (if <30 weeks) has been completed (if time permits) – not required if already on magnesium sulphate

Intrapartum

- Frequent BP monitoring (eg, every 5–15 minutes) in labour. If on magnesium sulphate – follow protocol
- Continuous CTG
- Continue antihypertensives – adjust if necessary for other factors, for example, effect of magnesium sulphate, neuraxial anaesthesia

Postpartum

- Continue magnesium sulphate for 24 hours
- If on methyldopa, consider changing to another antihypertensive, for example, ACE inhibitor
- Continue to monitor for disease resolution, titrate antihypertensives as required
- Advise to stay in secondary/tertiary facility for at least 72 hours (4–6 hourly BP)
- BP at home 24 hours post discharge, then at one week, then approximately weekly thereafter (in line with case-by-case planning according to BP stability and condition severity)
- Hospital to send the woman/person's GP and LMC a comprehensive discharge summary
- Recommend 6-week obstetric review

Pre-eclampsia bloods

Labetalol

Initially 20 mg IV bolus over 2 minutes
Repeat with 40–80 mg
Onset: 5 minutes Repeat with 40–80 mg
Repeat: every 10 minutes
Maximum: 300 mg

Nifedipine*

Initially 10 mg (immediate release capsules)
Onset: 30–45 minutes
Repeat: after 30–45 minutes (if needed)
Maximum: 80 mg daily

Hydralazine

5–10 mg (5 mg if fetal compromise) IV bolus over 3–10 minutes
Onset: 20 minutes Repeat: every 20 minutes
Maximum: 30 mg (consider IV bolus of crystalloid fluid before or when administering first IV hydralazine dose, usually 200–300 mL)

Magnesium sulphate

To prevent further eclamptic seizures, this anticonvulsant medicine should be administered – see protocol

Pre-eclampsia bloods

- FBC
- Electrolytes
- Creatinine
- LFT (incl AST, ALT)
- Coagulation if AST, ALT abnormal/low platelets

Signs and symptoms of pre-eclampsia

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

* Care must be taken when using nifedipine in combination with magnesium sulphate, the combination of which can precipitate severe hypotension.

HELLP

A variant of severe pre-eclampsia.
Elements include haemolysis, elevated liver enzymes and low platelet count

At diagnosis

- Acute referral and transfer to obstetric team (referral code 4006)
- BP control of primary importance if severe
- Admit to secondary/tertiary facility
- Spot urine PCR
- Pre-eclampsia bloods + coagulation bloods
- Assess fetal growth (umbilical artery Doppler assessment and cardiotocography if indicated)

Treatment

- Only conclusive treatment is birth of baby and placenta
- Begin magnesium sulphate – see protocol
- Start antihypertensive (acute), aim for a target BP below 140/100 mmHg



Maternal monitoring

- Management plan should include discussion with the woman/person, their LMC, obstetric, anaesthetic and intensive care teams and physicians where appropriate
- At least daily pre-eclampsia bloods
- Conduct coagulation studies if there are concerns about possible placental abruption

Maternal monitoring – magnesium sulphate

- Blood pressure every 5 minutes during bolus dose then hourly during maintenance dose
- Respiratory rate, O2 saturation, reflexes hourly
- Urine output (>100 mL over 4 hours)
- Fluid restrictions (replace loss at delivery and then 80–85 mL/hour total fluid) abruption

Fetal monitoring

- CTG (continuous if magnesium sulphate running)

Timing of birth

Any gestational age: Recommend birth after stabilising the woman/person and a course of corticosteroids (if $\leq 34+6$ weeks) and magnesium sulphate for neuroprotection (if <30 weeks) has been completed (if time permits) – not required if already on magnesium sulphate

Intrapartum

- Frequent BP monitoring (for example, every 5–15 minutes) in labour. If on magnesium sulphate – follow protocol
- Continuous CTG
- Continue antihypertensives – adjust if necessary for other factors, for example, effect of magnesium sulphate, neuraxial anaesthesia

Postpartum

- Continue magnesium sulphate for 24 hours
- If on methyldopa, consider changing to another antihypertensive, for example, ACE inhibitor
- Continue to monitor for disease resolution, titrate antihypertensives as required
- Advise to stay in secondary/tertiary facility for at least 72 hours (4–6 hourly BP)
- BP at home 24 hours post discharge, then at one week, then approximately weekly thereafter (in line with case-by-case planning according to severity)
- Hospital to send the woman/person's GP and LMC a comprehensive discharge summary
- Recommend 6-week obstetric review

Pre-eclampsia bloods

Labetalol

Initially 20 mg IV bolus over 2 minutes
Repeat with 40–80 mg
Onset: 5 minutes Repeat with 40–80 mg
Repeat: every 10 minutes
Maximum: 300 mg

Nifedipine*

Initially 10 mg (immediate release capsules)
Onset: 30–45 minutes
Repeat: after 30–45 minutes (if needed)
Maximum: 80 mg daily

Hydralazine

5–10 mg (5 mg if fetal compromise) IV bolus over 3–10 minutes
Onset: 20 minutes Repeat: every 20 minutes
Maximum: 30 mg (consider IV bolus of crystalloid fluid before or when administering first IV hydralazine dose, usually 200–300 mL)

Pre-eclampsia bloods

- FBC
- Electrolytes
- Creatinine
- LFT (incl AST, ALT)
- Coagulation if AST, ALT abnormal/low platelets

Signs and symptoms of pre-eclampsia

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

* Care must be taken when using nifedipine in combination with magnesium sulphate, the combination of which can precipitate severe hypotension.

Magnesium sulphate	
In pregnant women/people with eclampsia, recommend administering magnesium sulphate to help prevent seizures, unless contraindicated.	Strong recommendation; high-quality evidence
In pregnant women/people with severe pre-eclampsia, recommend administering magnesium sulphate to reduce the risk of eclampsia.	Strong recommendation; high-quality evidence
Recommend administering magnesium sulphate in a setting with one-on-one midwifery care, close monitoring and resuscitation/reversal medications (calcium gluconate).	Strong recommendation; very low-quality evidence
For settings that cannot administer the full magnesium sulphate regimen, this guideline recommends using a loading dose intramuscularly (IM) or intravenously (IV) (see protocol) and then immediately transferring the woman/person to a higher-level health care facility.	Strong recommendation; low-quality evidence
Consider continuing magnesium sulphate for 24 hours following birth or 24 hours after the last seizure, whichever is the later.	Strong recommendation; very low-quality evidence
Magnesium sulphate does not stop seizures but reduces the risk of a woman/person having a further seizure.	Good practice recommendation
Eclamptic seizures are generally short lived and self-limiting, so it is reasonable to delay administration of magnesium sulphate until the seizure has stopped.	Good practice recommendation

Magnesium sulphate protocol

Magnesium sulphate

- Magnesium sulphate is the medicine of choice to prevent further seizures in pregnant women/people with eclampsia and to reduce the risk of seizures in pregnant women/people with pre-eclampsia.
- Magnesium sulphate is also used for neuroprotection of the fetus at gestation <30 weeks. This is not required if the woman/person is already taking magnesium sulphate for HDP.
- Magnesium sulphate readily crosses the placenta.
- Magnesium is readily antagonised by IV calcium gluconate in the event of magnesium toxicity (calcium gluconate should be available where magnesium sulphate is used).

Indications

- As a prophylaxis to reduce the risk of eclampsia seizures for pregnant people with pre-eclampsia.
- To prevent further seizures in pregnant people with eclampsia seizures.

Precautions

Using this medicine can be hazardous in association with:

- dosing errors
- renal failure or severe renal compromise
- hypocalcaemic states
- other medicines, especially vasoactive medicines
- acute haemolytic states.

Administration

- Magnesium sulphate is best administered intravenously. However, the intramuscular route may be appropriate in some situations.
- The product guidelines recommend diluting magnesium sulphate for intravenous use to a concentration of 20% magnesium or less.
- Intravenous administration of magnesium sulphate may be via a syringe driver or a volumetric infusion pump.

Care during intravenous infusion

- Collect baseline observations (pulse, BP, respiratory rate, saturation of peripheral oxygen (SpO₂) and reflexes).
- Ensure the woman/person is aware that a feeling of warm flushing may be evident during the infusion. Other side effects may include nausea, vomiting, drowsiness and headaches.
- Recheck observations, including patellar or brachial reflexes (if neuraxial anaesthesia in place), 10 minutes after the loading dose starts and at the end of the loading dose (20 minutes).
- Continuously monitor the fetus from 26+0 weeks gestation until clinical review or discussion by medical staff. Between 24 and 26 weeks' gestation, consider individualised management related to fetal monitoring.

Maintenance

Monitor

Monitor:

- blood pressure – every 5 minutes during loading dose and then hourly during maintenance dose
- respiratory rate / SpO₂ – hourly
- patellar/brachial reflexes – hourly
- urine output – review hourly (insert urine catheter). Should be >100 mL/4 hours
- pre-eclampsia bloods = FBC (including haemoglobin, platelet count), creatinine, electrolytes, LFTs (albumin, ALT and AST).

Document patellar or brachial reflexes (if neuraxial anaesthesia in place).

Stop the infusion if:

- reflexes are absent
- the respiratory rate is less than 12 per minute or
- the urine output drops below 100 mL in 4 hours.

Monitoring magnesium levels is usually not necessary. Where serum creatinine is >100 µmol/L or urine output is <100 mL over 4 hours, check serum magnesium levels and adjust infusion rate. In these circumstances, check serum magnesium levels every 6 hours after starting infusion and consider reducing rate of infusion to 0.5 g/hour.

- Do not take blood for estimating magnesium from the arm that is receiving the infusion.
- Levels will vary according to serum albumin concentrations.
- Carefully monitor patients with chronic kidney disease or renal impairment because magnesium and calcium accumulation is more likely in these patients.

Toxicity

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

- call for medical assistance
- administer oxygen at 8–12 litres/minute
- stop infusion
- monitor vital signs
- administer calcium gluconate (10% solution), 10 mL, slowly intravenously
- check electrolytes, creatinine and magnesium sulphate levels.

Magnesium sulphate IV regimen

- The total adult daily dose should be no more than 40 g of magnesium sulphate.
- Do not administer more than 8 g of magnesium sulphate over 1 hour.
- Continue for 24 hours following birth or 24 hours after the last seizure, whichever is the later.

To reduce the risk of eclampsia (prophylaxis)

- For the loading dose, administer 4 g over 10 minutes. (Dilute to local protocol. Concentration should be no higher than 20%.)
- After 10 minutes, use maintenance dose infusion to begin maintenance at 1 g/hour.
- Conduct ECG monitoring and notify anaesthetist.

To reduce the risk of recurrent eclampsia seizures

- For the loading dose, administer 4 g over 5–10 minutes. (Dilute to local protocol. Concentration should be no higher than 20%.)
- After 10 minutes, use maintenance dose infusion to begin maintenance at 1 g/hour.
- Conduct ECG monitoring and have anaesthetist on site.
- If seizures have not stopped, an alternative medication may be required.

When seizure recurs during maintenance treatment

- Administer 2 g IV over 10 minutes. (Dilute to local protocol. Concentration should be no higher than 20%.)
- Once the condition is stable, either:
 - reset volumetric infusion pump to maintenance dose of 1 g/hour or
 - increase the maintenance infusion rate to 2 g/hour.
- Check for hyporeflexia and reduced respiration rate.

Ensure calcium gluconate is available.

Intramuscular dose (suitable for retrieval and transfer)

If IV administration is not available, an intramuscular magnesium sulphate 50% may be preferable for treating women with severe unstable pre-eclampsia.

The preferred regimen in such circumstances is to:

- administer two deep intramuscular injections of 4 g magnesium sulphate 50% solution into each buttock (the total dose of up to 10 g injected into one site is highly irritating)
- provide maintenance treatment of 5 g magnesium sulphate 50%, given by deep intramuscular injection, every 4 hours
- alternate the buttocks in which you administer the injection
- begin a maintenance infusion (see above) at any time after the initial bolus dose but, in this circumstance, consider measuring blood levels of magnesium.

Facilities differ in their protocols for compounding and administering magnesium sulphate infusions. No evidence is available to support the best way to do this. However, this guideline has sourced guidance from an article from the Director of Error Reporting Programs at the Institute for Safe Medication Practices, which was developed from reported errors when administering magnesium sulphate for obstetric purposes (Grissinger 2009; Simpson and Knox 2004).

Practice points for administering IV magnesium sulphate

- Premixed solutions. Staff should not have to mix magnesium sulphate solutions. Settings should make available premixed solutions for bolus doses and maintenance infusions. Avoid non-standard concentrations. Give bolus doses in separate, premixed piggyback infusions; do not administer them from the maintenance infusion.
- Label lines. When starting infusions or adjusting the rate, trace the tubing by hand from the IV bag to the pump and then to the patient for verification.
- Protocols. Establish dosing and administration protocols and standard order sets for magnesium sulphate.
- Double-checks. Make it a requirement for an independent double-check of the medicine, concentration, infusion rate, pump settings, line attachment and patient before administering IV magnesium sulphate.
- Monitoring. Monitor the patient's vital signs, oxygen saturation, reflexes and level of consciousness as outlined above. Assess the patient regularly for signs of toxicity as above. During bolus administration, a staff member should remain at the woman/person's bedside to oversee continuous monitoring.

- Staffing ratios. Staffing patterns should be sufficient to allow time for proper monitoring.
- Emergency preparedness. Educate staff to respond to emergencies caused by overdoses. Calcium gluconate should be readily available.

Intrapartum

This section covers the period immediately before and during birth. The first consideration in the intrapartum management of HDP should be the safety of the woman/person and their fetus. The second is to have a birth of a mature newborn that will not require intensive or prolonged neonatal care. There should be discussion with the woman/person and their whānau regarding planning and preparation for potential preterm birth. Pre-eclampsia is a progressive disease; the ultimate treatment is to deliver the baby and placenta. Decisions on the timing of delivery for pregnant women/people should be made on an individual basis and must balance maternal and fetal risks and benefits.

Timing of birth

Box 2: Indications for delivery in pregnant women/people with pre-eclampsia (adapted from Lowe et al 2014)	
Maternal	Fetal
Gestational age ≥ 37 weeks	Placental abruption
Inability to control hypertension	Severe FGR
Deteriorating platelet count	Non-reassuring fetal status
Intravascular haemolysis	
Deteriorating liver function	
Deteriorating renal function	
Persistent neurological symptoms	
Persistent epigastric pain, nausea or vomiting with abnormal LFTs	
Pulmonary oedema	

In deciding on the timing of the birth, consider BP level and its treatment, potential complications linked with the chosen mode of birth, the health of the woman/pregnant person and fetus, other obstetric complications or co-morbidities, and the woman/pregnant person's preferences.

For pregnant women/people with chronic hypertension	
<i>Before 37 weeks:</i> Do not recommend birth unless other maternal or fetal indications support it.	<i>Strong recommendation; moderate-quality evidence</i>
<i>After 37 weeks:</i> For pregnant women/people with low risk of adverse outcomes, consider expectant management. Early-term birth (37- and 38-weeks' gestation) is associated with poorer neonatal and childhood outcomes compared with babies born at full term (39 to 40+6 weeks' gestation). Unless there is an evidence-based indication supporting earlier planned birth, continue expectant management to 39 weeks' gestation or more.	<i>Strong recommendation; moderate-quality evidence</i>
For pregnant women/people with gestational hypertension	
<i>Before 37 weeks:</i> Recommend expectant management. Do not recommend birth unless other maternal or fetal indications support it.	<i>Strong recommendation; moderate-quality evidence</i>
<i>After 37 and before 40 weeks:</i> Consider birth. The pregnant woman/person, their LMC and the obstetric team should negotiate the timing.	<i>Strong recommendation; moderate-quality evidence</i>
For pregnant women/people with pre-eclampsia who are stable and without severe features	
<i>Before 34+0 weeks:</i> Plan an expectant approach. A clear plan should be discussed and agreed with the pregnant woman/person and clearly documented, including level of monitoring and thresholds to plan birth if the woman/person's and/or fetus' condition deteriorates. Consider inpatient management.	<i>Strong recommendation; low-quality evidence</i>
<i>At 34+0 to 36+6 weeks:</i> Plan an expectant approach. Offer induction of labour if maternal or fetal indications support delivery (see <i>Box 2</i>). Consider inpatient management. Discuss with the pregnant woman/person and their whānau the risks and benefits for planned early birth (reducing maternal	<i>Strong recommendation; moderate-quality evidence</i>

<p>adverse outcomes) and expectant management (reducing need for neonatal intensive care unit admission and associated with improved early childhood developmental outcomes).</p>	<p><i>Good practice recommendation</i></p>
<p><i>After 37 (for example, 37+0) weeks:</i> Recommend birth. Continuing pregnancy after 37 weeks has no appreciable benefits and increases the risk of deterioration. Decide on the timing and method after discussion with the pregnant woman/person, their LMC and the obstetric team.</p>	<p><i>Weak recommendation; low-quality evidence</i></p>

For pregnant women/people with severe/unstable pre-eclampsia	
<p><i>Perivable gestation:</i> Manage the condition in a tertiary setting in consultation with neonatology, the pregnant woman/person and their whānau and maternal fetal medicine if required.</p> <p><i>Preivable gestation:</i> Manage the condition in an appropriate setting (secondary or tertiary) in consultation with neonatology, the pregnant woman/person and their whānau and maternal fetal medicine if required.</p> <p><u>See also the New Zealand Consensus Statement on the care of mother and baby(ies) at perivable gestations (Newborn Clinical Network 2019).</u></p>	<p><i>Strong recommendation; moderate-quality evidence</i></p>
<p><i>Before 34 weeks:</i> Adopt an expectant approach in a secondary or tertiary centre with resources for maternal and fetal monitoring and critical care of the woman/pregnant person and the baby. If indication for birth presents, administer corticosteroids for fetal lung maturation and, if <30 weeks, also administer magnesium sulphate for fetal neuroprotection.</p> <p>Plan to manage expectantly until the course of antenatal corticosteroids is complete and woman/person has been transferred to a centre with the appropriate level of neonatal care, but expedite birth if the maternal or fetal condition deteriorates.</p>	<p><i>Strong recommendation; moderate-quality evidence</i></p> <p><i>Good practice recommendation</i></p>
<p><i>After 34 weeks:</i> Recommend birth after stabilising the woman/person in a centre with appropriate resources to care for the woman/pregnant person and the baby.</p>	<p><i>Strong recommendation; low-quality evidence</i></p>
For pregnant women/people with HELLP or eclampsia	
<p><i>Any gestational age:</i> Recommend birth after stabilising the woman/person and after they have completed a course of corticosteroids (≤34+6 weeks) and magnesium for neuroprotection (if <30 weeks) (unless there is maternal or fetal deterioration and if time permits).</p>	<p><i>Strong recommendation; moderate-quality evidence</i></p>

Anaesthesia	
Consider neuraxial methods of analgesia (that is, spinal, epidural and CSE) in labour, even for pregnant women/people with lower platelet counts. Do not recommend neuraxial methods when the platelet count is $<80 \times 10^9/L$.	<i>Strong recommendation; low-quality evidence</i>
Do not recommend fluid preloading when siting neuraxial anaesthetics.	<i>Strong recommendation; very low-quality evidence</i>
Spinal anaesthesia and CSE are the preferred techniques for caesarean section if an epidural is not already in place.	<i>Strong recommendation; very low-quality evidence</i>
If general anaesthesia is necessary, rapid sequence induction is the preferred technique. Aggressively prevent the hypertensive response to intubation.	<i>Strong recommendation; low-quality evidence</i>
Recommend propofol as an induction agent for general anaesthesia.	<i>Weak recommendation; very low-quality evidence</i>
Do not recommend central venous pressure monitoring.	<i>Strong recommendation; very low-quality evidence</i>
Do not recommend pulmonary artery catheterization.	<i>Strong recommendation; very low-quality evidence</i>
Consider a peripheral arterial line for monitoring BP.	<i>Strong recommendation; very low-quality evidence</i>
Continue magnesium sulphate during caesarean section.	<i>Strong recommendation; low-quality evidence</i>
Recommend fluid restriction to reduce the risk of fluid overload in the intrapartum and postpartum periods. Usually limit total fluids to 80–85 mL/hour for severe pre-eclampsia.	<i>Strong recommendation; low-quality evidence</i>
Neuraxial anaesthesia is less likely to cause hypotension in pre-eclamptic pregnant women/people than in healthy pregnant women/people, but it may still occur.	<i>Good practice recommendation</i>
A good working epidural in labour for a pregnant woman/person with a severe HDP may be useful to help reduce the hypertensive response to labour pain and can easily be topped up if a caesarean section follows. This may avoid the need for a general anaesthetic in an emergency.	<i>Good practice recommendation</i>

Consider potential side effects and the woman/person's choice before opting for an epidural.	
Mode of birth	
Recommend vaginal birth as the preferred mode of birth unless contraindicated for the woman/pregnant person or the fetus. Eclampsia is not an indication for caesarean section. In many cases, induced labour is a safe option.	<i>Weak recommendation; low-quality evidence</i>
<p>Make the decision about mode of birth with the woman/person and the medical team (including obstetrics, neonatology and anaesthetics).</p> <p>Recommend vaginal birth with or without induction in pregnant women/people with pre-eclampsia but no other obstetric contraindications.</p> <p>Consider caesarean before 28 weeks of gestation because labour induction is less successful and maternal and fetal disease is likely to be more severe.</p>	<i>Weak recommendation; very low-quality evidence</i>
Actively manage the third stage of labour.	<i>Strong recommendation; very low-quality evidence</i>
Avoid ergometrine and Syntometrine® as an uterotonic in pregnant people with HDP except when massive obstetric haemorrhage occurs.	<i>Weak recommendation; very low-quality evidence</i>

Postpartum

HDP can have lifelong consequences. This section covers the immediate period after birth followed by long-term considerations and recommendations.

Postnatal monitoring	
Carefully monitor pregnant women/people for increasing hypertension postpartum. Blood pressure frequently increases about three to five days after birth. Continue to monitor BP at routine postnatal assessments (see table 2: Monitoring requirements for pregnant women/people with HDP).	<i>Strong recommendation; very low-quality evidence</i>

Continue to observe strict fluid balance in pregnant women/people with severe pre-eclampsia.	<i>Weak recommendation; low-quality evidence</i>
Monitor until all signs of pre-eclampsia (including pre-eclampsia bloods) return to normal, but beware of post-partum severe features of pre-eclampsia or eclampsia.	<i>Strong recommendation; high-quality evidence</i>
Most commonly used antihypertensive medicines appear to be safe for babies. The benefits of breastfeeding outweigh potential risks to babies of transfer of antihypertensive medicines in breast milk.	<i>Good practice recommendation</i>
Pregnant women/people with HDP are at higher risk of venous thromboembolism. Assess the need for preventive treatments, using a recognised risk assessment tool.	<i>Good practice recommendation</i>

Pregnant women/people may have ongoing mental health issues after an experience of a complex pregnancy. This experience can be frightening for the woman/person and their family/whānau. Further information on mental health and pre-eclampsia and hypertension can be found in the companion document *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in Aotearoa New Zealand: Evidence statements* (Te Whatu Ora 2022).

Mental health screening and debriefing	
Screen for postnatal depression.	<i>Strong recommendation; very low-quality evidence</i>
Give pregnant women/people the opportunity to debrief after experiencing hypertension or pre-eclampsia in pregnancy. Discuss what this means for future pregnancies and their long-term health.	<i>Strong recommendation; low-quality evidence</i>
Long-term risks	
Give pregnant women/people with a history of HDP information on long-term risks of pre-eclampsia, including cardiovascular disease, and the importance of following a healthy lifestyle. (See table 3 for a list of these risks.)	<i>Strong recommendation; very low-quality evidence</i>
Give pregnant women/people with a history of pre-eclampsia information on risks linked with subsequent pregnancies. Give them the opportunity to discuss contraceptive options.	<i>Weak recommendation; very low-quality evidence</i>

GP follow-up: Assess pregnant women/people with a history of pre-eclampsia for BP, lipids, HbA1c, thyroid function and BMI.	<i>Weak recommendation; very low-quality evidence</i>
Hospital to send a comprehensive discharge summary to the pregnant woman/person and their LMC and GP, including postpartum plan of care, monitoring and specific advice on antihypertensive medication. This is particularly important for arranging long-term, ongoing follow-up.	<i>Good practice recommendation</i>
Many pregnant women/people are unaware of the long-term health implications of pre-eclampsia. Explain these implications and take the time to be sure each pregnant woman/person fully understands them.	<i>Good practice recommendation</i>

Table 3: Risk of developing long-term conditions for pregnant women/people who have had gestational hypertension or pre-eclampsia

Future risk	HDP (index pregnancy)	
	Gestational hypertension*	Pre-eclampsia
	Relative risk (95%CI)	
Gestational hypertension in future pregnancy	3.4 (2.0–5.8) (Zhang et al 2001)	6.3 (3.4–12.0) (Vikse et al 2008)
Pre-eclampsia in future pregnancy	7.6 (2.3–24.8) (Brown et al 2007)	7.2 (5.9–8.8) (Brown et al 2013)
Chronic hypertension	3.4 (0.8–13.9) (Bellamy et al 2007)	3.1 (2.5–3.9) (Brown et al 2013)
Cardiovascular disease	1.7 (0.6–4.4) (Bellamy et al 2007)	2.3 (1.9–2.8) (Brown et al 2013)
Cerebrovascular disease	1.5 (1.1–2.0) (Jónsdóttir et al 1995)	1.8(1.4–2.2) (Bellamy et al 2007)
Venous thromboembolism	–	1.8 (1.4–2.3) (Bellamy et al 2007)
End-stage kidney disease	–	4.3 (3.3–5.6) (Vikse et al 2008)

* More research is required around the long-term effects of gestational hypertension.

Further advice on Te Tiriti o Waitangi

Health practitioners may find that their professional associations offer helpful support around giving effect to the principles of Te Tiriti o Waitangi, for example:

- Medical Council of New Zealand: Statement on cultural safety (MCNZ 2019b)
- Medical Council of New Zealand: He Ara Hauora Māori: A pathway to Māori health equity (MCNZ 2019a)
- Midwifery Council of New Zealand: *Statement On Cultural Competence For Midwives* (Midwifery Council of New Zealand nd)
- Tūranga kaupapa, principles that give life and meaning to the midwifery profession's recognition of Māori as tangata whenua and the profession's obligations under Te Tiriti, in *Midwives: Handbook for Practice* (NZ College of Midwives 2015)
- The Royal Australasian College of Physicians: *Guideline Commentary on Consulting with Māori and Their Whānau* (Buchanan et al nd).

Health practitioners may also find it valuable to familiarise themselves with:

- *Best Health Outcomes for Māori: Practice implications* (Māori Ora Associates 2006)
- Improving Māori health through clinical assessment: Waikare o te Waka o Meihana (Pitama S et al 2014)
- University of Otago's Continuing Education: MIHI 501 Health Professionals Course: Application of Hui Process and Meihana Model to Clinical Practice³.

Cultural safety

Practising in a culturally safe way is important and a requirement of Te Tiriti o Waitangi, particularly in giving effect to the principles of active protection, options and partnership. It is important that health practitioners know that tikanga, or correct protocols and practices, are often specific to whānau, hapū and iwi and that observing tikanga does not involve a 'one size fits all' approach. Similarly, mātauranga Māori, or Māori knowledge, is not a single entity; rather there is both traditional and contemporary mātauranga Māori as well as mātauranga Māori that is specific to hapū and iwi environments, including land, seas,

³ For more details on this Continuing Education course, see the course webpage on the University of Otago website at: www.otago.ac.nz/continuingeducation/about/otago731553.html

waterways, weather systems, the stars, flora and fauna, and things seen and unseen. Older forms of mātauranga Māori have been somewhat protected from colonisation because they were composed or narrated in te reo Māori.

Rangatiratanga, or self-determining rights over tikanga and mātauranga Māori, is crucial to the safety and survival of that tikanga and mātauranga Māori. For this reason, health practitioners should be very careful to avoid imposing their understanding of tikanga or mātauranga Māori on Māori through maternity care. In addition, they should not assume that all Māori are familiar with terms such as ‘tikanga’, ‘mātauranga’ and ‘Te Tiriti’. Māori who are unfamiliar with such terms can experience such an assumption as diminishing their mana⁴ as expressed by Te Tiriti, which would be an opposite outcome to that intended by Te Tiriti, this consensus guideline and *Ngā Paerewa*.

⁴ Te Tiriti o Waitangi framework as set out in Whakamaua: Māori Health Action Plan 2020–2025 (Ministry of Health 2020c).

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Glossary

Antenatal	Occurring before birth; concerned with the care and treatment of the unborn child and pregnant woman/person.
Body mass index (BMI)	The body's weight in kilograms divided by the square of the woman/person's height in metres. This measurement is used to assess obesity.
Eclampsia	Seizures (convulsions) in a pregnant woman/woman/person related to HDP.
Evidence statement	A table summarising the results of a collection of studies, which together represent the evidence supporting a recommendation or series of recommendations in a guideline.
Expectant management	Continuation of a pregnancy beyond 48 hours while monitoring the woman/pregnant person and the fetus, rather than applying an intervention, such as caesarian section.
Fetal	Of or relating to a fetus or to the period of the development of the fetus.
Gestation	The time from conception to birth – the duration of gestation is measured from the first day of the last normal menstrual period.
Gestational age	The period of time between last menstrual period and birth.
HbA1c	Glycated haemoglobin, formed when glucose in the body builds up on the body's red blood cells; can develop into diabetes complications.
Hyperreflexia	Overactive reflexes.
Hypertension	High blood pressure.
Intrapartum	Relating to the period of labour and birth.
Neonatal	Relating to the neonatal period, which is the first four weeks after birth.
Neuraxial	Anaesthesia (also known as regional anaesthesia). Can be spinal, epidural or combined spinal and epidural anaesthesia (CSE).
Obstetric team	For the purposes of this guideline, the obstetric team is a specialist team that will include an obstetric specialist and

	registrar and may also include an obstetric physician, maternal fetal medicine specialist and/or neonatologist.
Odds ratio (OR)	Similar to risk ratio (RR) but with a different statistical definition. In a rare outcome (for example, a disease prevalent in less than 10 percent of the population), the OR will be approximately the same as the RR. However, it is defined as the ratio of the relative odds of the outcome occurring in one group compared with another group and is used when the absolute risk (risk in the general population) is unknown.
Woman/person-centred care	Care that gives respect and dignity by supporting the woman/person to be central and active in their own care through: <ul style="list-style-type: none"> • holistic care that takes account of the woman/person's physical, psychosocial, cultural, emotional and spiritual needs • focusing on the woman/person's expectations, aspirations and needs rather than the institutional or professional needs • recognising the woman/person's right to self-determination through choice, control and continuity of care from one or more known caregivers recognising the needs of the baby and the woman/person's whānau.
Pre-eclampsia	A pregnancy-induced condition that can occur in the second half of pregnancy. It is characterised by high blood pressure, sudden swelling along with rapid weight gain due to fluid retention and protein in the urine.
Preterm birth	The birth of a baby of less than 37 weeks' gestation.
Preterm labour	Labour before 37 weeks' gestation.
Postnatal	Occurring after birth; concerned with the care and treatment of the baby and woman/birthing person after birth.
Postpartum	The period of time after birth.
Proteinuria	The presence of excess proteins in the urine.
Randomised controlled trial (RCT)	A comparative study in which participants are randomly allocated to intervention and control groups and followed up to examine differences in outcomes between the groups.

Referral Guidelines	<i>Guidelines for Consultation with Obstetric and Related Medical Services (Referral Guidelines)</i> (Ministry of Health 2012).
Regimen	A pattern of treatment like dose or frequency.
Relative risk/risk ratio (RR)	The ratio of risks in two treatment groups. In intervention studies, it is the ratio of the risk in the intervention group to the risk in the control group. A risk ratio of one indicates no difference between comparison groups. For undesirable outcomes, a risk ratio that is less than one indicates that the intervention was effective in reducing the risk of that outcome.
Risk	The probability of an outcome that is given by the number with the outcome divided by the number with and without the outcome.
Small for gestational age (SGA)	An infant with birthweight less than the tenth birthweight centile or a fetus with an estimated fetal weight on a customised growth chart less than the tenth customised centile for gestation.
Spot urine	The sampling of a single, untimed urine specimen, voided spontaneously by the patient.
Systematic review	A review of a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant research and to collect and analyse data from the studies that are included in the review. Statistical methods (meta-analysis) may or may not be used to analyse and summarise the results of the included studies.

Abbreviations used in this guideline

ABCDE	Airway, breathing, circulation, disability, exposure
ACE	Angiotensin converting enzyme
AFV	Amniotic fluid volume
ALT	Alanine transaminase
ANZCA	Australian and New Zealand College of Anaesthetists
ART	Assisted reproductive technology
AST	Aspartate transaminase
BMI	Body mass index
BP	Blood pressure
CI	Confidence interval
CSE	Combined spinal and epidural anaesthesia
CTG	Cardiotocograph
dBp	Diastolic blood pressure
ECG	Electrocardiogram
FBC	Full blood count
FGR	Fetal growth restriction
GP	General practitioner
HDP	Hypertensive disorders in pregnancy
HELLP	Haemolysis, elevated liver enzymes and low platelet count
IM	Intramuscular
IUGR	Intrauterine growth restriction
IV	Intravenous
LFT	Liver function test
LMC	Lead maternity carer
NZSSD	New Zealand Society for the Study of Diabetes
OR	Odds ratio
PCR	Protein creatinine ratio
RACP	The Royal Australasian College of Physicians
RANZCOG	The Royal Australian and New Zealand College of Obstetricians and Gynaecologists
RCT	Randomised controlled trial
RR	Risk ratio or relative risk
sBP	Systolic blood pressure
SGA	Small for gestational age
SLE	Systemic lupus erythematosus
SpO₂	Peripheral capillary oxygen saturation
USS	Ultrasound scan

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