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

A clinical practice guideline

DRAFT UPDATE FOR CONSULTATION

September 2021

Contents

Process to update the 2018 clinical practice guideline

The Ministry of Health has contracted *Allen + Clarke* to undertake an update of the 2018 clinical practice guideline, *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in New Zealand*.

Our project team (Anna Gribble, Carly Woodham, Professor Frank Bloomfield, Dr Michelle Wise, and Norma Campbell) is grateful to the Maternity Guidelines Review Steering Group for its advice on the overall guidelines document, treatment summaries and evidence reviews. The Maternity Guidelines Review Steering Group includes:

- Dr Angela Beard (co-Chair, He Hono Wahine)
- Sue Bree (co-Chair, Midwifery Leaders' Group)
- Claire MacDonald (New Zealand College of Midwives)
- Dr Karaponi Okesene Gafa (Royal Australian and New Zealand College of Obstetricians + Gynaecologists)
- Dr Lesley Dixon (New Zealand College of Midwives)
- Liz Lewis-Hills (New Zealand Society for the Study of Diabetes)
- Dr Mariam Buksh (Royal Australasian College of Physicians)
- Dr Matthew Drake (Australian and New Zealand College of Anaesthetists)
- Dr Rachael McConnell (Royal Australian and New Zealand College of Obstetricians + Gynaecologists)
- Dr Rosemary Hall (New Zealand Society for the Study of Diabetes)
- Dr Sue Belgrave (Royal Australian and New Zealand College of Obstetricians + Gynaecologists)
- Dr Trevor Lloyd (Royal New Zealand College of General Practitioners).

Acknowledgement of gender

Not all people who become pregnant identify with the female gender. Terms specific to female identity are used in this document for ease of understanding, while acknowledging that this is a cis and heteronormative approach. We do not intend to exclude people of diverse gender identity, gender expression or sex characteristics where the words wahine/woman/women/her/she are used. Pregnant people should advise their Lead Maternity Carer (LMC) and the other health professionals involved in their care of their preferred pronouns so that these are used correctly and documented in their records.

Feedback questions

Proposed updates to *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in New Zealand* are based on consensus discussions within the Maternity Guidelines Review Steering Group, targeted literature reviews and general review. Literature reviews were conducted to answer six research questions about the prediction of hypertensive disorders in pregnancy (HDP), timing of birth, the use of low dose aspirin to prevent HDP, postnatal monitoring and tailoring the guideline to specific population groups. Revisions to the guideline include:

- splitting the guideline into two components: the guidelines and a companion document, *Evidence Statements*
- recognition of *Ngā Paerewa Health and Disability Services Standards*
- a section on Te Tiriti o Waitangi
- wording changes to recommendations to enhance clarity throughout
- updates to the recommendations on low dose aspirin
- updates to the postpartum monitoring requirements
- updates to recommendations on timing of birth
- update to the recommendations on magnesium sulphate
- additions to the literature in the companion document, *Evidence Statements*.

Thank you for considering this draft updated *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in New Zealand*. We appreciate your thoughts and comments in relation to the following questions.

1. Do you have any feedback on the proposed change to the **timing of birth recommendation for pre-eclampsia without severe features at 34+0 to 36+6 weeks' gestation** (page 36)? See evidence text box overleaf.
2. Do you have any feedback on the **treatment summaries**?
3. Do you have any feedback on the **monitoring requirements** table (*Table 2*)?
4. Do you have any other views or feedback on the draft updated *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in New Zealand Guideline?*

Please send your feedback to agribble@allenandclarke.co.nz by **5 November 2021.**

1 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). This will support a standardised approach to the diagnosis and management of hypertension, pre-eclampsia, and eclampsia to improve the outcomes for mothers and babies. This guideline covers recommendations for:

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

The guideline should also be read in conjunction with the *Ngā paerewa Health and disability services standard 8134:2021* (*Ngā paerewa*) and the corresponding *Sector Guidance for Birthing Units* and *DHB in-patient/private hospital services*. *Ngā paerewa*, alongside the sector guidance and the *Diagnosis and Treatment of Hypertension and Pre-eclampsia*, provide a suite of information about best practice maternity service provision.

2 Users of the guideline

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

Women and whānau can use the *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in New Zealand* guideline to understand how HDP are detected, treated and managed.

3 The need for the guideline

Pre-eclampsia complicates approximately 3–8% of pregnancies in Aotearoa New Zealand.[1] HDP together affect up to 10% of pregnancies (4–5% nulliparous; 2–3% in low-risk multipara and up to 20% in women with major risk factors).[2]

Chronic hypertension, gestational hypertension and pre-eclampsia have increased over time as a result of changes in the characteristics of mothers (such as their age and pre-pregnancy weight), whereas eclampsia has declined following on from widespread antenatal care and use of prophylactic treatments like magnesium sulphate.[3,4]

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.[5] HDP are linked with acute and long-term morbidity in mothers and babies.[6,7,8,9]

Eclampsia is preventable through early detection and management of pre-eclampsia. Practices in diagnosing and treating women with HDP vary throughout Aotearoa New Zealand. The proportion of women admitted to hospital with eclampsia, which is an indicator of severe maternal morbidity, also varies by ethnicity and across district health boards.[9]

4 Te Tiriti o Waitangi

Giving effect to Te Tiriti can be demonstrated through the practical application of the principles as articulated by the courts and the Waitangi Tribunal.[1] Applying the principles to maternity services is vital to enabling Māori to express their mana,[2] and ensures Māori receive high-quality, culturally safe and equitable health outcomes. Using the principles to work effectively and respectfully with Māori requires maternity services and maternity care providers to demonstrate the principles of Te Tiriti in their day-to-day practice with Māori. The principles of Te Tiriti provide the framework for maternity services and maternity care providers. How these principles apply to maternity services is supported by *Ngā paerewa*, and in particular, 1.1 Pae ora healthy futures.

The Waitangi Tribunal concluded that persistent health inequities experienced by Māori were the consequence of the failure to apply the principles of Te Tiriti at structural, organisational and health practitioner levels of the health and disability sector. Giving effect to Te Tiriti requires maternity care providers to know the principles of Te Tiriti and be able to capably apply these in partnership with Māori in their day-to-day maternity clinical practice. For the health and disability sector, the principles of Te Tiriti are as follows:

- **Tino rangatiratanga**: Maternity services and maternity care providers support the right of Māori to receive effective maternity care, conceptualising the woman's decisions 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**: Maternity services and maternity care providers can contribute to equitable obstetric and neonatal health outcomes for Māori by ensuring that, at a minimum, these outcomes match those of other New Zealanders. Equitable maternity outcomes will be achieved when the *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy in New Zealand* guideline is implemented in ways that give effect to the principles of Te Tiriti, relevant professional competencies, and *Ngā paerewa*.
- **Active protection**: Maternity services and maternity care providers share evidence-based information about obstetric and neonatal outcomes so that Māori can make decisions and prepare themselves to uphold their tikanga or cultural practice (i.e., karakia, rongoa, support people, etc.). Maternity care providers actively support Māori to make decisions that are best for them.
- **Options**: Maternity services and maternity care providers ensure that Māori have maternity care that enables them to uphold their tikanga or cultural practice regardless of where birth takes place. Processes must complement wahine Māori mana or inherent authority and dignity, support their tikanga or cultural practice, and be culturally safe as defined by Māori.
- **Partnership**: Maternity services and maternity care providers work in partnership with Māori, including a wahine Māori whānau, if requested. A partnered approach to the process and decision-making ensures wahine Māori can enact their rangatiratanga or self-determine their futures while exercising mana motuhake or authority over their bodies and reproductive health.

[1] In Hauora Report, Waitangi Tribunal, 2019: https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_152801817/Hauora%20W.pdf

[2] See Ministry of Health Te Tiriti o Waitangi Framework for the Ministry's four goals, each expressed in terms of mana: https://www.health.govt.nz/system/files/documents/pages/whakamaua-tiriti-o-waitangi-framework-a3-aug20.pdf

4.1 Cultural safety

Practicing in a culturally safe way is important and a requirement of Te Tiriti, particularly 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 tikanga is not a 'one size fits all'. Similarly, mātauranga Māori or Māori knowledge is not a single entity; rather there is traditional and contemporary mātauranga Māori, and mātauranga Māori that is specific to hapū and iwi environments that include land, seas, waterways, weather systems, the stars, flora and fauna, and things seen and unseen. Older forms of mātauranga Māori have been somewhat protected from colonisation by virtue of having been composed or narrated in te reo Māori.

Rangatiratanga or self-determining rights over tikanga and mātauranga Māori is crucial to its safety and survival. For this reason, health practitioners should be very careful not impose their understanding of tikanga or mātauranga Māori onto Māori through maternity care. Nor should they assume that all Māori are familiar with terms such as tikanga, mātauranga and Te Tiriti. Unfamiliarity with such terms can be experienced by Māori as a diminishment of their mana10 as expressed by Te Tiriti; an outcome that is antithetical to Te Tiriti, the *Diagnosis and Treatment of Hypertension and Pre-eclampsia in Pregnancy Guideline*, and the Standards: Ngā Paerewa.

Health practitioners may find support from their professional association to be helpful in terms of giving effect to the principles of Te Tiriti. This may include the following:

- Medical Council of New Zealand: Statement on cultural safety
- Medical Council of New Zealand: He Ara Hauora Māori: A Pathway to Māori Health Equity
- Midwifery Council of New Zealand: Statement on Cultural Competence for Midwives
- Turanga 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. See Midwives' Handbook for Practice
- The Royal Australasian College of Physicians: Guideline commentary on consulting with Māori and their whānau.

Health practitioners may also value familiarisation with the following:

- Māuri Ora Associates: Best health outcomes for Māori: Practice implications
- New Zealand Medical Association: Improving Māori health through clinical assessment: Waikare o te Waka o Meihana
- University of Otago MIHI 501 Health Professionals Course: Application of Hui Process and Meihana Model to Clinical Practice.

4.2 Equity

In New Zealand Aotearoa people have differences in health outcomes that are not only avoidable but unfair and unjust.[11] The structural determinants of health and wellbeing – for example income, employment, education, housing, and multiple forms of discrimination –

negatively impact people's health but they have little control over these. Health inequities – like inequitable maternity outcomes – are not about people but are the result of avoidable structural determinants in our communities.[3] When health practitioners understand the structures that create inequitable maternity outcomes, they can use different approaches and resources to achieve equitable maternity outcomes.

Achieving equitable maternity outcomes for Māori happens when service providers and health practitioners understand the structures that create Māori disadvantage and are supported to implement the Guideline recommendations in ways that give effect to the principles of Te Tiriti, meet professional competencies, and *Ngā paerewa*.

Other population groups in New Zealand Aotearoa also experience inequities that are unfair and unjust. Achieving equitable maternity outcomes for all happens when maternity service providers and health practitioners understand the structures that create disadvantage and are supported to implement the *Hypertension and Pre-eclampsia in Pregnancy Guideline* in ways that give effect to rights while also meeting professional competencies and Ngā paerewa.

Last, health practitioners should be aware that many peoples in Aotearoa New Zealand conceptualise anatomy, pregnancy, gender, sexuality, reproduction, contraception and birth in different ways according to their worldviews. Therefore, health practitioners should use proven health literacy practices[12] to communicate effectively with everyone using their services (see the sector guidance for 2021 *Nga Paerewa* Standard 1.4 E whakautetia ana ahau I am treated with respect and criteria 1.4.2).

4.3 Recommendations

The following recommendations apply:

- Health service providers and health practitioners must consider their commitments to deliver equitable services and meet obligations under Te Tiriti o Waitangi during implementation.
- Health service providers should ensure that patients with hypertension or pre-eclampsia during pregnancy, their partners and whānau are provided with culturally safe opportunities for discussion, reflection and debriefing.
- Māori, Pacific and Indian women are over-represented in poor obstetric outcomes related to HDP. Health service providers should monitor hypertension and pre-eclampsia in pregnancy by severity and ethnicity so that equity can be monitored, variations in outcome identified and areas for quality improvement identified and implemented based on this analysis.
- Assess and address barriers to effective communication with vulnerable groups including literacy, language, geographical, socioeconomic and cultural barriers.

5 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[13] statement. HDP includes:

- chronic/pre-existing hypertension
- gestational hypertension
- pre-eclampsia – de novo or superimposed on chronic hypertension
- eclampsia
- HELLP syndrome (see below for the definition of eachof these conditions).

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

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

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 atleast four hours apart.

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

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

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

Proteinuria is not essential for a pre-eclampsia diagnosis.

1. proteinuria – spot urine protein:creatinine ratio ≥30 mg/mmol or ≥2+ on dipstick testing confirmed by a protein:creatinine ratio test
2. other maternal organ dysfunction:
    - renal insufficiency (creatinine >90 μmol/L, urine output of <80 mL/4 hour)
    - liver involvement - elevated transaminases (aspartate transaminase (AST) and alanine transaminase (ALT)) – at least twice upper limit of normal ± right upper quadrant or epigastric abdominal pain)

        Note normal ranges are ALT 0-30 u/L andAST 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 (thrombocytopaenia – platelet count below 100 × 10^9/L, haemolysis)

3. uteroplacental dysfunction (eg, fetal growth restriction, abruption).

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

- difficulty controlling blood pressure (dBP ≥110 mmHg **or** sBP ≥160 mmHg)
- 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 ±right upper quadrant or epigastric abdominal pain (may be referred to upper back)
  b) progressive renal insufficiency (serum creatinine >90 μmol/L or doubling of serum creatine concentration in the absence of other renal disease, urine output of <80 mL/4 hour)
  c) worsening thrombocytopaenia (platelet count less than 100 × 10^9/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 women.
- worsening fetal growth restriction (with associated oligohydramnios or abnormal doppler)

☑ In a woman with pre-eclampsia, the presence of any of the following is an indicator of HELLP:

- maternal platelet count of less than 100 × 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

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

6 Clinical practice recommendations

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

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

Alongside each recommendation is a grade for the quality of the evidence that has informed the recommendation and the strength of the recommendation. This guideline strongly encourages practices marked ☑ and strongly discourages those marked ☒.

6.1 Pre-conception counselling recommendations

Where any woman 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 who wants to become pregnant and is on antihypertensive medicines, discuss changing from an angiotension converting enzyme (ACE) inhibitor to an alternative medication, if applicable.	*Strong recommendation; low-quality evidence*
Do not stop anti-hypertensives without ensuring blood pressure is controlled.	☑ *Good practice recommendation*

6.2 Antenatal recommendations

As early as possible in pregnancy or when the woman books for antenatal services, identify risks for HDP as part of the full health assessment (see *Table 1*, overleaf).	*Strong recommendation; low-quality evidence*
Refer women 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 women with a major risk factor for developing pre-eclampsia and commence between 12- and 16-weeks' gestation.	*Strong recommendation; moderate-quality evidence*
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	
For women who have a major risk factor for pre-eclampsia, offer calcium supplementation along with dietary advice to achieve 1 g elemental intake per day, from booking to birth.	*Strong recommendation; moderate-quality evidence*
Predictive testing	
Do not routinely use tools which combine different biochemical markers and uterine artery Doppler for predicting pre-eclampsia.	*Weak recommendation; very low-quality evidence*
Lifestyle	
Give specific education around optimal weight gain.	*Weak recommendation; very low-quality evidence*
Do not offer multi-vitamins, vitamin C, vitamin E or other supplements such as fish oil or magnesium in women at risk of preeclampsia.	*Strong recommendation; moderate-quality evidence*
Do not recommend salt restriction in women at risk of pre-eclampsia.	*Strong recommendation; moderate-quality evidence*
Do not recommend bed rest or restriction of physical activity in women at risk of pre-eclampsia.	*Strong recommendation; very low-quality evidence*

Women's experiences of antenatal care	
Develop educational tools and make available to help women understand issues relating to hypertension in pregnancy and pre-eclampsia: tools should consider women's different levels of health literacy and demographic diversity.	*Strong recommendation; very low-quality evidence*
Work is needed to ensure equity of care for all women, in particular, Māori, Pacific and Indian women 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 women and their whānau and keep them informed throughout the health decision-making process.	*Strong recommendation; very low-quality evidence*
Assess, address and document women's need for psychological care and support following a severe HDP	*Strong recommendation; very low-quality evidence*
Offer a referral to support agencies, such as social work support, to all women with pre-eclampsia.	☑ *Good practice recommendation*
Assess and address barriers to effective communication with vulnerable groups of women, such as literacy, language, geographical, socioeconomic and cultural barriers.	☑ *Good practice recommendation*
Antihypertensives	
Urgently treat all women with severe hypertension (dBP ≥110 mmHG or sBP ≥160 mmHg) with antihypertensives to acutely lower blood pressure. *See Box 1 (page 20) for acute treatment options*	*Strong recommendation; low-quality evidence*
Consider antihypertensives for women with gestational hypertension (dBP ≥90 mmHG or sBP ≥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.	*Strong recommendation; very low-quality evidence*
Provide information on antihypertensive medicines, symptoms of pre-eclampsia, and when and how to report symptoms, in plain English or a language the woman understands if English is a second 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: Increased risk of developing pre-eclampsia if woman has 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)[14]	4.3[a]	3.1–6.1
Renal disease[15]	4.1[a]	2.2–7.7
Chronic hypertension	3.6[a]	2.0–6.6
Previous history of HELLP[16]	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 sister	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)[17]	2.1	1.0–4.3
Genetic ancestry – African[18]	3.0[a]	2.0–4.4
– Indian	2.7[a]	1.3–5.5
– Māori[19]	1.5[a]	1.2–2.0
– Pacific	1.2[a]	1.0–1.6
Change in partner[20]	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)[21]	1.6[a]	1.36–1.95
dBP ≥80 mmHg at booking	1.4[b]	1.01–1.87
Any artificial reproduction technology [24,21]	1.2[a]	1.10–1.24

a. Adjusted odds ratio
b. Relative risk. Data from Duckitt and Harrington (2005)[22] 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 women with severe hypertension (dBP ≥110 or sBP ≥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 women with severe hypertension (dBP110 or sBP ≥160 mmHg).**
Nifedipine 10 mg conventional release tablet (oral) Onset of action: 30–45 minutes Onset of maximum effect: 30 minutes Repeat: after 30–45 minutes (if needed) Maximum: 80 mg daily
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
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 women 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 and her baby in conjunction with the woman and her LMC.	*Strong recommendation; very low-quality evidence*
For women with hypertension who are managed as outpatients, base the frequency of additional antenatal appointments (from the conventional appointment schedule) on each woman's individual needs, the severity of her condition and her preferences.	*Strong recommendation; very low-quality evidence*
For a woman 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's perspective.	*Strong recommendation; very low-quality evidence*
Evidence shows elevations in serum uric acid (hyperuricemia) are 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*
Women with a major risk factor for pre-eclampsia should have uterine artery Doppler studies performed at their 20-week anatomy scan. The result of this assessment can be used to plan the schedule for serial growth assessment.	☑ *Good practice recommendation*
Make a clear management plan for all women with HDP. The plan should include clinical responsibilities and reflect the women's preferences.	☑ *Good practice recommendation*

Table 2. Monitoring requirements for women with HDP

Pre-existing/chronic	Gestational hypertension	Pre-eclampsia /expectant management	Severe pre-eclampsia/ eclampsia (hospital inpatient)	Magnesium sulphate monitoring (high dependency-likesetting)	Intrapartum pre- eclampsia/ eclampsia	Postpartum
Identify **risk f**actors for pre-eclampsia	Blood pressure 1–2times a week	4–6 hourly **blood pressure** (except overnight when an interval of 8 hoursis acceptable)	One-on-one care	One-on-one care	**Blood pressure** at least hourly	Recommend women who have had pre-eclampsia **stay in secondary or tertiary facility** for at least 72 hours postpartum
			Hourly **blood pressure**, respiratory rate, oxygen saturation	**Blood pressure** every 5 minutes at loading dose then hourly during maintenance dose		
Consider more frequent **blood pressure measurementsand appointments** than normal if for pregnant women who have any of the risk factorsand unstable pre-eclampsia; individualise decision to the woman	**Proteiniuria at least** weekly[a]	Twice weekly **pre-eclampsia bloods** = full bloodcount (including haemoglobin, platelet count), creatinine, electrolytes, liver function tests (albumin, ALT and AST)	At least daily **pre-eclampsia bloods** = full bloodcount (including haemoglobin, platelet count), creatinine, electrolytes, liver function tests (albumin, ALT and AST)	At least daily **pre-eclampsia bloods** = full blood count (including haemoglobin, platelet count), creatinine, electrolytes, liverfunction tests (albumin, ALT and AST)	**Urine output** or **fluid balance**	Base the decision for **discharge timing** on the individual woman and on whether satisfactory monitoring and follow- up care arrangements have been made
	Pre-eclampsia bloods if sudden increase inBP or new proteinuria				Continuous **cardiotoco graphy**	4–6 hourly **blood pressure** (except overnight when an interval of 8 hours is acceptable)while inpatient
	Fetal assessment at time of diagnosis. Do not repeat USS in <2 weeks,unless fetal indications[b]	Perform **coagulation studies** if liver testsare abnormal or you have concerns about possible placental abruption	Perform **coagulation studies** if liver testsare abnormal or you have concerns about possible placental abruption	Perform **coagulation studies** if liver tests are abnormal or youhave concerns about possible placental abruption	**Fluid restriction** (replace loss at birth and then 80–85 mL/hour total fluid forsevere pre- eclampsia)	Monitor for **all signs of pre- eclampsia (including pre- eclampsia bloods)** returning to normal but beware of postpartum deterioration and eclampsia

Pre-existing/ chronic	Gestational hypertension	Pre-eclampsia /expectant management	Severe pre-eclampsia/ eclampsia (hospital inpatient)	Magnesium sulphate monitoring (high dependency-like setting)	Intrapartum pre-eclampsia/ eclampsia	Postpartum
Ongoing **fetal assessment**[b] for growth. If IUGR detected, follow the SGA pathway	Changes in **fetal movements**, other **signs/ symptoms** of pre-eclampsia. The woman assesses daily and her maternity carers when they see her	Repeat **laboratory investigations** more often if you have concerns about the condition of either mother or fetus	Repeat **laboratory investigations** more often if you have concerns about the condition of either mother or fetus	Repeat **laboratory investigations** more often if you have concerns about the condition of either mother or fetus		A BP check and assessment takes place at home within 24 hours of discharge from a hospital facility, and if normal, **follow up BP check** at 1 week and approximately weekly thereafter (with case-by-case planning to BP stability and condition severity.
		Cardiotocography (CTG) daily if inpatient	**Cardiotocography** daily	Continuous **cardiotoco-graphy**		Hospital to provide woman's GP with a **comprehensive discharge summary** including diagnosis, last BP, and any medication.
		Symptoms of labour (presence of contractions, rupture of membranes, abdominal pain, bleeding)	**Fluid restriction** 80–85 mL/hour total fluid for severe pre-eclampsia	**Toxicity monitoring** **Respiratoryrate/SpO_2** hourly **Patella reflexes hourly**		
		Symptoms of severe pre-eclampsia (headaches, visual changes, shortness of breath, epigastric pain, retrosternal pressure/pain, nausea, vomiting,	**Fluid balance** chart **Symptoms of labour** (presence of contractions, rupture of membranes, abdominal pain, bleeding)	**Urine output** (>100 mL over 4 hours)		

a**.** Urinalysis by dipstick followed by spot urine PCR if ≥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 fetalgrowth restriction or distress is suspected. c. Educate the woman around the need to contact her LMC urgently if she experiences symptoms of pre-eclampsia/eclampsia or any changes in fetal movements. ALT = alanine aminotransferase, AST = aspartate aminotransferase, BP=blood pressure, 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 bloodpressure more closely if blood pressure 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 women with 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,eg, ACE inhibitor
- BP at home 24-hour post discharge, then at one week, then approximately weekly thereafter (in line with case-by-case planning according to severity)
- Hospital to send woman'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 ≥90 OR sBP

At diagnosis

- Spot urine protein creatinine ratio (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 and symptoms of pre-eclampsia with the woman and her family

First-line Antihypertensives

- Labetalol
- Nifedipine
- Methyldopa

Maternal monitoring

- The obstetric team makes a management plan for ongoing care and monitoring in discussion with the woman and her 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

Pre-eclampsia bloods

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

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

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

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 and her LMC.

Intrapartum

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

Postpartum

- If on methyldopa, consider changing to another antihypertensive, eg, ACE inhibitor
- 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

Antihypertensives and breastfeeding

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

Pre-eclampsia

Hypertension (dBP ≥90 mmHg OR sBP ≥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 sBP140-160 and dBP 90-100 mmHg.
- Spot urine protein: creatinine ratio (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 woman and family

Maternal monitoring

- In hospital care provision, the obstetric team makes a management plan for ongoing care and monitoring in discussion with the woman and her 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

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

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 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. Management should be as an inpatient.
- At 34+0 to 36+6 weeks: Plan and expectant approach. Offer induction of labour if maternal or fetal indications support delivery (see box 2). Consider inpatient management.
- After 37 weeks: (eg, 37+0): Recommend birth. No appreciable benefit in continuing pregnancy after 37 weeks. The woman, her LMC and the obstetric team should negotiate the timing and method.

Intrapartum

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

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
- 6-week obstetric review

First-line antihypertensives

- Labetalol
- Nifedipine
- Methyldopa

Antihypertensives for acute lowering of BP

if dBP ≥110 mmHg OR sBP ≥160 mmHg

Nifedipine
10 mg conventional release tablet (oral)

Onset: 30–45 minutes

Repeat: after 30–45 minutes (if needed)

Maximum: 80 mg daily

Labetalol
Initially 20 mg IV bolus over 2 minutes

Onset: 5 minutes

Repeat with 40–80 mg

Repeat: every 10 minutes (if needed)

Maximum: 300 mg

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

Onset: 20 minutes

Repeat: every 20 minutes (if needed)

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/lowplatelets

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

Severe/unstable pre-eclampsia

Refer to Section 5. 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 protein: creatinine ratio (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 discussions with the obstetric and anaesthetic teams along with the woman and the LMC
- Hourly BP and respiratory rate
- Fluid balance chart
- At least daily pre-eclampsia bloods
- Conduct coagulation studies if liver function tests are abnormal oryou have concerns about possible placental abruption

Maternal monitoring – magnesium sulphate

- Blood pressure every 5 minutes during bolus dose, then hourly during maintenance dose
- Respiratory rate, O_2 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
- Before 34 weeks: Adopt expectant approach in a secondary or tertiary centre with resources for maternal and fetal monitoring and critical care of the mother 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 in a centre with appropriate resources for care of the mother and baby

Intrapartum

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

Postpartum

- Continue magnesium sulphate for 24 hours
- 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
- 6-week obstetric review

Antihypertensives for acute lowering of BP

Nifedipine

10 mg conventional release tablet(oral)

Onset: 30–45 minutes

Repeat: after 30–45 minutes (ifneeded)

Maximum: 80 mg daily

Labetalol

Initially 20 mg IV bolus over 2 minutes

Onset: 5 minutes

Repeat with 40–80 mg

Repeat: every 10 minutes (if needed)

Maximum: 300 mg

Hydralazine

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

Onset: 20 minutes

Repeat: every 20 minutes (if needed)

Maximum: 30 mg (consider IV bolusof crystalloid fluid before or when administering first IV hydralazine dose, usually 200–300 mL)

Magnesium sulphate

To prevent progression to eclampsia, this anticonvulsant mediine may 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, handsor feet
- Hyperreflexia

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 baby but aim to stabilise and monitor ifpossible 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 should include discussionwith the anaesthetic and intensive care teams but with obstetric lead
- Continuous SpO_2 monitoring
- Fluid balance
- At least daily pre-eclampsia bloods
- Conduct coagulation studies if liver function tests are abnormal or you haveconcerns about possible placental abruption

Maternal monitor

- Maternal monitoring – magnesiumsulp
- Blood pressure every 5 minutesduring b dose
- Respiratory rate, reflexes hourly
- Urine output (>100 mL over4 hours)
- Fluid restrictions (80–85 mL/hour tota

Fetal monitoring

- CTG (continuous if magnesium sulphate running)

Timing of birth

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

Intrapartum

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

Postpartum

- Continue magnesium sulphate for 24 hours
- 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
- 6-week obstetric review

Antihypertensives for acute lowering of BP

Nifedipine

10 mg conventional release tablet (oral)

Onset: 30–45 minutes

Repeat: after 30–45 minutes (if needed)

Maximum: 80 mg daily

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 minutesMaximum: 300 mg

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

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

HELLP

A variant of severe pre-eclampsia.
Elements include **H**aemolysis, **E**levated **L**iver enzymes and **L**ow **P**latelet 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, LMC, obstetric, anaesthetic and intensive care teams and physicians where appropriate
- At least daily pre-eclampsia bloods
- Conduct coagulation studies if you have concerns about possibleplacental abruption

Maternal monitoring – magnesium sulphate (if required)

- Blood pressure every 5 minutes during bolus dose then hourly during maintenance dose
- Respiratory rate, O_2 saturation,reflexes hourly
- Urine output (>100 mL over 4 hours)
- Fluid restrictions (replace loss at delivery 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 and a course of corticosteroids (if ≤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, eg, effect of magnesium sulphate, neuraxial anaesthesia

Postpartum

- Continue magnesium sulphate for 24 hours
- 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 severity)
- Hospital to send woman's GP and LMC a comprehensive discharge summary
- 6-week obstetric review

Antihypertensives for acute lowering of BP

Nifedipine
10 mg conventional release tablet (oral)

Onset: 30–45 minutes

Repeat: after 30–45 minutes (if needed)

Maximum: 80 mg daily

Labetalol
Initially 20 mg IV bolus over 2 minutesOnset: 5 minutes

Repeat with 40–80 mg

Repeat: every 10 minutes (if needed)

Maximum: 300 mg

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 ofpre-eclampsia

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

Magnesium sulphate	
In women with eclampsia, recommend administering magnesium sulphate to help prevent another seizure, unless contraindicated.	*Strong recommendation; high quality evidence*
In women with pre-eclampsia, recommend administering magnesium sulphate to reduce the risk of eclampsia.	*Weak 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 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 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 women with eclampsia and to reduce the risk of seizures in women with pre-eclampsia.
- Magnesium sulphate is also used for neuroprotection of the fetus at gestation <30 weeks. This is not required if the woman is already having 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 prophylaxis to reduce the risk of eclampsia seizures for women with pre-eclampsia.
- To prevent further seizures in women 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 routemay be appropriate in some situations.
- The product guidelines recommend diluting magnesium sulphate for intravenous use to aconcentration 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, blood pressure (BP), relative risk (RR), saturation of peripheral oxygen (SpO2) and reflexes).
- Ensure the woman is aware that a feeling of warm flushing may be evident during the infusion. Other side effects may include nausea, vomiting, drowsiness and headache.
- 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 to 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/SpO_2 – hourly
  - patellar/brachial reflexes – hourly
  - urine output – review hourly (insert urine catheter). Should be >100 mL/4 hours
  - pre-eclampsia bloods = full blood count (including haemoglobin, platelet count), creatinine, electrolytes, liver function tests (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/Lor urine output is <100 mL over 4 hours, check serum magnesium levels and adjust infusion levels. 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 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. Concentrationshould be no higher than 20%.)
- After 10 minutes, use maintenance dose infusion to begin maintenance at 1 g/hour.
- Conduct electrocardiogram (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 higherthan 20%.)
- Once the condition is stable, either:
  - reset volumetric infusion pump to maintenance dose of 1 g/hour
  - 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 intoeach 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 intramuscularinjection, 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.[23] [24]

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. Avoidnon-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 theIV bag to the pump, and then to the patient for verification.
- Protocols. Establish dosing and administration protocols and standard order sets formagnesium sulphate.
- Double-checks. Make it a requirement to have an independent double-check of the medicine, concentration, infusion rate, pump settings, line attachment, and patient beforeadministering 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'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.

6.3 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 and her fetus. The second is to have a birth of a mature newborn that will not require intensive or prolonged neonatal care. Pre-eclampsia is a progressive disease; the ultimate treatment is to deliver thebaby and placenta.

Timing of birth

Updated evidence (since 2018 guideline) regarding timing of birth for women with pre-eclampsia without severe features

A meta-analysis of three randomised controlled trials (n=1773) by Chatzakis et al. (2021) compared expectant management with immediate birth and reported that for women with non-severe pre-eclampsia between 34+0 and 36+6 wkGA, immediate delivery decreased the risk of adverse maternal outcomes (composite adverse maternal outcome not defined beyond any of the potential preeclampsia-related complications ranging from severe hypertension to maternal death) by 14% (RR 0.86, 95% CI 0.78-0.93) but increased the risk of neonatal intensive care unit (NICU) admissions by 23% (RR1.23, 95% CI 1.05-1.45), compared to expectant management. No significant differences were reported for HELLP, eclampsia or severe pre-eclampsia when pregnancy was prolonged for an average of seven days.

For more detailed information see the *Evidence Statement* companion document.

[1] Chatzakis, C., Liberis, A., Zavlanos, A., Petousis, S., Tsakmaki, E., Dinas, K., & Sotiriadis, A. (2021). Early delivery or expectant management for late preterm preeclampsia: A meta-analysis of randomized controlled trials. *Acta Obstetricia et Gynecologica Scandinavica*. https://doi.org/10.1111/aogs.14149

Box 2: Indications for delivery in women with pre-eclampsia (adapted from SOMANZ, 2014[25])

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 edema	

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

For women with chronic hypertension	
Before 37 weeks: Do not recommend birth unless other maternal or fetal indications support it.	*Strong recommendation; moderate-quality evidence*
After 37 weeks: For women 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.	*Strong recommendation; moderate-quality evidence*
For women with gestational hypertension	
Before 37 weeks: Recommend expectant management. Do not recommend birth unless other maternal or fetal indications support it.	*Strong recommendation; moderate-quality evidence*
After 37 and before 40 weeks: Consider birth. The woman, her LMC and the obstetric team should negotiate the timing.	*Strong recommendation; moderate-quality evidence*
For women with pre-eclampsia who are stable and without severe features	
Before 34+0 weeks: Plan an expectant approach. A clear plan should be discussed and agreed with the woman and clearly documented, including level of monitoring and thresholds to plan birth if condition of woman and/or fetus deteriorates. Consider inpatient management.	*Strong recommendation; low-quality evidence*
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 management. Discuss with the woman and her whānau the risks and benefits for planned early birth (reducing maternal adverse outcomes) and expectant management (reducing need for neonatal intensive care unit admission and associated with improved early childhood developmental outcomes).	*Strong recommendation; moderate-quality evidence* ☑ *Good practice recommendation*
After 37 (eg, 37+0) weeks: 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 woman, her LMC and the obstetric team.	*Weak recommendation; low-quality evidence*

For women with severe/unstable pre-eclampsia	
Peri- or pre-viability: Manage the condition in a tertiary setting in consultation with maternal fetal medicine and neonatology if possible, and with careful discussion with the woman.	*Strong recommendation; moderate-quality evidence*
Before 34 weeks: Adopt an expectant approach in a secondary or tertiary centre with resources for maternal and fetal monitoring and critical care of the mother 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.	*Strong recommendation; moderate-quality evidence*
After 34 weeks: Recommend birth after stabilising the woman in a centre with appropriate resources to care for the mother and the baby.	*Strong recommendation; low-quality evidence*
For women with HELLP or eclampsia	
Any gestational age: Recommend birth after stabilising the woman and after she has completed a course of corticosteroids (≤34+6 weeks) and magnesium for neuroprotection (if <30 weeks) (if time permits).	*Strong recommendation; moderate-quality evidence*

Anaesthesia	
Consider neuraxial methods of analgesia (ie, spinal, epidural and combined spinal and epidural anaesthesia (CSE)) in labour, even for women with lower platelet counts. Do not recommend neuraxial methods when the platelet count is <80 × 109/L.	*Strong recommendation; low-quality evidence*
Do not recommend fluid preloading when siting neuraxial anaesthetics.	*Strong recommendation; very low-quality evidence*
Spinal anaesthesia and CSE are the preferred techniques for caesarean section if an epidural is not already in place.	*Strong recommendation; very low-quality evidence*
If general anaesthesia is necessary, rapid sequence induction is the preferred technique. Aggressively prevent the hypertensive response to intubation.	*Strong recommendation; low-quality evidence*
Recommend Propofol as an induction agent for general anaesthesia.	*Weak recommendation; very low-quality evidence*
Do not recommend central venous pressure monitoring.	*Strong recommendation; very low-quality evidence*
Do not recommend pulmonary artery catheterisation	*Strong recommendation; very low-quality evidence*
Consider a peripheral arterial line for monitoring blood pressure.	*Strong recommendation; very low-quality evidence*
Continue magnesium sulphate during caesarean section	*Strong recommendation; low-quality evidence*
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.	*Strong recommendation; low-quality evidence*
Neuraxial anaesthesia is less likely to cause hypotension in pre-eclamptic women than in healthy women, but it may still occur.	☑ *Good practice recommendation*
A good working epidural in labour for a woman 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. Consider potential side effects and the woman's choice before opting for an epidural.	☑ *Good practice recommendation*

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

6.4 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 women for increasing hypertension postpartum. Blood pressure frequently increases about three to five days after birth. Continue to monitor blood pressure at routine postnatal assessments (see Table 2).	*Strong recommendation; very low-quality evidence*
Continue to observe strict fluid balance in women with severe pre-eclampsia.	*Weak recommendation; low-quality evidence*
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.	*Strong recommendation; high-quality evidence*
Most commonly used antihypertensive medicines appear to be safe for the baby. The benefits of breastfeeding outweigh potential risks to the baby of transfer of antihypertensive medicines in breast milk.	☑ *Good practice recommendation*
Women with HDP are at higher risk of venous thromboembolism. Assess the need for preventive treatments, using a recognised risk assessment tool.	☑ *Good practice recommendation*

Women may have ongoing mental health issues after an experience of a complex pregnancy. This experience can be frightening for the woman and her family and whānau.

Mental health screening and debriefing	
Screen for postnatal depression.	*Strong recommendation; very low-quality evidence*
Give women the opportunity to debrief after experiencing hypertension or pre-eclampsia in pregnancy. Discuss what this means for future pregnancies and their long-term health.	*Strong recommendation; low-quality evidence*
Long-term risks	
Give women 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.)	*Strong recommendation; very low-quality evidence*
Give women with a history of pre-eclampsia information on risks linked with subsequent pregnancies. Give them the opportunity to discuss contraceptive options, if they wish to.	*Weak recommendation; very low-quality evidence*
GP follow-up: Assess women with a history of pre-eclampsia for blood pressure, lipids, HbA1c, thyroid function and BMI.	*Weak recommendation; very low-quality evidence*
Hospital to send a comprehensive discharge summary to the woman's primary carers (eg, LMC and GP) and the woman, including specific advice on antihypertensive medication. This is particularly important for arranging long-term, ongoing follow-up.	☑ *Good practice recommendation*
Many women are unaware of the long-term health implications of pre-eclampsia. Explain these implications and take the time to be sure each woman fully understands them.	☑ *Good practice recommendation*

Table 3: Risk of developing long-term conditions for women 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)[26]	6.3 (3.4–12.0)[28]
Pre-eclampsia in future pregnancy	7.6 (2.3–24.8)[27**]	7.2 (5.9–8.8)[26]
Chronic hypertension	3.4 (0.8–13.9)[28]	3.1 (2.5–3.9)[29]
Cardiovascular disease	1.7 (0.6–4.4)31	2.3 (1.9–2.8)[32]
Cerebrovascular disease	1.5 (1.1–2.0)[30]	1.8(1.4–2.2)[31]
Venous thromboembolism	-	1.8 (1.4–2.3)[31]
End-stage kidney disease	-	4.3 (3.3–5.6)[31]

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

Glossary

Antenatal	Occurring before birth; concerned with the care and treatment of the unborn child and pregnant women.
Body mass index (BMI)	The body's weight in kilograms divided by the square of the height in metres. The measurement is used to assess obesity.
Eclampsia	Seizures (convulsions) in a pregnant woman related to HDP.
Evidence statement	A table summarising the results of a collection of studies that together represent the evidence supporting a recommendation or series of recommendations in a guideline.
Expectant management	Continuation of the pregnancy beyond 48 hours while monitoring the mother and the fetus, rather than intervention.
Fetal	Of or relating to a fetus or to the period of its development.
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.
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, but may also include 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 (eg, a disease prevalent in <10% of the population), the OR will be approximately the same as RR. However, it is defined as 'the ratio of the relative odds of the outcome occurring in Group A compared to it occurring in Group B' and is used when the absolute risk (risk in general population) is unknown.
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 pregnant women after birth.
Postpartum	The period of time after birth.
Randomised controlled trial	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	*Guidelines for Consultation with Obstetric and Related Medical Services*
Regimen	A pattern of treatment like dose or frequency of a.
Relative risk/risk ratio	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 10th birthweight centile or a fetus with an estimated fetal weight on a customised growth chart less than the 10th 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.
Woman-centred care	Care that gives respect and dignity by supporting the woman to be central and active in her own care through: • holistic care taking account of the woman's physical, psychosocial, cultural, emotional and spiritual needs • focusing on the woman's expectations, aspirations and needs, rather than the institutional or professional needs • recognising the woman's right to self-determination through choice, control and continuity of care from one or more known caregivers recognising the needs of the baby, the woman's whānau.

List of abbreviations

ACE	Angiotensin converting enzyme
ALT	Alanine transaminase
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 disorder in pregnancy
HELLP	Haemolysis, Elevated Liver enzymes and Low Platelet count
IM	Intramuscular
IUGR	Intrauterine growth restriction
IV	Intravenous
LMC	Lead maternity carer
sBP	Systolic blood pressure

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