Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

INSTITUTE OF OBSTETRICIANS & GYNAECOLOGISTS
ROYAL COLLEGE OF PHYSICIANS OF IRELAND

CLINICAL PRACTICE GUIDELINE

THE MANANGEMENT OF HYPERTENSION IN PREGNANCY

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

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Contents

1.0 Revision History

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1.0	05/03/16		

2.0 Abbreviations

HELLP	Haemolysis, Elevated Liver Enzymes and Low Platelets
HDP	Hypertensive Disorders of Pregnancy
IUGR	Intrauterine Growth Restriction
LDA	Low-dose aspirin
SGA	Small for Gestational Age

3.0 Key Recommendations

- Blood pressure should be measured with a calibrated aneroid device or an automated machine that has been validated for use in pregnancy and using an appropriately sized cuff.
- Automated reagent strip readers should be used for screening for proteinuria.
- Women with chronic hypertension, regardless of the cause, should be encouraged to attend for pre-conception advice and when pregnant, should book under the care of an obstetrician.
- Every effort should be made to diagnose secondary causes of chronic hypertension if a women presents with newly diagnosed sustained hypertension in early pregnancy.
- At the current time, screening for pre-eclampsia using biomarker based tests should not be undertaken outside the confines of clinical trials.
- Low dose aspirin should be prescribed prior to 16 weeks' gestation for women at risk of developing pre-eclampsia.
- For women with uncomplicated chronic hypertension who are otherwise well with controlled blood pressure at ≥ 37+0 weeks' gestation, delivery should be considered at 38+0 to 39+6 weeks' gestation.

4.0 Purpose and Scope

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

5.0 Background and Introduction

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

Hypertensive disorders during pregnancy carry risks for the woman and the baby. Hypertension in pregnancy remains one of the leading causes of maternal death in the UK and Ireland, Europe and elsewhere (Abalos E et al., 2014; Khan KS et al., 2006). Detailed enquiries have examined standards of care, and substandard care (where different management might have been expected to prevent death) has been identified in the majority of cases (Schutte JM et al., 2008; Knight M et al., 2014). These failures of care occur throughout pregnancy and not just in the critical care environment.

Hypertensive disorders during pregnancy may result in substantial short-term maternal morbidity. More recently, the long-term consequences for women with a diagnosis of hypertension during pregnancy have become clear, in particular chronic hypertension and an increase in lifetime cardiovascular risk (Bellamy L et al., 2007; Smith GCS et al., 2001).

Hypertensive disorders also carry a risk for the baby. About 1 in 20 (5%) stillbirths in infants without congenital abnormality occur in women with pre-eclampsia (Simpson LL., 2002). The contribution of pre-eclampsia to the overall preterm birth rate is substantial: 8–10% of all preterm births result from hypertensive disorders (Slattery MM., 2008). Small-for-gestational-age (SGA) babies (mainly because of intrauterine growth restriction (IUGR) arising from placental disease) are common, with 20–25% of preterm births and 14–19% of term births in women with pre-eclampsia being less than the tenth centile of birthweight for gestation (Rasmussen S., 2006).

There is national guidance on the care of women with severe pre-eclampsia or eclampsia (Pre-eclampsia and Eclampsia Clinical Practice Guideline no. 3, 2011). This clinical guideline contains recommendations for the diagnosis and

management of hypertensive disorders during pregnancy in the antenatal, intrapartum and postnatal periods. It includes recommendations for women with chronic hypertension who wish to conceive and recommendations for advice to women after a pregnancy complicated by hypertension.

6.0 Methodology

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

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

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

Guidelines reviewed included:

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

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

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

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

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7.0 Clinical Guideline

7.1 Measurement of Blood Pressure

Accurate blood pressure measurement impacts on the diagnosis and management of hypertensive diseases in pregnancy. Blood pressure should be measured with the woman rested and in a sitting position with the arm at the level of the heart. An appropriately sized cuff should be used to avoid over or underestimation. If the mid-arm circumference is greater than 33cm, a large cuff should be used. The average of two blood pressure readings needs to be taken to properly diagnose hypertension.

Korotkoff phase V should be used to measure the diastolic blood pressure in pregnancy as it is far more reproducible. Where Korotkoff 5 is absent, Korotkoff 4 (muffling) can be accepted but the method used should be consistent and documented.

Blood pressure should be measured with a calibrated aneroid device or an automated machine that has been validated for use in pregnancy. Automated methods need to be used with caution, as even devices validated in pregnancy may underestimate blood pressure readings in pre-eclampsia. Therefore, a comparison using a calibrated aneroid device is recommended.

All devices, whether aneroid or automated, need to be calibrated for accuracy regularly.

7.2 Proteinuria Quantification

Urinary reagent-strip testing is simple, cheap and an appropriate screening test for proteinuria especially when the suspicion of pre-eclampsia is low. Approximate equivalence is:

1+ = 0.3 g/l

2+ = 1 g/l

3+ = 3 g/l

There is considerable observer error with visual reagent-strip assessment. Consequently, automated reagent-strip readers, which significantly improve both false positive and negative rates, should be used.

If an automated reagent-strip reading device yields a result of 1+ or more, proteinuria should be formally quantified.

The gold standard for diagnosing abnormal proteinuria in pregnancy is a 24-h urinary protein >300 mg per day, although its accuracy is affected by numerous factors such as adequacy and accuracy of collection, and variations in protein excretion. Where 24-hour urine collection is used to quantify proteinuria, there should be a recognised method of evaluating the completeness of the sample.

A spot urine protein/creatinine cut-off level of 30 mg/mmol equates to a 24-h urine protein >300 mg per day and this eliminates the inherent difficulties in undertaking the 24-h urine collections and speeds up the process of decision-making.

7.3 Diagnosis of Hypertension

Hypertension in pregnancy should be defined as:

• A systolic blood pressure ≥ 140mmHg

• A diastolic blood pressure ≥ 90mmHg

These measurements should be based on the average of at least two measurements, taken using the same arm, several hours apart. Elevations of both systolic and diastolic blood pressures have been associated with adverse fetal outcome and therefore both are important.

Hypertension can be further defined as mild, moderate or severe.

Mild Hypertension: Diastolic blood pressure 90–99mmHg, systolic blood pressure 140–149mmHg.

Moderate Hypertension: Diastolic blood pressure 100–109mmHg, systolic blood pressure 150–159mmHg.

Severe Hypertension: Diastolic blood pressure 110mmHg or greater, systolic blood pressure 160mmHg or greater.

For severe hypertension, a repeat measurement should be taken for confirmation no more than 15 minutes later.

7.4 Classification of Hypertension

It is imperative that every effort is made to accurately classify women with hypertension in pregnancy. The classification is as follows:

- Chronic hypertension of all causes
- Gestational (non-proteinuric) hypertension

- Pre-eclampsia
- Superimposed pre-eclampsia

This classification of the hypertensive disorders in pregnancy (HDP) reflects the pathophysiology of the constituent conditions as well as the risks and potential outcomes for both mother and baby. This clinical classification (or very similar) has been adopted by numerous national and international bodies.

7.4.1 Chronic Hypertension of all causes

Chronic or pre-existing pregnancy hypertension predates the pregnancy or appears before 20 weeks' gestation. A substantial number of pregnancies (0.2–5%) are complicated by pre-existing hypertension and the prevalence in western societies is likely to increase due to the advancing age of the prospective mother at conception and the rising tide of obesity. Approximately 90-95% of cases of chronic hypertension are considered to be essential in origin. Adverse outcomes of pregnancy are more common in women with pre-existing hypertension, regardless of the cause, but women with secondary hypertension and co-morbid conditions such as renal disease are at significantly increased risk of poor pregnancy outcome and require multidisciplinary care.

- **Essential (Primary) Hypertension:** Defined by a blood pressure greater than or equal to 140 mmHg systolic and/or 90mmHg diastolic confirmed before pregnancy or before 20 completed weeks' gestation without a known cause. The diagnosis can be difficult in women whose blood pressure before pregnancy or early in the first trimester is unknown as the physiological fall in blood pressure in the second trimester can obscure pre-existing hypertension. A diagnosis of essential hypertension can only be made after a thorough evaluation has eliminated secondary causes.

- **Secondary Hypertension**: Hypertension occurring secondary to an underlying medical cause. Important secondary causes of chronic hypertension in pregnancy include:

➢ Chronic kidney disease e.g. glomerulonephritis, reflux nephropathy, and adult polycystic kidney disease.

➢ Renal artery stenosis.

➢ Systemic disease with renal involvement e.g. diabetes mellitus, systemic lupus erythaematosus.

➢ Endocrine disorders e.g. phaeochromocytoma, Cushing's syndrome and primary hyperaldosteronism.

- Coarctation of the aorta.

  In the absence of any of the above conditions, it is likely that a woman with high blood pressure in the first half of pregnancy has essential hypertension. It may not possible to fully investigate these disorders during pregnancy, and complete appraisal may need to be deferred until after delivery.

- **White Coat Hypertension**: Some women with apparent essential hypertension may have white coat hypertension (raised blood pressure in the presence of a clinical attendant but normal blood pressure otherwise as assessed by ambulatory or home blood pressure monitoring). These women appear to have a lower risk of superimposed pre-eclampsia than women with true essential hypertension but are still at an increased risk compared with normotensive women. White-coat effect in early pregnancy is common. Forty percent of women progress to persistent hypertension at ≥ 20 weeks (i.e., gestational hypertension) and 8% to pre-eclampsia. Women with white-coat effect have risks (e.g., severe hypertension, preterm delivery, and NICU admission) intermediate between normotension and either chronic or gestational hypertension.

- **Transient Hypertensive Effect**: Elevated blood pressure may be due to environmental stimuli (e.g; the pain of labour). A transient hypertensive effect is not associated with an increased risk of adverse outcomes.

7.4.2 Gestational (non-proteinuric) hypertension

Gestational hypertension is characterised by the new onset of hypertension after 20 weeks' gestation without any maternal or fetal features of pre-eclampsia, followed by return of blood pressure to normal within 3 months post-partum.

At first presentation this diagnosis will include some women (up to 25%) who are in the process of developing pre-eclampsia but have not yet developed proteinuria or other manifestations. Some women initially diagnosed in this category will manifest persistent blood pressure elevation beyond 12 weeks post-partum and eventually be classified as having chronic hypertension.

Gestational hypertension near term is associated with little increase in the risk of adverse pregnancy outcomes and mild hypertension does not need treating. The earlier the gestation at presentation and the more severe the hypertension, the higher is the likelihood that the woman with gestational hypertension will progress to develop pre-eclampsia or an adverse pregnancy outcome.

7.4.3 Pre-eclampsia

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

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

- **Proteinuria:** spot urine protein/creatinine >30 mg/ mmol (0.3mg/mg) or >300mg/day or at least 1g/L ('2 +') on dipstick testing.

  OR in the absence of proteinuria

- **Other maternal organ dysfunction:**
  - **Renal insufficiency**: serum or plasma creatinine >90µmol/L
  - **Haematological involvement:** Thrombocytopenia (<100,000 /µL), haemolysis or disseminated intravascular coagulation (DIC)
  - **Liver involvement**: Raised serum transaminases, severe epigastric and/or right upper quadrant pain
  - **Neurological involvement**: eclampsia, hypereflexia with sustained clonus, persistent new headache, persistent visual disturbances (photopsia, scotomata, cortical blindness, posterior reversible encephalopathy syndrome, retinal vasospasm), Stroke
  - **Pulmonary oedema**
- **Fetal growth restriction**

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

7.4.4 Superimposed pre-Eclampsia

Superimposed pre-eclampsia is diagnosed when a woman with chronic hypertension or pre-existing proteinuria develops one or more of the systemic

features of pre-eclampsia after 20 weeks' gestation. Worsening or accelerated hypertension should increase surveillance for pre-eclampsia but it is not diagnostic.

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

7.5 Preconception Care, Screening & Prevention

7.5.1 Preconception Care

Pre-conceptual counselling for women with pre-existing hypertension is recommended. Maternal characteristics that increase the risk of superimposed pre-eclampsia should be identified and modifiable risk factors such as obesity and poorly controlled diabetes should be addressed. Counselling should include an explanation of the risk of pre-eclampsia and fetal growth restriction. Women should be educated about the signs and symptoms of pre-eclampsia.

Changes in antihypertensive agent(s) for care in pregnancy should be made while the woman is planning pregnancy if the woman has uncomplicated pre-existing hypertension, or, if in the presence of comorbid conditions, she is likely to conceive easily (within 12 months).

Antihypertensive drugs acceptable for use in pregnancy are described in Table 1. Angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARB) and renin inhibitors should be discontinued when planning pregnancy or as soon as pregnancy is diagnosed.

7.5.2 Screening

In recent decades, there have been intensive research efforts directed towards developing screening tests for hypertensive pre-eclampsia. Widespread plasma alterations precede the clinical onset of pre-eclampsia and there is intense interest in the identification of predictive biomarkers, in the common expectation that early pregnancy prediction of the disorder will be improved by the addition of biomarkers to clinical and ultrasound based algorithms. Consistent with the placental origin of the disease, placentally derived angiogenic growth factors and related receptors such as PlGF, soluble fms-like tyrosine kinase-1 (vascular

endothelial growth factor receptor 1), angiogenin and endoglin have been previously implicated in pre-eclampsia by many investigators. Several commercially available tests, based on these biomarkers and others, are now available. For example, PerkinElmer and Roche have PlGF-based assays for the prediction of pre-eclampsia. Both report greatest clinical utility for the detection of early onset pre-eclampsia but are of limited use for the prediction of term disease. Perhaps this is not surprising as it is widely held that early-onset pre-eclampsia is a more homogeneous disorder, associated with abnormal placentation, that can be predicted, to a degree, through altered levels of specific plasma proteins involved in angiogenesis. Alere has developed a point of care test PlGF for the prediction of adverse outcomes in women presenting with suspected pre-eclampsia.

Crucially, however, none of these tests have been validated in appropriately designed and adequately powered large scale randomised controlled trials to asses sensitivity, specificity and cost effectiveness. There is a further concern; heightened awareness of risk will possibly lead to increased intervention. The pursuit of lower maternal morbidity complications may occur at the expense of a substantial increase in pre-term delivery rates and substantially reduced mean gestational age and increased neonatal and long-term morbidity. **Therefore, no screening test should be used outside a randomised controlled trial.** Furthermore, the design of any future trials of proposed screening tests for pre-eclampsia should include a co-primary outcome of a non inferior difference in composite neonatal outcome.

7.5.3 Reducing the risk of Hypertensive Disorders in Pregnancy

Strategies to prevent pre-eclampsia are the subject on on-going intensive research efforts. To date, no treatment can effectively prevent pre-eclampsia in all cases.

Daily use of low-dose aspirin (LDA) appears to reduce the risk of pre-eclampsia in women at increased risk of developing the condition. While LDA seems to have the greatest benefit when it is started before 16 weeks' gestation, there is no evidence to suggest there are risks associated with starting LDA at a later gestational age. Moreover, LDA appears to be well tolerated and safe with no major adverse effects or evidence of increased bleeding or placental abruption.

Therefore, women at high risk of pre-eclampsia should take 75mg 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 erythematosis or antiphospholipid syndrome
- type 1 or type 2 diabetes
- chronic hypertension

Women with **more than one** moderate risk factor for pre-eclampsia should take take 75mg of aspirin daily from 12 weeks until the birth of the baby.

Factors indicating moderate risk are:

- first pregnancy
- age 40 years or older
- pregnancy interval of more than 10 years
- body mass index (BMI) of 35kg/m2 or more at first visit
- family history of pre-eclampsia
- multiple pregnancy

Calcium supplementation appears to reduce the risk of hypertension and/or pre-eclampsia, though this effect seems to be strongest in women whose dietary calcium intake is low and/or who are at increased risk of pre-eclampsia. Women with calcium intake <1000 mg/day may consider increasing their daily calcium intake to 1000 – 2500 mg/day by consuming additional foods high in calcium (i.e. dairy products or fortified soy beverages) or through supplementation.

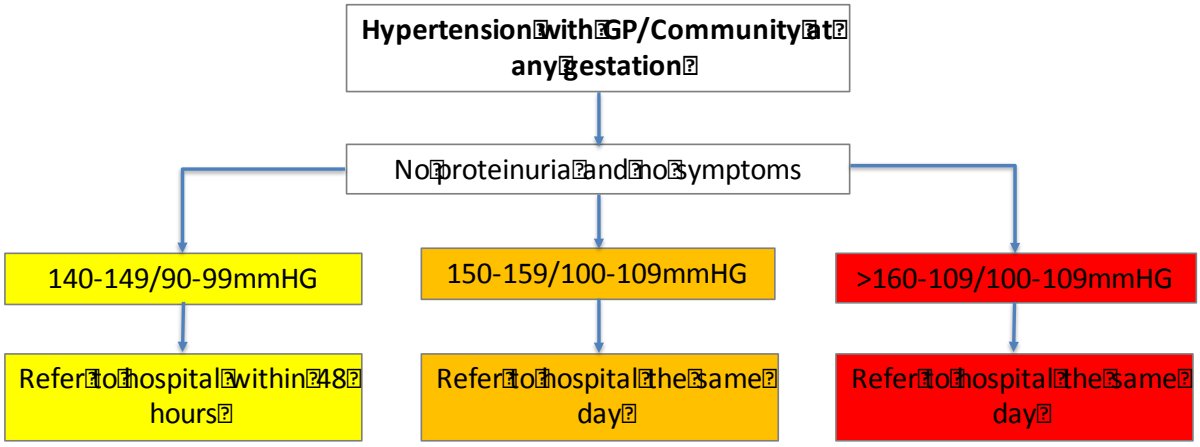
Advice on rest, exercise and work for women at risk of hypertensive disorders during pregnancy should be the same as for healthy pregnant women.

7.6 Investigation of Hypertension

7.6.1 Community Referral

Pregnant women found to be hypertensive in the community should be referred for hospital investigation. Please see Figure 1.

Figure 1. Flow diagram for illustrating the referral pathway of the hypertensive pregnant patient



7.6.2 Hospital Pathway

Pregnant women referred with hypertension need appropriate investigation to classify what type of hypertensive disorder of pregnancy they have.

Once referred with elevated blood pressure a work-up should be performed to ensure the blood pressure is truly elevated (not transient or white coat hypertension) and to rule out secondary hypertension and end organ damage (unless such evaluations have previously been performed).

Investigations should include baseline urinalysis, serum sodium, potassium and creatinine (U&E), uric acid and full blood count: to use as comparators if superimposed pre-eclampsia is suspected later in pregnancy. A fasting glucose should be performed to assess for diabetes as well as a glucose tolerance test arranged for those at risk of gestational diabetes. An ECG and a cardiac ECHO should be arranged for those with longstanding hypertension (> 4 years) to assess left ventricular function.

The most common cause of secondary hypertension is renal disease and is easily screened for with urinalysis and biochemical investigation (U&E). If proteinuria is detected on urinalysis a formal test needs to be carried out to quantify the level of proteinuria. If chronic kidney disease is suspected a renal ultrasound should be performed to rule out polycystic kidney disease (PCKD). Other causes of

secondary hypertension in this age group are primary aldosteronism, phaeochromocytoma and Cushing disease. For women with features suggestive of secondary hypertension (resistant hypertension, hypokalaemia (<3.0 mEq/L) elevated serum creatinine level, lack of family history of hypertension, and age <35 years) referral to a physician with expertise in treating hypertension to direct the work up may be considered.

7.7 Management of the Hypertensive Disorders of Pregnancy

7.7.1 Chronic Hypertension

Women with chronic hypertension, whether essential or secondary, are at high risk of pregnancy complications and should therefore be observed frequently during the pregnancy by an obstetrician familiar with the management of hypertension in pregnancy. The frequency of review will be determined by such factors as how successfully blood pressure is controlled, the number of agents used, associated disorders (e.g. renal disease, proteinuria) and by the gestation but should be increased in the second half of pregnancy when complications are more likely. There may be a role for the use of home blood pressure monitoring equipment for this group of patients.

LDA should be initiated ideally at 12 weeks' gestation and in any case prior to 16 weeks' gestation. Serial surveillance for fetal growth restriction should be carried out as the risk for fetal growth restriction is higher in women with chronic hypertension (see the Clinical Practice Guideline 'Fetal Growth Restriction-Recognition, Diagnosis and Management' published by the Institute of Obstetricians and Gynaecologists, Royal College of Physicians of Ireland and Clinical Strategy and Programmes Directorate, Health Service Executive.).

Clinicians must be vigilant for superimposed pre-eclampsia in women with chronic hypertension.

For pregnant women with chronic hypertension, treatment with anti-hypertensives should be considered if already on medication pre-pregnancy or if moderate to severe hypertension develops. Mild hypertension does not require treatment. There is some evidence that in the presence of end organ damage tighter blood pressure control is beneficial and therapy should be used to keep systolic blood pressure below 140 mmHg and diastolic blood pressure at 80-90 mmHg.

7.7.2 Gestational Hypertension

Women with new onset gestational hypertension should be cared for by an obstetrician. Combined antenatal care between the hospital and GP is acceptable.

Women with **mild** hypertension do not need treatment but should be seen weekly for blood pressure assessment and screening for proteinuria. Blood tests should be performed at diagnosis and not repeated unless clinically indicated. Ultrasound for fetal assessment should be carried out at diagnosis, but need not be repeated if normal and clinical surveillance is satisfactory.

Women with **moderate hypertension** should be commenced on medication (see 7.8) and be reviewed at least twice a week to assess blood pressure. At each visit urine should be checked for proteinuria. Bloods tests should be performed at diagnosis but not repeated unless clinically indicated. Ultrasound for fetal assessment should be carried out at diagnosis, but need not be repeated if normal and clinical surveillance is satisfactory.

Those with **severe hypertension** should be commenced on medication (see 7.8) and admitted to hospital until blood pressure stabilises. While an inpatient blood pressure needs to be assessed regularly and urine should be checked for proteinuria daily but once stabilised and discharged home this can be reduced to twice weekly review and assessment.

Blood tests should be performed daily while inpatient and an ultrasound for fetal assessment should be carried out at diagnosis. Serial ultrasound surveillance should be every fortnight with daily CTG while inpatient. Consideration should be given to the use of corticosteroids for fetal lung maturation if less than 36 completed weeks' gestation.

In the event intrauterine growth restriction (IUGR) is identified, the frequency of surveillance will need to be increased.

Clinicians must be vigilant for progression to pre-eclampsia in women with gestational hypertension and reassessment for pre-eclampsia needs to be considered if clinically indicated.

7.7.3 Pre-eclampsia

Women with pre-eclampsia should be managed according to the Clinical Practice Guideline 'The Diagnosis and management of severe preeclampsia and eclampsia' published by the Institute of Obstetricians and Gynaecologists, Royal College of Physicians of Ireland and Clinical Strategy and Programmes Directorate, Health Service Executive.

7.8 Treatment of Hypertensive Disorders of Pregnancy

Instituting medical therapy of **mild hypertension** has not been shown to improve neonatal outcomes and may mask the diagnosis and recognition of progression to severe disease. Treatment should therefore be reserved for **moderate to severe hypertension**, with the goal of reducing maternal complications such as cerebrovascular accidents, and prolongation of the pregnancy. Severe hypertension requires urgent assessment and management. Increasing evidence exists that cerebral perfusion pressure is altered in pregnant women making them more susceptible to cerebral haemorrhage, posterior reversible encephalopathy syndrome and hypertensive encephalopathy. It is universally agreed that severe hypertension should be lowered promptly, albeit carefully, to prevent such complications (for further information on the treatment of severe pre-eclampsia see Clinical Practice Guideline: The Diagnosis and Management of Pre-eclampsia and Eclampsia).

For women without underlying medical problems, antihypertensive drug therapy should be used to keep systolic blood pressure below 150 mmHg and diastolic blood pressure at 80-99 mmHg. For women with underlying medical problems, such as diabetes or renal disease, there is some evidence that tighter control is beneficial and therapy should be used to keep systolic blood pressure below 140 mmHg and diastolic blood pressure at 80-90 mmHg. Tighter control does not seem to be associated with adverse fetal or neonatal outcomes and is associated with a lower frequency of severe maternal hypertension.

There is insufficient evidence to identify a single preferred agent for non-acute, moderate-severe hypertension management. However, there is consistency across guidelines internationally regarding the acceptability of oral labetalol, nifedipine and methyldopa as first line agents for non-acute treatment of hypertension in pregnancy, based on good quality evidence. Oral labetalol should be considered as first line treatment, with a recommendation to consider alternatives methyldopa and nifedipine only after considering maternal, fetal and neonatal side effect profiles.

Second line agents include hydralazine and prazocin. Angiotension converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARB) and renin inhibitors, have been associated with fetal renal abnormalities, and are contraindicated in pregnancy.

For those with moderate-severe hypertension, with medical therapy should be reviewed twice weekly to assess blood pressure levels. If the initial dose of any antihypertensive drug fails to adequately control blood pressure, the dose should be increased incrementally until the maximum dose is reached. If adequate control of blood pressure has still not been achieved, a second antihypertensive agent may be introduced. This drug should be prescribed in addition to and not instead of the first agent.

Table 1. Antihypertensive Drugs Recommended in Pregnancy

Drug	Dosage Range	Action	Contraindication and Comments
Labetalol	Standard dose: 200-600 mg orally per day in 2-4 divided doses Maximum dosage: 2,400 mg per day	Beta blocker with mild alpha vasodilator effect	Avoid in women with cardiac conduction abnormalities, systolic heart failure or asthma. SI: bradycardia, bronchospasm, nausea, nausea, headache which usually resolves within 24 hours
Nifedipine (extended release) i.e. Adalat LA	Standard dose: 30-60 mg orally per day Maximum dosage: 90 mg per day	Calcium channel antagonist	Ensure correct form prescribed; short acting is not recommended due to risk of hypotension Not recommended before 20 weeks' gestation Caution regarding possible interaction with intravenous magnesium sulphate leading to severe hypotension Avoid in women with aortic stenosis SI: Severe headache, flushing, tachycardia, constipation
Methyldopa	Standard dose: 250-1000 mg orally per day in 2-3 divided doses Maximum dosage: 3000 mg per day	Centrally acting	Slow onset over 24 hours SI: dry mouth, blurred vision, depression, and sedation (dose dependant) Associated with hepatitis, haemolytic anaemia Withdrawal effects: rebound hypertension Stop +/- substitute with other agents within 2 days post delivery

Table 2. Flowchart for Hypertension in Pregnancy Management

HTN >20/40 **No proteinuria** **No symptoms**	**Mild HTN** **140/90-149/99**	**Moderate HTN** **150/100-159/109**	**Severe HTN** **160/110 or higher**
Admission to Hospital:	No	Commence TX and monitor BP - Home/admit	Yes –until BP stabilised <159/109
Treatment:	No	Yes	Yes
Measurement of BP:	Once a week unless situation changes	Twice a week	Minimum 4 times a day until BP stabilises
Screening for proteinuria:	At each visit (weekly)	At each visit (twice weekly)	Daily while in-patient
Blood Tests:	At presentation & then as per routine antenatal care	At presentation & then as per routine antenatal care	At presentation & then at least weekly
Fetal Assessment:	US for fetal growth and AFI if less than 34 weeks. No repeat if normal. US not required if >34 weeks unless clinically indicated	US for fetal growth and AFI if less than 34 weeks. No repeat if normal. US not required if >34 weeks unless clinically indicated	US for fetal growth, AFI & Dopplers and CTG If normal US repeat no more than every 2 weeks.

7.9 Delivery

7.9.1 Timing of Delivery

Timing of delivery is dependent on the severity of the maternal condition and the gestation at which the hypertension presents. A clinical assessment should include the woman's symptoms, the severity of the hypertension, well-being of the fetus and the favourability of the cervix.

Evidence from the HYPITAT Trial (Broekhuijsen K., 2015) suggests that in women with gestational hypertension, induction of labour after 37 weeks'

gestation is associated with a significant reduction in adverse maternal outcome including progression to pre-eclampsia and adverse neonatal outcomes without an increase in Caesarean section rates.

For women with uncomplicated chronic hypertension who are otherwise well with controlled blood pressure at ≥ 37+0 weeks' gestation, delivery should be considered at 38+0 to 39+6 weeks' gestation.

7.9.2 Mode of Delivery

For women with any hypertensive disorder of pregnancy, vaginal delivery should be considered unless a Caesarean delivery is required for the usual obstetric indications. Antihypertensive treatment should be continued throughout labour and delivery to maintain systolic blood pressure at < 160 mmHg and diastolic blood pressure at < 110 mmHg. The third stage of labour should be actively managed with oxytocics, however ergometrine maleate should not be administered to women with any hypertensive disorder of pregnancy.

7.10 Postnatal Management

7.10.1 Care in the first 6 Weeks Postpartum

Blood pressure usually stabilises in the first two months following pregnancy. Appraisal and treatment should be based on the assumption that levels will decline. In many women with pre-existing hypertension blood pressure is often unstable immediately after delivery and may require a medication adjustment. Blood pressure should be measured during the time of peak postpartum blood pressure, at days 3 to 6 after delivery. Women with pre-existing hypertension who did not require treatment during the pregnancy often need treatment postpartum.

Severe postpartum hypertension must be treated with antihypertensive therapy to keep systolic blood pressure below 150 mmHg and diastolic blood pressure at 80-99 mmHg. For women with underlying medical problems, such as diabetes or renal disease, there is some evidence that tighter control is beneficial and therapy should be used to keep systolic blood pressure below 140 mmHg and diastolic blood pressure at 80-90 mmHg.

Non-steroidal anti-inflammatory drugs should not be given postpartum if hypertension is difficult to control, if there is evidence of kidney injury (oliguria and/or creatinine≥ 90 μM), or if platelets are <50 to 109/L.

Postpartum thromboprophylaxis should be considered in women with pre-eclampsia, particularly in the presence of other risk factors.

Antihypertensive agents generally acceptable for use in breastfeeding include the following: labetalol, nifedipine XL, methyldopa, captopril, and enalapril.

7.10.2 Care Beyond 6 Weeks Postpartum

Follow-up after 6 weeks is required to ensure resolution of pregnancy-related changes and ascertain the need for ongoing care. Women with chronic hypertension, a long duration of antihypertensive treatment in pregnancy, higher maximum systolic and diastolic blood pressures, higher body mass index, or occurrence of preterm pre-eclampsia are more likely to have sustained hypertension postpartum (exceeding 6 weeks).

Women with persistent hypertension not previously assessed should undergo routine work-up according to standard regimens.

Advice regarding future lifestyle and optimization of risk factors in subsequent pregnancies may be required. This is particularly relevant for women who are obese, have cardiovascular risk factors, secondary hypertension, or end-organ disease.

Table 3. Flowchart for Postnatal Hypertension Management

Postnatal HTN **<6/52 postpartum**	**Mild-Moderate HTN** **No medication**	**Moderate-Severe HTN** **With medication**	**Chronic HTN**
Treatment:	Commence treatment if BP persistently >149/99	Continue antenatal anti-hypertensives Reduce antihypertensives if BP <130/80 Stop/substitute methyldopa within 2 days of delivery	Continue antenatal anti-hypertensives Maintain BP <140/90 Review long term antihypertensives at 2 weeks Stop methyldopa within 2 days of delivery and replace to antihypertensives prior to pregnancy
Measurement of BP:	Daily for first 2 days after delivery At least once between Day 3 and 5 As clinically indicated or if commenced on antihypertensives	Daily for first 2 days after delivery At least once between Day 3 and 5 As clinically indicated or if a change in antihypertensives	Daily for first 2 days after delivery At least once between Day 3 and 5 As clinically indicated or if a change in antihypertensives
How often to review:	Care plan for postnatal period to include frequency of BP checks and symptoms awareness	Care plan for postnatal period to include frequency of BP checks and symptoms awareness Offer medical review in 2 weeks +/- 6 weeks Offer specialist review if still on antihypertensive by 6-8 weeks Annual Blood pressure and cardiovascular risks assessment	Care plan for postnatal period to include frequency of BP checks and symptoms awareness Offer medical review with pre-pregnancy team at 6-8 weeks Investigation as per diagnosis of hypertension prior to 20 weeks if not previously performed

7.10.3 Long-term Consequences

Women who have been diagnosed with either pre-eclampsia or gestational hypertension are at increased risk of subsequent hypertension and cardiovascular disease.

We recommend counselling women who have had hypertensive disorders in pregnancy that they will benefit from avoiding smoking, maintaining a healthy weight, exercising regularly and eating a healthy diet. It is recommended that all women with previous hypertensive disorders in pregnancy have an annual blood pressure check and regular assessment of other cardiovascular risk factors including serum lipids and blood glucose.

8.0 References

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9.0 Implementation Strategy

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

10.0 Qualifying Statement

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

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

11.0 Appendices

Pull out and keep versions of the following elements of this guideline are included as appendices.

Appendix 1 Flow diagram for illustrating the referral pathway of the hypertensive pregnant patient

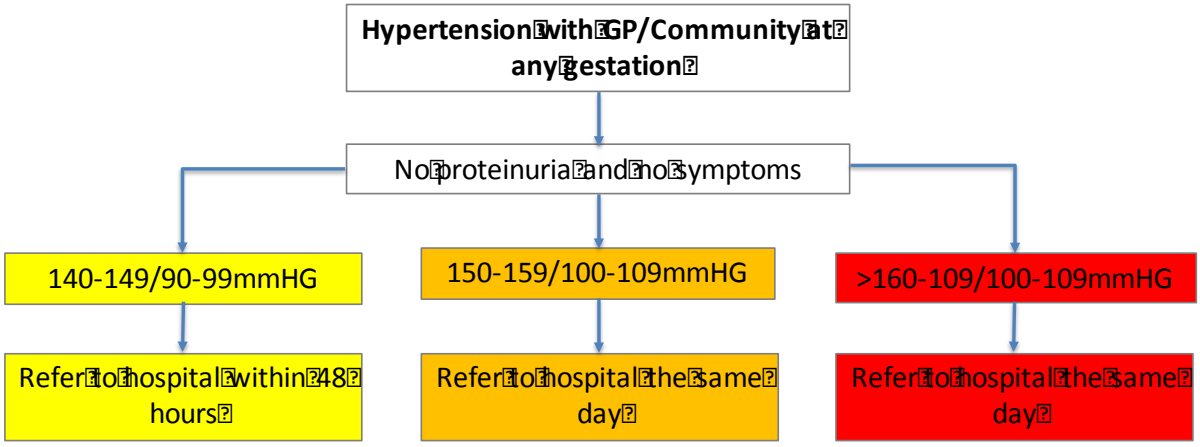
Appendix 2 Antihypertensive Drugs Recommended in Pregnancy

Appendix 3 Flowchart for Hypertension in Pregnancy Management

Appendix 4 Flowchart for Postnatal Hypertension Management

11.1 Appendix 1

Flow diagram for illustrating the referral pathway of the hypertensive pregnant patient



11.2 Appendix 2

Antihypertensive Drugs Recommended in Pregnancy

Drug	Dosage Range	Action	Contraindication and Comments
Labetalol	Standard dose: 200-600 mg orally per day in 2-4 divided doses Maximum dosage: 2,400 mg per day	Beta blocker with mild alpha vasodilator effect	Avoid in women with cardiac conduction abnormalities, systolic heart failure or asthma. SI: bradycardia, bronchospasm, nausea, nausea, headache which usually resolves within 24 hours
Nifedipine (extended release) i.e. Adalat LA	Standard dose: 30-60 mg orally per day Maximum dosage: 90 mg per day	Calcium channel antagonist	Ensure correct form prescribed; short acting is not recommended due to risk of hypotension Not recommended before 20 weeks' gestation Caution regarding possible interaction with intravenous magnesium sulphate leading to severe hypotension Avoid in women with aortic stenosis SI: Severe headache, flushing, tachycardia, constipation
Methyldopa	Standard dose: 250-1000 mg orally per day in 2-3 divided doses Maximum dosage: 3000 mg per day	Centrally acting	Slow onset over 24 hours SI: dry mouth, blurred vision, depression, and sedation (dose dependant) Associated with hepatitis, haemolytic anaemia Withdrawal effects: rebound hypertension Stop +/- substitute with other agents within 2 days post delivery

11.3 Appendix 3

Flowchart for Hypertension in Pregnancy Management

HTN >20/40 **No proteinuria** **No symptoms**	**Mild HTN** **140/90-149/99**	**Moderate HTN** **150/100-159/109**	**Severe HTN** **160/110 or higher**
Admission to Hospital:	No	Commence TX and monitor BP - Home/admit	Yes –until BP stabilised <159/109
Treatment:	No	Yes	Yes
Measurement of BP:	Once a week unless situation changes	Twice a week	Minimum 4 times a day until BP stabilises
Screening for proteinuria:	At each visit (weekly)	At each visit (twice weekly)	Daily while in-patient
Blood Tests:	At presentation & then as per routine antenatal care	At presentation & then as per routine antenatal care	At presentation & then at least weekly
Fetal Assessment:	US for fetal growth and AFI if less than 34 weeks. No repeat if normal. US not required if >34 weeks unless clinically indicated	US for fetal growth and AFI if less than 34 weeks. No repeat if normal. US not required if >34 weeks unless clinically indicated	US for fetal growth, AFI & Dopplers and CTG If normal US repeat no more than every 2 weeks.

11.4 Appendix 4

Flowchart for Postnatal Hypertension Management

Postnatal HTN **<6/52 postpartum**	**Mild-Moderate HTN** **No medication**	**Moderate-Severe HTN** **With medication**	**Chronic HTN**
Treatment:	Commence treatment if BP persistently >149/99	Continue antenatal anti-hypertensives Reduce antihypertensives if BP <130/80 Stop/substitute methyldopa within 2 days of delivery	Continue antenatal anti-hypertensives Maintain BP <140/90 Review long term antihypertensives at 2 weeks Stop methyldopa within 2 days of delivery and replace to antihypertensives prior to pregnancy
Measurement of BP:	Daily for first 2 days after delivery At least once between Day 3 and 5 As clinically indicated or if commenced on antihypertensives	Daily for first 2 days after delivery At least once between Day 3 and 5 As clinically indicated or if a change in antihypertensives	Daily for first 2 days after delivery At least once between Day 3 and 5 As clinically indicated or if a change in antihypertensives
How often to review:	Care plan for postnatal period to include frequency of BP checks and symptoms awareness	Care plan for postnatal period to include frequency of BP checks and symptoms awareness Offer medical review in 2 weeks +/- 6 weeks Offer specialist review if still on antihypertensive by 6-8 weeks Annual Blood pressure and cardiovascular risks assessment	Care plan for postnatal period to include frequency of BP checks and symptoms awareness Offer medical review with pre-pregnancy team at 6-8 weeks Investigation as per diagnosis of hypertension prior to 20 weeks if not previously performed