NICE National Institute for Health and Care Excellence

NICE guideline

Hypertension in pregnancy: diagnosis and management

NICE guideline
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Your responsibility

The recommendations in this guideline represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, professionals and practitioners are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or the people using their service. It is not mandatory to apply the recommendations, and the guideline does not override the responsibility to make decisions appropriate to the circumstances of the individual, in consultation with them and their families and carers or guardian.

All problems (adverse events) related to a medicine or medical device used for treatment or in a procedure should be reported to the Medicines and Healthcare products Regulatory Agency using the Yellow Card Scheme.

Local commissioners and providers of healthcare have a responsibility to enable the guideline to be applied when individual professionals and people using services wish to use it. They should do so in the context of local and national priorities for funding and developing services, and in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities. Nothing in this guideline should be interpreted in a way that would be inconsistent with complying with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

Contents

This guideline replaces CG107.

This guideline is the basis of QS35.

Overview

This guideline covers diagnosing and managing hypertension (high blood pressure), including pre-eclampsia, during pregnancy, labour and birth. It also includes advice for women with hypertension who wish to conceive and women who have had a pregnancy complicated by hypertension. It aims to improve care during pregnancy, labour and birth for women and their babies.

We've created a series of visual summaries to explain assessment, treatment and other aspects of care for various conditions relating to hypertension in pregnancy.

Who is it for?

- Healthcare professionals
- Women who develop hypertension during pregnancy, who have hypertension and wish to conceive, and who have had a pregnancy complicated by hypertension, and their relatives and carers

Recommendations

People have the right to be involved in discussions and make informed decisions about their care, as described in NICE's information on making decisions about your care.

Making decisions using NICE guidelines explains how we use words to show the strength (or certainty) of our recommendations, and has information about prescribing medicines (including off-label use), professional guidelines, standards and laws (including on consent and mental capacity), and safeguarding.

1.1 Reducing the risk of hypertensive disorders in pregnancy

Symptoms of pre-eclampsia

1.1.1 Advise pregnant women to see a healthcare professional immediately if they experience symptoms of pre-eclampsia. Symptoms include:

- severe headache
- problems with vision, such as blurring or flashing before the eyes
- severe pain just below the ribs
- vomiting
- sudden swelling of the face, hands or feet.

See the NICE guideline on antenatal care for advice on risk factors and symptoms of pre-eclampsia. **[2010, amended 2019]**

Antiplatelet agents

For the indication in recommendations 1.1.2 and 1.1.3, although its use is common in UK clinical practice, at the time of publication (June 2019), aspirin did not have a UK marketing authorisation. Community pharmacies cannot legally sell aspirin as a pharmacy medicine for prevention of pre-eclampsia in pregnancy in England. Aspirin for this indication must be prescribed. The prescriber should see the summary of product characteristics for the manufacturer's advice on use in pregnancy. See NICE's information on prescribing medicines.

1.1.2 Advise pregnant women at high risk of pre-eclampsia to take 75 mg to 150 mg of aspirin daily from 12 weeks until the birth of the baby. Women at high risk are those with any of the following:

- hypertensive disease during a previous pregnancy
- chronic kidney disease
- autoimmune disease such as systemic lupus erythematosus or antiphospholipid syndrome
- type 1 or type 2 diabetes
- chronic hypertension. **[2010, amended 2019]**

1.1.3 Advise pregnant women with more than 1 moderate risk factor for pre-eclampsia to take 75 mg to 150 mg of aspirin daily from 12 weeks until the birth of the baby. Factors indicating moderate risk are:

- nulliparity
- age 40 years or older
- pregnancy interval of more than 10 years
- body mass index (BMI) of 35 kg/m^2 or more at first visit
- family history of pre-eclampsia
- multi-fetal pregnancy. **[2010, amended 2019]**

Other pharmaceutical agents

1.1.4 Do not use the following to prevent hypertensive disorders during pregnancy:

- nitric oxide donors
- progesterone
- diuretics
- low molecular weight heparin. **[2010]**

Nutritional supplements

1.1.5 Do not recommend the following supplements solely with the aim of preventing hypertensive disorders during pregnancy:

- magnesium
- folic acid
- antioxidants (vitamins C and E)
- fish oils or algal oils
- garlic. **[2010]**

Diet

1.1.6 Do not recommend salt restriction during pregnancy solely to prevent gestational hypertension or pre-eclampsia. **[2010]**

Lifestyle

1.1.7 Give the same advice on rest, exercise and work to women with chronic hypertension or at risk of hypertensive disorders during pregnancy as healthy pregnant women. See the NICE guideline on antenatal care. **[2010, amended 2019]**

Diabetes

1.1.8 For women with pre-existing diabetes or gestational diabetes, see the NICE guideline on diabetes in pregnancy. **[2019]**

1.2 Assessment of proteinuria in hypertensive disorders of pregnancy

1.2.1 Interpret proteinuria measurements for pregnant women in the context of a full clinical review of symptoms, signs and other investigations for pre-eclampsia. **[2019]**

1.2.2 Use an automated reagent-strip reading device for dipstick screening for proteinuria in pregnant women in secondary care settings. **[2019]**

1.2.3 If dipstick screening is positive (1+ or more), use albumin:creatinine ratio or protein:creatinine ratio to quantify proteinuria in pregnant women. **[2019]**

1.2.4 Do not use first morning urine void to quantify proteinuria in pregnant women. **[2019]**

1.2.5 Do not routinely use 24-hour urine collection to quantify proteinuria in pregnant women. **[2019]**

1.2.6 If using protein:creatinine ratio to quantify proteinuria in pregnant women:

- use 30 mg/mmol as a threshold for significant proteinuria
- if the result is 30 mg/mmol or above and there is still uncertainty about the diagnosis of pre-eclampsia, consider re-testing on a new sample, alongside clinical review. **[2019]**

1.2.7 If using albumin:creatinine ratio as an alternative to protein:creatinine ratio to diagnose pre-eclampsia in pregnant women with hypertension:

- use 8 mg/mmol as a diagnostic threshold

- if the result is 8 mg/mmol or above and there is still uncertainty about the diagnosis of pre-eclampsia, consider re-testing on a new sample, alongside clinical review. **[2019]**

For a short explanation of why the committee made the 2019 recommendations and how they might affect practice, see the rationale and impact section on assessment of proteinuria.

Full details of the evidence and the committee's discussion are in evidence review G: assessment of proteinuria.

1.3 Management of chronic hypertension in pregnancy

Pre-pregnancy advice

1.3.1 Offer women with chronic hypertension referral to a specialist in hypertensive disorders of pregnancy to discuss the risks and benefits of treatment. **[2010, amended 2019]**

1.3.2 Advise women who take angiotensin-converting enzyme (ACE) inhibitors or angiotensin II receptor blockers (ARBs):

- that there is an increased risk of congenital abnormalities if these drugs are taken during pregnancy
- to discuss alternative antihypertensive treatment with the healthcare professional responsible for managing their hypertension, if they are planning pregnancy

- to discuss alternative treatment with the healthcare professional responsible for managing their condition, if ACE inhibitors or ARBs are being taken for other conditions such as renal disease. **[2010, amended 2019]**

  In 2014, the Medicines and Healthcare products Regulatory Agency (MHRA) issued a drug safety update on ACE inhibitors and angiotensin II receptor antagonists: not for use in pregnancy, which states 'Use in women who are planning pregnancy should be avoided unless absolutely necessary, in which case the potential risks and benefits should be discussed'.

1.3.3 Stop antihypertensive treatment in women taking ACE inhibitors or ARBs if they become pregnant (preferably within 2 working days of notification of pregnancy) and offer alternatives. **[2010]**

1.3.4 Advise women who take thiazide or thiazide-like diuretics:

- that there may be an increased risk of congenital abnormalities and neonatal complications if these drugs are taken during pregnancy
- to discuss alternative antihypertensive treatment with the healthcare professional responsible for managing their hypertension, if they are planning pregnancy. **[2010, amended 2019]**

1.3.5 Advise women who take antihypertensive treatments other than ACE inhibitors, ARBs, thiazide or thiazide-like diuretics that the limited evidence available has not shown an increased risk of congenital malformation with such treatments. **[2010, amended 2019]**

Treatment of chronic hypertension

1.3.6 Offer pregnant women with chronic hypertension advice on:

- weight management
- exercise
- healthy eating

- lowering the amount of salt in their diet.

  Provide this advice in line with the NICE guideline on hypertension in adults. **[2019]**

1.3.7 Continue with existing antihypertensive treatment if safe in pregnancy, or switch to an alternative treatment, unless:

- sustained systolic blood pressure is less than 110 mmHg **or**
- sustained diastolic blood pressure is less than 70 mmHg **or**
- the woman has symptomatic hypotension. **[2019]**

1.3.8 Offer antihypertensive treatment to pregnant women who have chronic hypertension and who are not already on treatment if they have:

- sustained systolic blood pressure of 140 mmHg or higher **or**
- sustained diastolic blood pressure of 90 mmHg or higher. **[2019]**

1.3.9 When using medicines to treat hypertension in pregnancy, aim for a target blood pressure of 135/85 mmHg. **[2019]**

1.3.10 Consider labetalol to treat chronic hypertension in pregnant women. Consider nifedipine for women in whom labetalol is not suitable, or methyldopa if both labetalol and nifedipine are not suitable. Base the choice on any pre-existing treatment, side-effect profiles, risks (including fetal effects) and the woman's preference. **[2019]**

At the time of publication (June 2019), some brands of nifedipine were specifically contraindicated during pregnancy by the manufacturer in its summary of product characteristics. Refer to the individual summaries of product characteristics for each preparation of nifedipine for further details. See NICE's information on prescribing medicines.

1.3.11 Offer pregnant women with chronic hypertension aspirin 75 mg to 150 mg once daily from 12 weeks. **[2019]**

Although its use is common in UK clinical practice, at the time of

publication (June 2019), aspirin did not have a UK marketing authorisation for this indication. Community pharmacies cannot legally sell aspirin as a pharmacy medicine for prevention of pre-eclampsia in pregnancy in England. Aspirin for this indication must be prescribed. The prescriber should see the summary of product characteristics for the manufacturer's advice on use in pregnancy. See NICE's information on prescribing medicines.

1.3.12 Offer placental growth factor (PLGF)-based testing to help rule out pre-eclampsia between 20 weeks and 36 weeks and 6 days of pregnancy, if women with chronic hypertension are suspected of developing pre-eclampsia. (See the NICE diagnostics guidance on PLGF-based testing to help diagnose suspected preterm pre-eclampsia). **[2019, amended 2023]**

For a short explanation of why the committee made the 2019 recommendations and how they might affect practice, see the rationale and impact section on treatment of chronic hypertension.

Full details of the evidence and the committee's discussion are in evidence review A: interventions for chronic hypertension.

Antenatal appointments

1.3.13 In women with chronic hypertension, schedule additional antenatal appointments based on the individual needs of the woman and her baby. This may include:

- weekly appointments if hypertension is poorly controlled
- appointments every 2 to 4 weeks if hypertension is well-controlled. **[2010, amended 2019]**

Timing of birth

1.3.14 Do not offer planned early birth before 37 weeks to women with chronic hypertension whose blood pressure is lower than 160/110 mmHg, with or

without antihypertensive treatment, unless there are other medical indications. **[2010, amended 2019]**

1.3.15 For women with chronic hypertension whose blood pressure is lower than 160/110 mmHg after 37 weeks, with or without antihypertensive treatment, timing of birth and maternal and fetal indications for birth should be agreed between the woman and the senior obstetrician. **[2010]**

1.3.16 If planned early birth is necessary (see recommendation 1.5.7 in the section on timing of birth), offer a course of antenatal corticosteroids and magnesium sulfate if indicated, in line with the NICE guideline on preterm labour and birth. **[2010, amended 2019]**

Postnatal investigation, monitoring and treatment

1.3.17 In women with chronic hypertension who have given birth, measure blood pressure:

- daily for the first 2 days after birth
- at least once between day 3 and day 5 after birth
- as clinically indicated if antihypertensive treatment is changed after birth. **[2010]**

1.3.18 In women with chronic hypertension who have given birth:

- aim to keep blood pressure lower than 140/90 mmHg
- continue antihypertensive treatment, if required (for choice of antihypertensive during the postnatal period, see the section on antihypertensive treatment during the postnatal period, including during breastfeeding)
- offer a review of antihypertensive treatment 2 weeks after the birth, with their GP or specialist. **[2010, amended 2019]**

1.3.19 If a woman has taken methyldopa to treat chronic hypertension during pregnancy, stop within 2 days after the birth and change to an alternative antihypertensive treatment (for choice of antihypertensive

during the postnatal period, see the section on antihypertensive treatment during the postnatal period, including during breastfeeding). **[2010, amended 2019]**

1.3.20 Offer women with chronic hypertension a medical review 6 to 8 weeks after the birth with their GP or specialist as appropriate. **[2010, amended 2019]**

1.4 Management of gestational hypertension

Assessment and treatment of gestational hypertension

1.4.1 In women with gestational hypertension, a full assessment should be carried out in a secondary care setting by a healthcare professional who is trained in the management of hypertensive disorders of pregnancy. **[2010, amended 2019]**

1.4.2 In women with gestational hypertension, take account of the following risk factors that require additional assessment and follow-up:

- nulliparity
- age 40 years or older
- pregnancy interval of more than 10 years
- family history of pre-eclampsia
- multi-fetal pregnancy
- BMI of 35 kg/m^2 or more
- gestational age at presentation
- previous history of pre-eclampsia or gestational hypertension
- pre-existing vascular disease
- pre-existing kidney disease. **[2010]**

1.4.3 Offer women with gestational hypertension the tests and treatment listed

in table 1. **[2019]**

Table 1 Management of pregnancy with gestational hypertension

Management	Hypertension: blood pressure (BP) of 140/90 to 159/109 mmHg	Severe hypertension: blood pressure of 160/110 mmHg or more
Admission to hospital	Do not routinely admit to hospital	Admit, but if BP falls below 160/110 mmHg, then manage as for hypertension
Antihypertensive pharmacological treatment	Offer pharmacological treatment if BP remains above 140/90 mmHg	Offer pharmacological treatment to all women
Target blood pressure once on antihypertensive treatment	Aim for BP of 135/85 mmHg or less	Aim for BP of 135/85 mmHg or less
Blood pressure measurement	Once or twice a week (depending on BP) until BP is 135/85 mmHg or less	Every 15 to 30 minutes until BP is less than 160/110 mmHg
Dipstick proteinuria testing **(Use an automated reagent-strip reading device for dipstick screening for proteinuria in a secondary care setting)**	Once or twice a week (with BP measurement)	Daily while admitted
Blood tests	Measure full blood count, liver function and renal function at presentation and then weekly	Measure full blood count, liver function and renal function at presentation and then weekly

Management	Hypertension: blood pressure (BP) of 140/90 to 159/109 mmHg	Severe hypertension: blood pressure of 160/110 mmHg or more
Placental growth factor (PLGF)-based testing	Carry out PLGF-based testing on 1 occasion (in accordance with NICE guidance, see recommendation 1.4.4) if there is suspicion of pre-eclampsia	Carry out PLGF-based testing on 1 occasion (in accordance with NICE guidance, see recommendation 1.4.4) if there is suspicion of pre-eclampsia
Fetal assessment	Offer fetal heart auscultation at every antenatal appointment Carry out ultrasound assessment of the fetus at diagnosis and, if normal, repeat every 2 to 4 weeks, if clinically indicated Carry out a cardiotocography (CTG) only if clinically indicated (For advice, see the section on fetal monitoring)	Offer fetal heart auscultation at every antenatal appointment Carry out ultrasound assessment of the fetus at diagnosis and, if normal, repeat every 2 weeks, if severe hypertension persists Carry out a CTG at diagnosis and then only if clinically indicated (For advice, see the section on fetal monitoring

1.4.4 Offer placental growth factor (PLGF)-based testing to help rule out pre-eclampsia in women presenting with suspected pre-eclampsia (for example, with gestational hypertension) between 20 weeks and 36 weeks and 6 days of pregnancy. (See the NICE diagnostics guidance on PLGF-based testing to help diagnose suspected preterm pre-eclampsia.) **[2019, amended 2023]**

1.4.5 Consider labetalol to treat gestational hypertension. Consider nifedipine for women in whom labetalol is not suitable, and methyldopa if labetalol or nifedipine are not suitable. Base the choice on side-effect profiles, risk (including fetal effects) and the woman's preferences. **[2010, amended 2019]**

At the time of publication (June 2019), some brands of nifedipine were specifically contraindicated during pregnancy by the manufacturer in its summary of product characteristics. Refer to the individual summaries of product characteristics for each preparation of nifedipine for further details. See NICE's information on prescribing medicines.

1.4.6 Do not offer bed rest in hospital as a treatment for gestational hypertension. **[2010]**

For a short explanation of why the committee made the 2019 recommendations and how they might affect practice, see the rationale and impact section on monitoring and treatment of gestational hypertension.

Full details of the evidence and the committee's discussion are in evidence review B: monitoring gestational hypertension.

Timing of birth

1.4.7 Do not offer planned early birth before 37 weeks to women with gestational hypertension whose blood pressure is lower than 160/110 mmHg, unless there are other medical indications. **[2010, amended 2019]**

1.4.8 For women with gestational hypertension whose blood pressure is lower than 160/110 mmHg after 37 weeks, timing of birth, and maternal and fetal indications for birth should be agreed between the woman and the senior obstetrician. **[2010, amended 2019]**

1.4.9 If planned early birth is necessary (see recommendation 1.5.7 in the section on timing of birth), offer a course of antenatal corticosteroids and magnesium sulfate if indicated, in line with the NICE guideline on preterm labour and birth. **[2010, amended 2019]**

Postnatal investigation, monitoring and treatment

1.4.10 In women with gestational hypertension who have given birth, measure

blood pressure:

- daily for the first 2 days after birth
- at least once between day 3 and day 5 after birth
- as clinically indicated if antihypertensive treatment is changed after birth. **[2010]**

1.4.11 In women with gestational hypertension who have given birth:

- continue antihypertensive treatment if required (for choice of antihypertensive during the postnatal period, see the section on antihypertensive treatment during the postnatal period, including during breastfeeding)
- advise women that the duration of their postnatal antihypertensive treatment will usually be similar to the duration of their antenatal treatment (but may be longer)
- reduce antihypertensive treatment if their blood pressure falls below 130/80 mmHg. **[2010, amended 2019]**

1.4.12 If a woman has taken methyldopa to treat gestational hypertension, stop within 2 days after the birth and change to an alternative treatment if necessary (for choice of antihypertensive during the postnatal period, see the section on antihypertensive treatment during the postnatal period, including during breastfeeding). **[2010, amended 2019]**

1.4.13 For women with gestational hypertension who did not take antihypertensive treatment and have given birth, start antihypertensive treatment if their blood pressure is 150/100 mmHg or higher. **[2010, amended 2019]**

1.4.14 Write a care plan for women with gestational hypertension who have given birth and are being transferred to community care that includes all of the following:

- who will provide follow-up care, including medical review if needed
- frequency of blood pressure monitoring needed

- thresholds for reducing or stopping treatment
- indications for referral to primary care for blood pressure review. **[2010]**

1.4.15 Offer women who have had gestational hypertension and who remain on antihypertensive treatment, a medical review with their GP or specialist 2 weeks after transfer to community care. **[2010, amended 2019]**

1.4.16 Offer all women who have had gestational hypertension a medical review with their GP or specialist 6 to 8 weeks after the birth. **[2010, amended 2019]**

1.5 Management of pre-eclampsia

Assessing pre-eclampsia

1.5.1 Assessment of women with pre-eclampsia should be performed by a healthcare professional trained in the management of hypertensive disorders of pregnancy. **[2010, amended 2019]**

1.5.2 Carry out a full clinical assessment at each antenatal appointment for women with pre-eclampsia, and offer admission to hospital for surveillance and any interventions needed if there are concerns for the wellbeing of the woman or baby. Concerns could include any of the following:

- sustained systolic blood pressure of 160 mmHg or higher
- any maternal biochemical or haematological investigations that cause concern, for example, a new and persistent:
  - rise in creatinine (90 micromol/litre or more, 1 mg/100 ml or more) **or**
  - rise in alanine transaminase (over 70 IU/litre, or twice upper limit of normal range) **or**
  - fall in platelet count (under 150,000/microlitre)
- signs of impending eclampsia

- signs of impending pulmonary oedema
- other signs of severe pre-eclampsia
- suspected fetal compromise
- any other clinical signs that cause concern. **[2019]**

1.5.3 Consider using either the fullPIERS or PREP-S validated risk prediction models to help guide decisions about the most appropriate place of care (such as the need for in utero transfer) and thresholds for intervention. **[2019]**

1.5.4 When using a risk prediction model, take into account that:

- fullPIERS is intended for use at any time during pregnancy
- PREP-S is intended for use only up to 34 weeks of pregnancy
- fullPIERS and PREP-S models do not predict outcomes for babies. **[2019]**

For a short explanation of why the committee made the 2019 recommendations and how they might affect practice, see the rationale and impact section on assessment of women with pre-eclampsia.

Full details of the evidence and the committee's discussion are in evidence review C: prediction of complications in pre-eclampsia.

Treatment of pre-eclampsia

1.5.5 Offer women with pre-eclampsia the tests and treatments listed in table 2. **[2019]**

Table 2 Management of pregnancy with pre-eclampsia

Management	Hypertension: blood pressure (BP) of 140/90 to 159/109 mmHg	Severe hypertension: blood pressure of 160/110 mmHg or more
Admission to hospital	Admit if any clinical concerns for the wellbeing of the woman or baby (see recommendation 1.5.2) or if high risk of adverse events suggested by the fullPIERS or PREP-S risk prediction models	Admit, but if BP falls below 160/110 mmHg, then manage as for hypertension
Antihypertensive pharmacological treatment	Offer pharmacological treatment if BP remains above 140/90 mmHg	Offer pharmacological treatment to all women
Target blood pressure once on antihypertensive treatment	Aim for BP of 135/85 mmHg or less	Aim for BP of 135/85 mmHg or less
Blood pressure measurement	At least every 48 hours, and more frequently if the woman is admitted to hospital	Every 15 to 30 minutes until BP is less than 160/110 mmHg, then at least 4 times daily while the woman is an inpatient, depending on clinical circumstances
Dipstick proteinuria testing **(Use an automated reagent-strip reading device for dipstick screening for proteinuria in a secondary care setting)**	Only repeat if clinically indicated, for example, if new symptoms and signs develop or if there is uncertainty over diagnosis	Only repeat if clinically indicated, for example, if new symptoms and signs develop or if there is uncertainty over diagnosis

Management	Hypertension: blood pressure (BP) of 140/90 to 159/109 mmHg	Severe hypertension: blood pressure of 160/110 mmHg or more
Blood tests	Measure full blood count, liver function and renal function twice a week	Measure full blood count, liver function and renal function 3 times a week
Fetal assessment	Offer fetal heart auscultation at every antenatal appointment Carry out ultrasound assessment of the fetus at diagnosis and, if normal, repeat every 2 weeks Carry out a cardiotocography (CTG) at diagnosis and then only if clinically indicated (For advice, see the section on fetal monitoring)	Offer fetal heart auscultation at every antenatal appointment Carry out ultrasound assessment of the fetus at diagnosis and, if normal, repeat every 2 weeks Carry out a CTG at diagnosis and then only if clinically indicated (For advice, see the section on fetal monitoring)

1.5.6 Offer labetalol to treat hypertension in pregnant women with pre-eclampsia. Offer nifedipine for women in whom labetalol is not suitable, and methyldopa if labetalol or nifedipine are not suitable. Base the choice on any pre-existing treatment, side-effect profiles, risks (including fetal effects) and the woman's preference. **[2010, amended 2019]**

At the time of publication (June 2019), some brands of nifedipine were specifically contraindicated during pregnancy by the manufacturer in its summary of product characteristics. Refer to the individual summaries of product characteristics for each preparation of nifedipine for further details. See NICE's information on prescribing medicines.

Timing of birth

1.5.7 Record maternal and fetal thresholds for planned early birth before 37 weeks in women with pre-eclampsia. Thresholds for considering planned early birth could include (but are not limited to) any of the

following known features of severe pre-eclampsia:

- inability to control maternal blood pressure despite using 3 or more classes of antihypertensives in appropriate doses
- maternal pulse oximetry less than 90%
- progressive deterioration in liver function, renal function, haemolysis, or platelet count
- ongoing neurological features, such as severe intractable headache, repeated visual scotomata, or eclampsia
- placental abruption
- reversed end-diastolic flow in the umbilical artery doppler velocimetry, a non-reassuring cardiotocograph, or stillbirth.

  Other features not listed above may also be considered in the decision to plan early birth. **[2019]**

  Be aware that some pulse oximeters can underestimate or overestimate oxygen saturation levels, especially if the saturation level is borderline. Overestimation has been reported in people with dark skin. See also the NHS England Patient Safety Alert on the risk of harm from inappropriate placement of pulse oximeter probes.

1.5.8 Involve a senior obstetrician in any decisions on timing of birth for women with pre-eclampsia. **[2010, amended 2019]**

1.5.9 Discuss with the anaesthetic team if birth is planned in a woman with pre-eclampsia. **[2010, amended 2019]**

1.5.10 Discuss with the neonatal team if birth is planned in a woman with pre-eclampsia, and neonatal complications are anticipated. **[2010, amended 2019]**

1.5.11 Offer intravenous magnesium sulfate and a course of antenatal corticosteroids if indicated, if early birth is planned for women with preterm pre-eclampsia, in line with the NICE guideline on preterm labour

and birth. **[2010, amended 2019]**

1.5.12 Decide on timing of birth in women with pre-eclampsia as recommended in table 3. **[2019]**

Table 3 Timing of birth in women with pre-eclampsia

Weeks of pregnancy	Timing of birth
Before 34 weeks	Continue surveillance unless there are indications (see recommendation 1.5.7 in the section on timing of birth) for planned early birth. Offer intravenous magnesium sulfate and a course of antenatal corticosteroids in line with the NICE guideline on preterm labour and birth.
From 34 weeks to 36 weeks plus 6 days	Continue surveillance unless there are indications (see recommendation 1.5.7 in the section on timing of birth) for planned early birth. When considering the option of planned early birth, take into account the woman's and baby's condition, risk factors (such as maternal comorbidities, multi-fetal pregnancy) and availability of neonatal unit beds. Consider a course of antenatal corticosteroids in line with the NICE guideline on preterm labour and birth.
37 weeks onwards	Initiate birth within 24 to 48 hours.

For a short explanation of why the committee made the 2019 recommendations and how they might affect practice, see the rationale and impact section on monitoring and treatment of pre-eclampsia and timing of birth.

Full details of the evidence and the committee's discussion are in evidence review D: interventions for pre-eclampsia.

Postnatal investigation, monitoring and treatment (including after discharge from critical care)

Blood pressure

1.5.13 In women with pre-eclampsia who did not take antihypertensive treatment and have given birth, measure blood pressure:

- at least 4 times a day while the woman is an inpatient
- at least once between day 3 and day 5 after birth
- on alternate days until normal, if blood pressure was abnormal on days 3 to 5. **[2010]**

1.5.14 In women with pre-eclampsia who did not take antihypertensive treatment and have given birth, start antihypertensive treatment if blood pressure is 150/100 mmHg or higher. **[2010]**

1.5.15 Ask women with pre-eclampsia who have given birth about severe headache and epigastric pain each time blood pressure is measured. **[2010]**

1.5.16 In women with pre-eclampsia who took antihypertensive treatment and have given birth, measure blood pressure:

- at least 4 times a day while the woman is an inpatient
- every 1 to 2 days for up to 2 weeks after transfer to community care until the woman is off treatment and has no hypertension. **[2010]**

1.5.17 For women with pre-eclampsia who have taken antihypertensive treatment and have given birth:

- continue antihypertensive treatment (for choice of antihypertensive during the postnatal period, see the section on antihypertensive treatment during the postnatal period, including during breastfeeding)
- consider reducing antihypertensive treatment if their blood pressure falls below 140/90 mmHg

- reduce antihypertensive treatment if their blood pressure falls below 130/80 mmHg. **[2010, amended 2019]**

1.5.18 If a woman has taken methyldopa to treat pre-eclampsia, stop within 2 days after the birth and change to an alternative treatment if necessary (for choice of antihypertensive during the postnatal period, see the section on antihypertensive treatment during the postnatal period, including during breastfeeding). **[2010, amended 2019]**

1.5.19 Offer women with pre-eclampsia who have given birth transfer to community care if all of the following criteria have been met:

- there are no symptoms of pre-eclampsia
- blood pressure, with or without treatment, is 150/100 mmHg or less
- blood test results are stable or improving. **[2010, amended 2019]**

1.5.20 Write a care plan for women with pre-eclampsia who have given birth and are being transferred to community care that includes all of the following:

- who will provide follow-up care, including medical review if needed
- frequency of blood pressure monitoring
- thresholds for reducing or stopping treatment
- indications for referral to primary care for blood pressure review
- self-monitoring for symptoms. **[2010]**

1.5.21 Offer women who have had pre-eclampsia and who remain on antihypertensive treatment, a medical review with their GP or specialist 2 weeks after transfer to community care. **[2010, amended 2019]**

1.5.22 Offer all women who have had pre-eclampsia a medical review with their GP or specialist 6 to 8 weeks after the birth. **[2010, amended 2019]**

Haematological and biochemical monitoring

1.5.23 In women who have pre-eclampsia with mild or moderate hypertension, or after step-down from critical care:

- measure platelet count, transaminases and serum creatinine 48 to 72 hours after birth or step-down
- do not repeat platelet count, transaminases or serum creatinine measurements if results are normal at 48 to 72 hours. **[2010]**

1.5.24 If biochemical and haematological indices are outside the reference range in women with pre-eclampsia who have given birth, repeat platelet count, transaminases and serum creatinine measurements as clinically indicated until results return to normal. **[2010, amended 2019]**

1.5.25 In women with pre-eclampsia who have given birth, carry out a urinary reagent-strip test 6 to 8 weeks after the birth. **[2010]**

1.5.26 Offer women who had pre-eclampsia and still have proteinuria (1+ or more) at 6 to 8 weeks after the birth, a further review with their GP or specialist at 3 months after the birth to assess kidney function. **[2010, amended 2019]**

1.5.27 Consider referring women with an abnormal kidney function assessment at 3 months for a specialist kidney assessment in line with the NICE guideline on chronic kidney disease. **[2010, amended 2019]**

1.6 Fetal monitoring

Fetal monitoring in chronic hypertension

1.6.1 In women with chronic hypertension, carry out an ultrasound for fetal growth and amniotic fluid volume assessment, and umbilical artery doppler velocimetry at 28 weeks, 32 weeks and 36 weeks. **[2010, amended 2019]**

1.6.2 In women with chronic hypertension, only carry out cardiotocography if

clinically indicated. **[2010, amended 2019]**

Fetal monitoring in gestational hypertension

1.6.3 In women with gestational hypertension, carry out an ultrasound for fetal growth and amniotic fluid volume assessment and umbilical artery doppler velocimetry at diagnosis and if normal repeat every 2 to 4 weeks, if clinically indicated. **[2010, amended 2019]**

1.6.4 In women with gestational hypertension, only carry out cardiotocography if clinically indicated. **[2010, amended 2019]**

Fetal monitoring in pre-eclampsia or severe gestational hypertension

1.6.5 Carry out cardiotocography at diagnosis of pre-eclampsia or severe gestational hypertension. **[2010]**

1.6.6 If conservative management of pre-eclampsia or severe gestational hypertension is planned, carry out all the following tests at diagnosis:

- ultrasound for fetal growth and amniotic fluid volume assessment
- umbilical artery doppler velocimetry. **[2010]**

1.6.7 If the results of all fetal monitoring are normal in women with pre-eclampsia or severe gestational hypertension, do not routinely repeat cardiotocography unless clinically indicated. **[2010, amended 2019]**

1.6.8 In women with pre-eclampsia or severe gestational hypertension, repeat cardiotocography if any of the following occur:

- the woman reports a change in fetal movement
- vaginal bleeding
- abdominal pain
- deterioration in maternal condition. **[2010]**

1.6.9 In women with pre-eclampsia or severe gestational hypertension, repeat ultrasound for fetal growth and amniotic fluid volume assessment or umbilical artery doppler velocimetry every 2 weeks, with subsequent surveillance and monitoring determined by the findings of these scans. **[2010, amended 2019]**

1.6.10 For women with pre-eclampsia or severe gestational hypertension, write a care plan that includes all of the following:

- the timing and nature of future fetal monitoring
- fetal indications for birth and if and when antenatal corticosteroids should be given
- plans for discussion with neonatal paediatricians and obstetric anaesthetists. **[2010, amended 2019]**

Women who need additional fetal monitoring

1.6.11 Carry out an ultrasound for fetal growth and amniotic fluid volume assessment and umbilical artery doppler velocimetry starting at between 28 and 30 weeks (or at least 2 weeks before previous gestational age of onset if earlier than 28 weeks) and repeating 4 weeks later in women with previous:

- severe pre-eclampsia
- pre-eclampsia that resulted in birth before 34 weeks
- pre-eclampsia with a baby whose birth weight was less than the 10th centile
- intrauterine death
- placental abruption. **[2010]**

1.6.12 In women who need additional fetal monitoring (see recommendation 1.6.11), carry out cardiotocography only if clinically indicated. **[2010, amended 2019]**

1.7 Intrapartum care

1.7.1 Give advice and treatment to women with hypertensive disorders of pregnancy in line with the NICE guideline on intrapartum care, unless there are recommendations in this guideline on the same topic. Offer care in accordance with the NICE guideline on intrapartum care for women with hypertension whether treated or untreated, and not just on the basis of blood pressure in labour. **[2010, amended 2019]**

1.7.2 Give women with chronic hypertension advice and care in line with the NICE guideline on intrapartum care for women with existing medical conditions or obstetric complications and their babies. **[2019]**

Blood pressure

1.7.3 During labour, measure blood pressure:

- hourly, in women with hypertension
- every 15 to 30 minutes until blood pressure is less than 160/110 mmHg in women with severe hypertension. **[2010, amended 2019]**

1.7.4 Continue use of antenatal antihypertensive treatment during labour. **[2010]**

Haematological and biochemical monitoring

1.7.5 Determine the need for haematological and biochemical tests during labour in women with hypertension using the same criteria as in the antenatal period even if regional analgesia is being considered. **[2010]**

Care during epidural analgesia

1.7.6 Do not preload women who have severe pre-eclampsia with intravenous fluids before establishing low-dose epidural analgesia or combined spinal epidural analgesia. **[2010, amended 2019]**

Management of second stage of labour

1.7.7 Do not routinely limit the duration of the second stage of labour in women with controlled hypertension. **[2010, amended 2019]**

1.7.8 Consider operative or assisted birth in the second stage of labour for women with severe hypertension whose hypertension has not responded to initial treatment. **[2010, amended 2019]**

1.8 Medical management of severe hypertension, severe pre-eclampsia or eclampsia in a critical care setting

Anticonvulsants

1.8.1 If a woman in a critical care setting who has severe hypertension or severe pre-eclampsia has or previously had an eclamptic fit, give intravenous magnesium sulfate. **[2010]**

1.8.2 Consider giving intravenous magnesium sulfate to women with severe pre-eclampsia who are in a critical care setting if birth is planned within 24 hours. **[2010]**

1.8.3 Consider the need for magnesium sulfate treatment, if 1 or more of the following features of severe pre-eclampsia is present:

- ongoing or recurring severe headaches
- visual scotomata
- nausea or vomiting
- epigastric pain
- oliguria and severe hypertension
- progressive deterioration in laboratory blood tests (such as rising creatinine or liver transaminases, or falling platelet count). **[2010, amended 2019]**

1.8.4 Use the Collaborative Eclampsia Trial regimen for administration of magnesium sulfate:

- A loading dose of 4 g should be given intravenously over 5 to 15 minutes, followed by an infusion of 1 g/hour maintained for 24 hours. If the woman has had an eclamptic fit, the infusion should be continued for 24 hours after the last fit.
- Recurrent fits should be treated with a further dose of 2 g to 4 g given intravenously over 5 to 15 minutes. **[2010, amended 2019]**

  The MHRA has issued a warning about the risk of skeletal adverse effects in the neonate following prolonged or repeated use of magnesium sulfate in pregnancy. Maternal administration of magnesium sulfate for longer than 5 to 7 days in pregnancy has been associated with skeletal adverse effects and hypocalcaemia and hypermagnesemia in neonates. If use of magnesium sulfate in pregnancy is prolonged or repeated, consider monitoring of neonates for abnormal calcium and magnesium levels and skeletal adverse effects.

1.8.5 Do not use diazepam, phenytoin or other anticonvulsants as an alternative to magnesium sulfate in women with eclampsia. **[2010, amended 2019]**

Antihypertensives

1.8.6 Treat women with severe hypertension who are in critical care during pregnancy or after birth immediately with 1 of the following:

- labetalol (oral or intravenous)
- oral nifedipine
- intravenous hydralazine. **[2010, amended 2019]**

  At the time of publication (June 2019), some brands of nifedipine were specifically contraindicated during pregnancy by the manufacturer in its summary of product characteristics. Refer to the individual summaries of product characteristics for each preparation of nifedipine for further details. See NICE's information on prescribing medicines.

1.8.7 In women with severe hypertension who are in critical care, monitor their response to treatment:

- to ensure that their blood pressure falls
- to identify adverse effects for both the woman and the baby
- to modify treatment according to response. **[2010]**

1.8.8 Consider using up to 500 ml crystalloid fluid before or at the same time as the first dose of intravenous hydralazine in the antenatal period. **[2010]**

Corticosteroids for fetal lung maturation

1.8.9 If early birth is considered likely within 7 days in women with pre-eclampsia, offer a course of antenatal corticosteroids in line with the NICE guideline on preterm labour and birth. **[2010, amended 2019]**

Corticosteroids to manage HELLP syndrome

1.8.10 Do not use dexamethasone or betamethasone for the treatment of HELLP syndrome. **[2010]**

Fluid balance and volume expansion

1.8.11 Do not use volume expansion in women with severe pre-eclampsia unless hydralazine is the antenatal antihypertensive. **[2010]**

1.8.12 In women with severe pre-eclampsia, limit maintenance fluids to 80 ml/hour unless there are other ongoing fluid losses (for example, haemorrhage). **[2010]**

Caesarean section versus induction of labour

1.8.13 Choose mode of birth for women with severe hypertension, severe pre-eclampsia or eclampsia according to the clinical circumstances and the woman's preference. **[2010]**

Referral to critical care

1.8.14 Refer women with severe hypertension or severe pre-eclampsia to the appropriate critical care setting using the criteria in table 4. **[2010]**

Table 4 Clinical criteria for choice of critical care level

Critical care level	Clinical criteria
Level 3 care	Severe pre-eclampsia and needing ventilation
Level 2 care	Step-down from level 3 or severe pre-eclampsia with any of the following complications: • eclampsia • HELLP syndrome • haemorrhage • hyperkalaemia • severe oliguria • coagulation support • intravenous antihypertensive treatment • initial stabilisation of severe hypertension • evidence of cardiac failure • abnormal neurology
Level 1 care	Pre-eclampsia with hypertension Ongoing conservative antenatal management of severe preterm hypertension Step-down treatment after the birth

1.9 Antihypertensive treatment during the postnatal period, including during breastfeeding

For the indications in recommendations 1.9.4, 1.9.6 and 1.9.8, in 2009, the Medicines and Healthcare products Regulatory Agency (MHRA) issued a drug safety update on ACE inhibitors and angiotensin II receptor antagonists: recommendations on how to use during breastfeeding, and a subsequent clarification was issued in 2014 stating that 'although ACE inhibitors and angiotensin II receptor antagonists are generally not recommended for use by breastfeeding mothers, they are not absolutely contraindicated. Healthcare professionals may prescribe these medicines during breastfeeding if they consider that this treatment is essential for the lactating mother. In mothers who are breastfeeding older infants, the use of captopril, enalapril, or quinapril may be considered if an ACE inhibitor is necessary for the mother. Careful follow-up of the infant for possible signs of hypotension is recommended'.

For the indications in recommendations 1.9.5 and 1.9.6, at the time of publication (June 2019), some brands of nifedipine were specifically contraindicated during pregnancy by the manufacturer in its summary of product characteristics. Refer to the individual summaries of product characteristics for each preparation of nifedipine for further details.

See NICE's information on prescribing medicines.

1.9.1 Advise women with hypertension who wish to breastfeed that their treatment can be adapted to accommodate breastfeeding, and that the need to take antihypertensive medication does not prevent them from breastfeeding. **[2019]**

1.9.2 Explain to women with hypertension who wish to breastfeed that:

- antihypertensive medicines can pass into breast milk
- most antihypertensive medicines taken while breastfeeding only lead to very low levels in breast milk, so the amounts taken in by babies are very small and would be unlikely to have any clinical effect

- most medicines are not tested in pregnant or breastfeeding women, so disclaimers in the manufacturer's information are not because of any specific safety concerns or evidence of harm.

  Make decisions on treatment together with the woman, based on her preferences. **[2019]**

1.9.3 As antihypertensive agents have the potential to transfer into breast milk:

- consider monitoring the blood pressure of babies, especially those born preterm, who have symptoms of low blood pressure for the first few weeks
- when discharged home, advise women to monitor their babies for drowsiness, lethargy, pallor, cold peripheries or poor feeding. **[2019]**

1.9.4 Offer enalapril to treat hypertension in women during the postnatal period, with appropriate monitoring of maternal renal function and maternal serum potassium. **[2019]**

1.9.5 For women of black African or Caribbean family origin with hypertension during the postnatal period, consider antihypertensive treatment with:

- nifedipine **or**
- amlodipine if the woman has previously used this to successfully control her blood pressure. **[2019]**

1.9.6 For women with hypertension in the postnatal period, if blood pressure is not controlled with a single medicine, consider a combination of nifedipine (or amlodipine) and enalapril. If this combination is not tolerated or is ineffective, consider either:

- adding atenolol or labetalol to the combination treatment **or**
- swapping 1 of the medicines already being used for atenolol or labetalol. **[2019]**

1.9.7 When treating women with antihypertensive medication during the postnatal period, use medicines that are taken once daily when possible. **[2019]**

1.9.8 Where possible, avoid using diuretics or angiotensin receptor blockers to treat hypertension in women in the postnatal period who are breastfeeding or expressing milk. **[2010, amended 2019]**

1.9.9 Treat women with hypertension in the postnatal period who are not breastfeeding and who are not planning to breastfeed in line with the NICE guideline on hypertension in adults. **[2019]**

For a short explanation of why the committee made the 2019 recommendations and how they might affect practice, see the rationale and impact section on antihypertensive treatment during breastfeeding.

Full details of the evidence and the committee's discussion are in evidence review E: postnatal management of hypertension.

1.10 Advice and follow-up at transfer to community care

Risk of recurrence of hypertensive disorders of pregnancy

1.10.1 Advise women with hypertensive disorders of pregnancy that the overall risk of recurrence in future pregnancies is approximately 1 in 5 (see table 5). **[2019]**

Table 5 Likelihood of recurrence of hypertensive disorders of pregnancy

Prevalence of hypertensive disorder in a future pregnancy	Any hypertension in previous or current pregnancy	Pre-eclampsia in previous or current pregnancy	Gestational hypertension in previous or current pregnancy
Any hypertension	Approximately 21% (1 in 5 women)	Approximately 20% (1 in 5 women)	Approximately 22% (1 in 5 women)

Prevalence of hypertensive disorder in a future pregnancy	Any hypertension in previous or current pregnancy	Pre-eclampsia in previous or current pregnancy	Gestational hypertension in previous or current pregnancy
Pre-eclampsia	Approximately 14% (1 in 7 women)	Up to approximately 16% (1 in 6 women) If birth was at 28 to 34 weeks: approximately 33% (1 in 3 women) (No evidence was identified for women who gave birth at less than 28 weeks, but the committee agreed that the risk was likely to be at least as high, if not higher, than that for women who gave birth between 28 and 34 weeks) If birth was at 34 to 37 weeks: approximately 23% (1 in 4 women)	Approximately 7% (1 in 14 women)
Gestational hypertension	Approximately 9% (1 in 11 women)	Between approximately 6 and 12% (up to 1 in 8 women)	Between approximately 11% and 15% (up to 1 in 7 women)
Chronic hypertension	Not applicable	Approximately 2% (up to 1 in 50 women)	Approximately 3% (up to 1 in 34 women)

Long-term risk of cardiovascular disease

1.10.2 Advise women who have had a hypertensive disorder of pregnancy that this is associated with an increased risk of hypertension and cardiovascular disease in later life (see table 6). **[2019]**

Table 6 Cardiovascular risk in women who have had a hypertensive disorder of pregnancy

Risk of future cardiovascular disease	Any hypertension in current or previous pregnancy	Pre-eclampsia in current or previous pregnancy	Gestational hypertension in current or previous pregnancy	Chronic hypertension in current or previous pregnancy
Major adverse cardiovascular event	Risk increased (up to approximately 2 times)	Risk increased (approximately 1.5 to 3 times)	Risk increased (approximately 1.5 to 3 times)	Risk increased (approximately 1.7 times)
Cardiovascular mortality	Risk increased (up to approximately 2 times)	Risk increased (approximately 2 times)	(no data)	(no data)
Stroke	Risk increased (up to approximately 1.5 times)	Risk increased (approximately 2 to 3 times)	Risk may be increased	Risk increased (approximately 1.8 times)
Hypertension	Risk increased (approximately 2 to 4 times)	Risk increased (approximately 2 to 5 times)	Risk increased (approximately 2 to 4 times)	(not applicable)

Notes: Risks described are overall estimates, summarised from risk ratios, odds ratios and hazard ratios.

Increased risk is compared to the background risk in women who did not have hypertensive disorders during pregnancy. Absolute risks are not reported, because these will vary considerably, depending on the follow-up time (range from 1 to 40 years postpartum).

1.10.3 Advise women who have had a hypertensive disorder of pregnancy to discuss how to reduce their risk of cardiovascular disease, including hypertensive disorders, with their GP or specialist. This may include:

- avoiding smoking, as recommended in the NICE guideline on tobacco
- maintaining a healthy lifestyle, as recommended in the NICE guideline on cardiovascular disease
- maintaining a healthy weight, as recommended in the NICE guideline on obesity. **[2019]**

1.10.4 In women who have had pre-eclampsia or hypertension with early birth before 34 weeks, consider pre-pregnancy counselling to discuss possible risks of recurrent hypertensive disorders of pregnancy, and how to lower them for any future pregnancies. **[2019]**

For a short explanation of why the committee made the 2019 recommendations and how they might affect practice, see rationale and impact section on risk of recurrence of hypertensive disorders of pregnancy and long-term cardiovascular disease.

Full details of the evidence and the committee's discussion are in evidence review F: advice at discharge.

Body mass index and recurrence of hypertensive disorders of pregnancy

1.10.5 Advise women who have had pre-eclampsia to achieve and keep a BMI within the healthy range before their next pregnancy (18.5 to 24.9 kg/m^2). See also the NICE guideline on obesity. **[2010, amended 2019]**

Inter-pregnancy interval and recurrence of hypertensive disorders of pregnancy

1.10.6 Advise women who have had pre-eclampsia that the likelihood of recurrence increases with an inter-pregnancy interval greater than 10 years. **[2010, amended 2019]**

Long-term risk of end-stage kidney disease

1.10.7 Tell women with a history of pre-eclampsia who have no proteinuria and

no hypertension at the postnatal review (6 to 8 weeks after the birth) that although the relative risk of end-stage kidney disease is increased, the absolute risk is low and no further follow-up is necessary. **[2010]**

Thrombophilia and the risk of pre-eclampsia

1.10.8 Do not routinely perform screening for thrombophilia in women who have had pre-eclampsia. **[2010]**

Terms used in this guideline

Chronic hypertension

Hypertension that is present at the booking visit, or before 20 weeks, or if the woman is already taking antihypertensive medication when referred to maternity services. It can be primary or secondary in aetiology.

Eclampsia

A convulsive condition associated with pre-eclampsia.

Gestational hypertension

New hypertension presenting after 20 weeks of pregnancy without significant proteinuria.

HELLP syndrome

Haemolysis, elevated liver enzymes and low platelet count.

Hypertension

Blood pressure of 140 mmHg systolic or higher, or 90 mmHg diastolic or higher. **[2019]**

Multi-fetal pregnancy

A pregnancy with more than 1 baby (such as twins, triplets).

Pre-eclampsia

New onset of hypertension (over 140 mmHg systolic or over 90 mmHg diastolic) after 20 weeks of pregnancy and the coexistence of 1 or more of the following new-onset conditions:

- proteinuria (urine protein:creatinine ratio of 30 mg/mmol or more **or** albumin:creatinine ratio of 8 mg/mmol or more, **or** at least 1 g/litre [2+] on dipstick testing) **or**
- other maternal organ dysfunction:
  - renal insufficiency (creatinine 90 micromol/litre or more, 1.02 mg/100 ml or more)
  - liver involvement (elevated transaminases [alanine aminotransferase or aspartate aminotransferase over 40 IU/litre] with or without right upper quadrant or epigastric abdominal pain)
  - neurological complications such as eclampsia, altered mental status, blindness, stroke, clonus, severe headaches or persistent visual scotomata
  - haematological complications such as thrombocytopenia (platelet count below 150,000/microlitre), disseminated intravascular coagulation or haemolysis
- uteroplacental dysfunction such as fetal growth restriction, abnormal umbilical artery doppler waveform analysis, or stillbirth.

Severe hypertension

Blood pressure over 160 mmHg systolic or over 110 mmHg diastolic.

Severe pre-eclampsia

Pre-eclampsia with severe hypertension that does not respond to treatment or is associated with ongoing or recurring severe headaches, visual scotomata, nausea or vomiting, epigastric pain, oliguria and severe hypertension, as well as progressive deterioration in laboratory blood tests such as rising creatinine or liver transaminases or falling platelet count, or failure of fetal growth or abnormal doppler findings.

Recommendations for research

As part of the 2019 update, the guideline committee made 6 research recommendations on the management of pregnancy with chronic hypertension, pre-eclampsia, fetal monitoring, the use of antihypertensives in breastfeeding and advice and follow-up. A research recommendation from the 2010 guideline which was superseded by these new research recommendations was deleted, and 3 research recommendations where research was now underway or had been completed were also deleted.

Key recommendations for research

1 Management of chronic hypertension in pregnancy

In women who need treatment for chronic hypertension in pregnancy, what is the effectiveness and safety of antihypertensive agents (compared in head-to-head trials) in improving maternal and perinatal outcomes? **[2019]**

For a short explanation of why the committee made this recommendation for research, see the rationale and impact section on pre-eclampsia.

Full details of the evidence and the committee's discussion are in evidence review A: interventions for chronic hypertension.

2 Management of hypertension in pregnancy

In women who need treatment for hypertension in pregnancy, what are the adverse neonatal outcomes associated with maternal use of beta blockers (or mixed alpha-beta blockers)? **[2019]**

For a short explanation of why the committee made this recommendation for research, see the rationale and impact section on chronic hypertension.

Full details of the evidence and the committee's discussion are in evidence review A: interventions for chronic hypertension.

3 Management of pre-eclampsia

In which women with pre-eclampsia is inpatient management associated with better outcomes for women and babies? **[2019]**

For a short explanation of why the committee made this recommendation for research, see the rationale and impact section on pre-eclampsia.

Full details of the evidence and the committee's discussion are in evidence review B: monitoring gestational hypertension.

4 Antihypertensive treatment during the postnatal period

In women who need treatment for high blood pressure after birth, what is the effectiveness and safety (including in breastfeeding women) of antihypertensive agents in achieving adequate blood pressure control? **[2019]**

For a short explanation of why the committee made this recommendation for research, see the rationale and impact section on antihypertensive treatment during breastfeeding.

Full details of the evidence and the committee's discussion are in evidence review E: postnatal management of hypertension.

5 Fetal monitoring

In women with hypertensive disorders of pregnancy, what is the optimal fetal monitoring

strategy to detect small for gestational age infants? **[2019]**

For a short explanation of why the committee made this recommendation for research, see the rationale and impact section on fetal monitoring.

Full details of the evidence and the committee's discussion are in evidence review B: monitoring gestational hypertension.

6 Advice and follow-up at transfer to community care

In women who have had hypertension during pregnancy, what interventions reduce the risk of a) recurrent hypertensive disorders of pregnancy, and b) subsequent cardiovascular disease? **[2019]**

For a short explanation of why the committee made this recommendation for research, see the rationale and impact section on follow up after hypertensive disorders of pregnancy.

Full details of the evidence and the committee's discussion are in evidence review F: advice at discharge.

Other recommendations for research (from 2010 guideline)

Haematological and biochemical monitoring in women with gestational hypertension

What is the role of assessing haematological or biochemical parameters at diagnosis of gestational hypertension and during surveillance of gestational hypertension? **[2010]**

Rationale and impact

These sections briefly explain why the committee made the recommendations and how they might affect practice. They link to details of the evidence and a full description of the committee's discussion.

Assessment of proteinuria

Recommendations 1.2.1 to 1.2.7

Why the committee made the recommendations

The committee were aware that there is often over-reliance on a proteinuria result in the diagnosis of pre-eclampsia, and agreed that healthcare professionals should use the results of a full clinical review, including severity of hypertension and other signs and symptoms, before making a diagnosis of pre-eclampsia.

The committee amended the recommendation on automated dipstick tests from the 2010 guideline to emphasise that this should be used as a screening tool for proteinuria. The committee highlighted the importance of using automated dipstick analysis in secondary care rather than visual analysis, which they were aware from their experience has a higher error rate.

Protein:creatinine ratio (PCR) and albumin:creatinine ratio (ACR) were both shown to have high specificity and high sensitivity at the chosen thresholds (30 mg/mmol and 8 mg/mmol respectively), and therefore either could be used depending on local availability. The committee agreed that using both tests together did not have any additional diagnostic benefit.

There was some evidence that using the first morning urine void in assessment of proteinuria can lead to lower diagnostic accuracy, and so the committee recommended against using this.

As PCR and ACR show very high diagnostic accuracy, they should be used in place of 24-hour urine collection, which is awkward for women and could delay identification of proteinuria. However, there are rare occasions when it might be more appropriate to use

24-hour collection (for example, women with renal complications), and so the committee agreed it should not be ruled out entirely.

There was good evidence that a PCR of 30 mg/mmol had good diagnostic accuracy, showing high sensitivity and specificity and should be used as the threshold for significant proteinuria. However, the committee recommended retesting for results above 30 mg/mmol if there is still diagnostic uncertainty (for example, the woman has no other clinical signs or symptoms of pre-eclampsia) because there is large variation in protein excretion during the day and from day to day. The committee agreed that this would prevent women being diagnosed with pre-eclampsia on the basis of a single raised PCR result.

Evidence from a single study showed high sensitivity and specificity for an ACR result of 8 mg/mmol to diagnose proteinuria. However, the committee were also aware of further results from a large, UK-based study, which provided further evidence for the efficacy of a threshold of 8 mg/mmol in the diagnosis of severe pre-eclampsia. The committee were aware that this threshold is different to that used for detection of microalbuminuria in the non-pregnant population. However, they agreed that, on the basis of the evidence reviewed, it was appropriate to use a threshold of 8 mg/mmol for pregnant women.

As with PCR, the committee were aware that women are sometimes diagnosed with pre-eclampsia on the basis of a single raised ACR, and that this may lead to over-diagnosis. Therefore, they made a recommendation to consider repeating the ACR measurement if there was ongoing clinical uncertainty about the diagnosis.

No evidence was reviewed that examined the timing of repeat testing for either ACR or PCR, and so no recommendations could be made regarding this.

How the recommendations might affect practice

The recommendation to take account of other clinical features when assessing women for suspected pre-eclampsia might lead to an increased need for follow-up and surveillance. However, this will also reduce the chance that a diagnosis of pre-eclampsia is missed by raising awareness of the multi-system nature of the disease, and so could reduce the number of women who go on to develop complications from undiagnosed pre-eclampsia.

Not all secondary care units currently use automated dipstick analysis to screen for proteinuria, so the recommendations might increase the need for automated reagent-strip reading devices. However, the accuracy and reliability of screening will be improved,

reducing the need for further investigations for some women and correctly identifying more women who need further testing or investigations.

Moving from 24-hour urine collection to spot urine ACR or PCR will save time, with potential for faster diagnosis, and a reduction in inaccuracies because of incomplete samples. It is also likely to improve quality of life, as the process of completing a 24-hour urine collection is time-consuming and awkward.

A PCR of 30 mg/mmol is already used routinely as a diagnostic threshold and therefore should not change practice. Currently units may use different ACR levels for diagnosis and so the recommendation to use 8 mg/mmol will standardise practice.

Recommendations have been made for the use of either ACR or PCR allowing local decisions to use whichever test is available, so this should not affect practice.

Repeating the PCR or ACR test may incur a small additional cost. However, this should reduce the false positive rate, and mean some women will avoid unnecessary follow-up or intensive monitoring (such as hospital admission) if their proteinuria resolves and is shown to be transient.

Return to recommendations

Treatment of chronic hypertension

Recommendations 1.3.6 to 1.3.12

Why the committee made the recommendations

The committee agreed that pregnant woman with chronic hypertension should be offered lifestyle advice similar to other adults with hypertension, and in line with the NICE guideline on hypertension in adults.

There was very little evidence available on treatment initiation thresholds for chronic hypertension in pregnancy, so the committee based their recommendations on the values specified in the recent Control of Hypertension in Pregnancy Study (CHIPS) and the NICE guideline on hypertension in adults. There was evidence for target blood pressure levels from the large CHIPS trial, so the committee made recommendations based on this.

There was some very limited evidence of both benefits and harms for different antihypertensive medicines. However, there was not enough evidence to recommend one treatment over another. As labetalol, nifedipine and methyldopa had been recommended in the previous guideline (for gestational hypertension and pre-eclampsia), and these medicines had been used for many years in pregnancy, the committee agreed they should be preferred treatment options for chronic hypertension in pregnancy. Labetalol is specifically licensed for use in pregnancy and so is suggested as the first-line option, with nifedipine as the next alternative, and methyldopa as the third option (as it may lead to more side effects and be the least effective option of the 3).

There was some very limited evidence for the benefits of aspirin in reducing preterm births and neonatal unit admissions, so the committee retained the recommendation on aspirin from the previous guideline, but incorporated it into the section on the treatment of chronic hypertension in pregnancy. The committee noted that the studies used different doses of aspirin (ranging from 50 mg to 150 mg daily), and that common practice in the UK was to offer 75 mg to 150 mg, therefore this dose range was recommended.

The committee were aware of the link between chronic hypertension and both pre-existing and gestational diabetes, therefore they made an overarching recommendation at the beginning of the guideline to cross-refer to the existing NICE guideline on diabetes in pregnancy.

The committee made a new recommendation referring to the NICE diagnostics guidance on placental growth factor (PLGF) testing as this may be applicable to women with chronic hypertension.

As there is currently a lack of evidence on the difference in outcomes between different antihypertensive medications, and concerns about possible adverse neonatal events from beta blockers, the committee made research recommendations on these topics.

How the recommendations might affect practice

Based on these recommendations, a clear blood pressure target should now be set for women with chronic hypertension in pregnancy who need antihypertensive treatment to improve consistency of treatment targets.

Starting treatment for hypertension and offering aspirin to women with chronic hypertension who are pregnant are standard care, so these recommendations are not

expected to change practice significantly.

Return to recommendations

Monitoring and treatment of gestational hypertension

Recommendations 1.4.3 and 1.4.4

Why the committee made the recommendations

The committee updated the table from the previous guideline on the management of pregnancy with gestational hypertension. There was very little evidence available on treatment initiation thresholds for gestational hypertension in pregnancy, so the committee made recommendations using the values specified in the recent Control of Hypertension in Pregnancy Study (CHIPS). There was evidence for target blood pressure levels from the large CHIPS trial, so the committee made recommendations based on this. The committee made a new recommendation referring to the NICE diagnostics guidance on placental growth factor (PLGF) testing as this is applicable to women with gestational hypertension.

The committee were aware of the link between gestational hypertension and both pre-existing and gestational diabetes, therefore they made an overarching recommendation at the beginning of the guideline to cross-refer to the existing NICE guideline on diabetes in pregnancy.

There was no evidence on fetal monitoring in gestational hypertension, so the committee made a research recommendation on the optimal fetal monitoring strategy to detect small for gestational age infants.

How the recommendations might affect practice

The recommendations reflect current clinical practice in many units, but may help standardise practice across the NHS for units that currently use other blood pressure targets.

Return to recommendations

Assessment of women with pre-eclampsia

Recommendations 1.5.2 to 1.5.4

Why the committee made the recommendations

The committee agreed, based on their clinical expertise, that women with pre-eclampsia should have a full clinical assessment at every antenatal appointment and should be admitted to hospital if there are any concerns about the wellbeing of the woman or her baby. The committee agreed that this would include (but was not limited to) reasons such as severe hypertension or other features of pre-eclampsia indicating increased risk of adverse outcomes.

There was some evidence that the fullPIERS and PREP-S models can help identify women at different risks of adverse outcomes because of pre-eclampsia. There was more extensive validation of the fullPIERS model, and the validation studies were conducted in populations from a range of healthcare settings. The PREP-S model had been developed using a UK population, and validated using data from similar multinational settings. It was noted that further validation of PREP-S was unlikely to be conducted, because of the cost of conducting these studies. The committee therefore agreed that both models could be considered as options, in addition to a full clinical assessment, to help guide decisions relating to interventions and place of care.

The tools predict adverse outcomes in women, but are not designed to predict outcomes for babies. The committee agreed it was important to highlight this.

How the recommendations might affect practice

The use of a full clinical assessment and validated models to predict risk may improve consistency in current practice with regard to admission to hospital for women with pre-eclampsia. Some centres offer admission to all women with pre-eclampsia, whereas others only offer it to a small proportion of women. The guidance might increase the number of women who are admitted to hospital in some centres if admission is not currently routine, but might decrease admission in other centres, thus standardising practice.

Return to recommendations

Monitoring and treatment of pre-eclampsia and timing of birth

Recommendations 1.5.5, 1.5.7 and 1.5.12

Why the committee made the recommendations

The committee updated the table from the previous guideline on the management of pregnancy with pre-eclampsia. There was limited evidence on the best place of treatment for women with pre-eclampsia. Because of this, the committee made recommendations based on other evidence they reviewed (see evidence review C), which showed that women should be admitted if there were concerns for the wellbeing of the woman or her baby, or a high risk of complications of pre-eclampsia predicted using the fullPIERS or PREP-S model. (See the section of the guideline on assessing pre-eclampsia and evidence review C for more details on the use of the fullPIERS and PREP-S models.)

There was no evidence on treatment initiation thresholds or target blood pressure levels for pre-eclampsia, so the committee based their recommendations on the NICE guideline on hypertension in adults and the values specified in the Control of Hypertension In Pregnancy Study (CHIPS; see evidence review A), which included women with chronic or gestational hypertension.

There was some very limited evidence of both benefits and harms for different pharmacological interventions. However, as there was not enough evidence to recommend one treatment over another, the committee adopted the choices from the previous guideline and recommended choosing a treatment based on previous treatments, side-effect profiles and the woman's preferences. Labetalol is specifically licensed for use in pregnancy and so is suggested as the first-line option, with nifedipine as the next alternative, and methyldopa as the third option (as it may lead to more side effects and be the least effective option of the 3).

There was limited evidence on the benefits and harms of planned early birth compared with expectant management of pregnancy in women with pre-eclampsia, so the committee recommended that decisions about timing of birth should be based on whether the woman and baby are at risk of adverse outcomes if pregnancy is prolonged. These recommendations were based on those from the previous guideline, and expanded based on international guidelines, which were used by the committee in their clinical practice.

Based on the data from HYPITAT-II study, the committee also agreed that pregnancies in women with pre-eclampsia could be managed with continued surveillance to 37 weeks, unless there were specific concerns or indications to offer a planned early birth before then.

There was limited evidence to guide the best place of care for women with pre-eclampsia and their babies, so the committee made a research recommendation.

How the recommendations might affect practice

The recommendations are in line with current best clinical practice, so are unlikely to cause a significant change in practice.

Currently, some units admit all women with pre-eclampsia routinely, some only admit women who they believe to be at a high risk of complications, and some admit very few. Standardising practice could therefore increase or reduce the number of women who will be admitted, depending on a unit's current practice, but is likely to reduce unwanted variance between units.

Return to recommendations

Antihypertensive treatment during the postnatal period, including during breastfeeding

Recommendations 1.9.1 to 1.9.7 and 1.9.9

Why the committee made the recommendations

There was very little evidence on the efficacy and safety of antihypertensive agents in postnatal women, so the committee made recommendations based on the NICE guideline on hypertension in adults, with adaptations based on the potential effects of medicines on the baby. The committee therefore recommended the use of an angiotensin converting enzyme (ACE) inhibitor as first-line treatment, except in women of African or Caribbean family origin, in whom a calcium-channel blocker would be used first line. The choice of second-line medicine was modified from the NICE guideline on hypertension in adults as angiotensin receptor blockers, thiazide and thiazide-like diuretics are not recommended during breastfeeding. Therefore, the committee agreed that beta-blockers should be used

as the second-line antihypertensive agent. The committee also agreed that the medicines with once-daily administration should be used wherever possible and for this reason the committee recommended enalapril in preference to captopril (which is taken 3 times daily) and atenolol as an alternative to labetalol (which is taken 2 to 4 times daily).

Based on their experience, the committee made recommendations on advice for women who wish to breastfeed while taking antihypertensives, and on the monitoring of babies whose mothers are taking antihypertensives.

As there was very little evidence on the effectiveness and safety of antihypertensives for postnatal use, the committee revised the research recommendation made in the 2010 guideline.

How the recommendations might affect practice

There is currently wide variation in practice over use of antihypertensive treatment in the postnatal period, and these recommendations may reduce variation in practice. The recommendations could lead to an increase in the use of atenolol instead of labetalol in the postnatal period.

Return to recommendations

Risk of recurrence of hypertensive disorders of pregnancy and long-term cardiovascular disease

Recommendations 1.10.1 to 1.10.4

Why the committee made the recommendations

Long-term follow-up studies of women who have experienced hypertensive disorders during pregnancy showed an increased risk of long-term cardiovascular disease and a higher prevalence of hypertensive disorders in subsequent pregnancies compared with women unaffected by hypertensive disorders.

There was no evidence on which interventions could reduce the risk of recurrence of hypertensive disorders of pregnancy or future cardiovascular disease, so the committee made a research recommendation.

How the recommendations might affect practice

Providing guidance and advice to women on future risks and signposting appropriate care and lifestyle advice may be an additional activity for some healthcare professionals, compared with current practice.

Return to recommendations

Context

Hypertensive disorders during pregnancy affect around 8% to 10% of all pregnant women and can be associated with substantial complications for the woman and the baby. Women can have hypertension before pregnancy or it can be diagnosed in the first 20 weeks (known as chronic hypertension), new onset of hypertension occurring in the second half of pregnancy (gestational hypertension) or new hypertension with features of multi-organ involvement (pre-eclampsia).

Although the proportion of women with pregnancy hypertensive disorders overall appears to have stayed reasonably stable, maternal mortality from hypertensive causes has fallen dramatically: less than 1 woman in every million who gives birth now dies from pre-eclampsia. There is consensus that introduction of the 2010 NICE evidence-based guidelines, together with the findings from the confidential enquiry into maternal deaths, has made a pivotal contribution to this fall in maternal mortality. However, hypertension in pregnancy continues to cause substantial maternal morbidity, stillbirths and neonatal deaths, and perinatal morbidity. Women with hypertension in pregnancy are also at increased risk of cardiovascular disease later in life.

Variations in care contribute to inequity in adverse outcomes. Adoption and implementation of evidence-based national guidelines have a central role in reducing this variance and improving care and outcomes across the maternity service. Research that has been done since publication of the previous guideline has addressed areas of uncertainty and highlighted where the recommendations can be updated. A surveillance report from 2017 identified new studies in the following areas:

- management of pregnancy with chronic hypertension
- management of pregnancy with gestational hypertension
- management of pregnancy with pre-eclampsia
- breastfeeding
- advice and follow-up care at transfer to community care.

The scope of this update was limited to these sections; it did not include other areas being looked at by other groups (for example, screening strategies for pre-eclampsia, which is

being evaluated by the UK National Screening Committee), and did not look into alternative approaches to categorisation of hypertension in pregnancy (for example, looking at treatment for all types of pregnancy hypertension together, rather than within the subdivisions of chronic hypertension, gestational hypertension and pre-eclampsia). This update has also clarified the basis for the current definition of pre-eclampsia, in order to better align with the stated aims of the 2010 guideline to be consistent with those agreed by the International Society for the Study of Hypertension in Pregnancy (ISSHP).

The aim of the 2019 guideline is to present updated evidence-based recommendations, relevant to practising clinicians, while identifying outstanding areas of uncertainty that need further research. There is a strong argument for uptake of these new guidelines into clinical practice, in order to minimise unnecessary variance and provide optimal care for women and their babies. In doing this, low rates of maternal mortality should be maintained, and progress on reduction of maternal morbidity and perinatal morbidity and mortality can be pursued.

Finding more information and committee details

To find NICE guidance on related topics, including guidance in development, see the NICE topic page hypertension.

For full details of the evidence and the guideline committee's discussions, see the evidence reviews. You can also find information about how the guideline was developed, including details of the committee.

NICE has produced tools and resources to help you put this guideline into practice. For general help and advice on putting NICE guidelines into practice, see resources to help you put NICE guidance into practice.

Update information

April 2023: In recommendations 1.3.12 and 1.4.4, we updated the information about when placental growth factor (PLGF)-based testing for pre-eclampsia should be carried out. This brings it in line with our diagnostics guidance on PLGF-based testing to help diagnose suspected preterm pre-eclampsia.

June 2019: We have reviewed the evidence on the assessment of proteinuria and the treatment of women with chronic and gestational hypertension and pre-eclampsia, breastfeeding and advice on discharge. These recommendations are marked **[2019]**.

We have also made some changes without an evidence review:

- Combined, updated and clarified advice throughout to make it simpler to follow.
- Updated advice on pre-eclampsia in line with the NICE guidelines on antenatal care and pre-term labour and birth.
- Amended dose information for aspirin use in pre-eclampsia in line with current national guidance.
- Updated advice on rest, exercise and work for women with pre-eclampsia in line with the NICE guideline on antenatal care.
- Expanded the advice on the risks of angiotensin-converting enzyme (ACE) inhibitors to treat hypertension in pregnancy.
- Expanded and amended the advice on chlorothiazide to thiazide and thiazide-like diuretics, because chlorothiazide is no longer widely used.
- Updated terminology used for various aspects of treatment in line with current practice.
- Updated the advice on when to offer planned early birth and action to take beforehand.
- Updated the advice on continuing antihypertensive treatment after birth, including treatment with methyldopa.
- Added cross references where suitable to NICE guidance on breastfeeding.

- Updated guidance if necessary to be more specific on which healthcare professionals are responsible for undertaking reviews and checks.
- Updated scan and test times for women with chronic hypertension in pregnancy, and why scans and tests may be needed.
- Updated advice about creating care plans and who should be involved.
- Updated advice on anti-convulsants.
- Updated advice on angiotensin-receptor blockers during breastfeeding.
- Updated definitions and terms used to reflect current clinical practice.

These recommendations are marked **[2010, amended 2019]**.

Recommendations marked **[2010]** last had an evidence review in 2010. In some cases, minor changes have been made to the wording to bring the language and style up to date, without changing the meaning.

Minor changes since publication

October 2022: We added text to indicate that pulse oximetry may be less reliable in people with dark skin. We also added a link to the NHS patient safety alert on the risk of harm from inappropriate placement of pulse oximeter probes. See recommendation 1.5.7.

August 2022: We corrected the term 'first pregnancy' to 'nulliparity' in recommendation 1.1.3.

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