



Community Care
OF NORTH CAROLINA

Pregnancy Medical Home Program Care Pathway

Management of
Hypertensive Disorders
in Pregnancy

August 2019

Introduction

Preeclampsia is a leading cause of iatrogenic preterm birth. In the past, severe preeclampsia was treated by timely delivery. Current data suggest improved perinatal outcomes with expectant management of preeclampsia with severe features¹. The average gestational age gained with expectant management of preeclampsia with severe features ranges from 7-14 days². Women who have preeclampsia without severe features should be managed expectantly until 37 0/7 weeks of gestation³.

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Note

Pregnancy Medical Home Care Pathways are intended to assist providers of obstetrical care in the clinical management of problems that can occur during pregnancy. They are intended to support the safest maternal and fetal outcomes for patients receiving care at North Carolina Pregnancy Medical Home practices. This pathway was developed after reviewing American College of Obstetricians and Gynecologists (ACOG) resources such as practice bulletins, committee opinions, and Guidelines for Perinatal Care as well as current obstetrical literature. PMH Care Pathways offer a framework for the provision of obstetrical care, rather than an inflexible set of mandates. Clinicians should use their professional knowledge and judgment when applying pathway recommendations to their management of individual patients.

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1 | Definitions

Definitions apply to women typically with a gestational age > 20 weeks⁴.

Gestational Hypertension: A systolic BP \geq 140 mmHg or diastolic BP \geq 90 mmHg taken on 2 occasions >4 hours apart in the absence of proteinuria or severe features that occur after 20 weeks of gestation in a woman with previously normal blood pressure.

Preeclampsia: A systolic BP \geq 140 mmHg or diastolic BP \geq 90 mmHg taken on 2 occasions > 4 hours apart with new onset proteinuria or with severe features.

Severe Features:

- Severe hypertension: systolic BP \geq 160mmHg or diastolic BP \geq 110 mmHg taken on 2 occasions
- Thrombocytopenia: platelet count $<$ 100,000/mm³
- Impaired liver function: abnormally elevated liver enzymes (to twice normal concentration)
- New onset renal insufficiency: serum creatinine $>$ 1.1 mg/dL or doubling of the serum creatinine from baseline
- Pulmonary edema
- New onset visual or cerebral disturbances

Proteinuria: $>$ 300mg of protein in a 24-hour timed urine collection or protein/creatinine ratio \geq 0.3mg/dL or dipstick reading of 1+ if quantitative methods not available.

Chronic hypertension with superimposed preeclampsia: Onset of proteinuria in a woman with preexisting hypertension, sudden increase in proteinuria if already present in early gestation, sudden increase in hypertension or development of severe features.

2 | Management of Preeclampsia Without Severe Features or Chronic Hypertension with Superimposed Preeclampsia

Setting for management:

- Outpatient with close follow-up or inpatient in a facility with obstetrical services available
- Women with preeclampsia with severe features, chronic hypertension with superimposed preeclampsia, or non-compliance should be hospitalized

Antepartum surveillance:

- Evaluation at least twice weekly for evidence of severe features of preeclampsia by measurement of blood pressure and review of symptoms
- Fetal testing with daily fetal kick counts and at least twice-weekly biophysical profile or non-stress test
- Weekly determination of amniotic fluid volume
- Ultrasound at 3-week intervals to evaluate fetal growth
- Laboratory testing for evidence of thrombocytopenia, renal insufficiency, elevated liver enzymes or hemolysis completed at diagnosis and repeated with changes in clinical characteristics or at least weekly
- Once a diagnosis of preeclampsia is established, timed urine collections are not warranted as expectant management may continue despite the severity of proteinuria
- Oral anti-hypertensive medications should only be used in those with severe hypertension without other severe features

Indications for delivery:

- ≥ 37 0/7 weeks
- Non-reassuring fetal testing
- Consider consultation with Maternal-Fetal Medicine (MFM) for any patient <37 0/7 weeks of gestation with additional clinical complications, such as PPROM, fetal growth restriction, suspected abruption

Mode of delivery:

- Vaginal is preferred
- Cesarean deliveries are reserved for the usual obstetrical indications

Indications for delivery:

- Data strongly supports the use of intrapartum magnesium sulfate for preeclampsia with severe features
 - Literature for preeclampsia without severe features remains unclear
- If magnesium sulfate is used for seizure prophylaxis, therapy should continue for 12-24 hours postpartum or when urine output is ≥ 150 ml per hour for 3 hours

3 | Management of Gestational Hypertension

Close monitoring for the development of preeclampsia, progressing to preeclampsia with severe features (AST, platelets and Cr).

Weekly or twice-a-week nonstress test or biophysical profile.

Oral anti-hypertensive medications:

- Should only be used in those with severe hypertension.

Indication for delivery:

- Gestational age ≥ 37 0/7 weeks gestation

4 | Management of Preeclampsia With Severe Features or Chronic Hypertension with Superimposed Preeclampsia

Initial evaluation and management:

- Serial maternal assessment of blood pressure and signs/symptoms of severe features
 - Laboratory evaluation: CBC with platelets, LFTs, creatinine
 - Assess urine output, initiate 24-hour collection of urine for protein when there is concern for chronic hypertension with superimposed preeclampsia with severe features
 - Antihypertensive therapy is indicated as soon as possible (within 30-60 minutes) for sustained systolic BP ≥ 160 mm Hg or diastolic BP ≥ 110 mm Hg
 - “Sustained” is defined as severe-range BP which is persistent for 15 minutes or longer
 - Magnesium sulfate for seizure prophylaxis (not for BP control)
- Fetal assessment
 - Fetal monitoring as appropriate for gestational ages 24 0/7 - 33 6/7 weeks
 - Ultrasound for estimated fetal weight and presentation
 - Initiate antenatal corticosteroids prior to 34 0/7 weeks gestation
- Gestational dating criteria ≥ 34 0/7: delivery at hospital with appropriate level of maternal and neonatal support
- Gestational age < 34 0/7 weeks
 - Women with suspected early onset preeclampsia with severe features should be admitted for evaluation and consideration, or transferred to a center with appropriate level of maternal and neonatal support, including MFM consultation

Patient counseling:

- Patient should be counselled about management options on expectant management versus delivery:

- Maternal risks and approximate incidence:
 - HELLP syndrome: 20%
 - Eclampsia: 2%
 - Pulmonary edema: 5%
 - Acute renal failure: 2%
- Fetal risks:
 - Worsening fetal condition: 40%
 - Abruptio placenta: rare
 - Fetal death: rare
- Patient should be counselled about management options on expectant management for benefits to the fetus by increasing gestational age at delivery and risks to the mother:
 - Fetal death is an absolute contraindication to expectant management for severe disease in singleton pregnancies
 - Severe hypertension, controlled with antihypertensive medication, by itself is not an indication for delivery prior to 34 0/7 weeks
 - If severe hypertension cannot be controlled with antihypertensive medication, then delivery is indicated
 - The amount of proteinuria by itself is not an indication for delivery in women with early onset of preeclampsia with severe features

5 | References

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5. Chronic Hypertension in Pregnancy: Report of the American College of Obstetricians and Gynecologists. Practice Bulletin 2018 Dec; 203
6. Gestational Hypertension and Preeclampsia: Report of the American College of Obstetricians and Gynecologists. Practice Bulletin 2018 Dec; 202
7. LeFevre ML. Low-Dose Aspirin for the Prevention of Morbidity and Mortality from Preeclampsia: US Preventive Services Task Force Recommendation Statement. Annals of Internal Medicine, December 2014.

6 | Appendix A: Low-Dose Aspirin for the Prevention of Morbidity and Mortality from Preeclampsia

Women at elevated risk for preeclampsia should receive a recommendation for low-dose aspirin (81mg/day)⁷.

- Higher doses (up to 150 mg/ day) have been used in some trials, however, the American College of Obstetricians and Gynecologists (ACOG), the Society for Maternal- Fetal Medicine (SMFM), and the US Preventative Services Task Force (USPSTF) all recommend 81 mg
- This recommendation should be based on the presence of one or more “high risk” factors or two or more “moderate risk” factors
- Initiate low-dose aspirin at 12-16 weeks of gestation (optimally before 16 weeks); may be initiated up to 28 weeks of gestation in patients with delayed entry to prenatal care

Definitions:

Adapted from U.S. Preventive Services Task Force and ACOG Committee [Opinion 743](#).

- High risk factors:
 - History of preeclampsia
 - Multifetal gestation
 - Chronic hypertension
 - Type I diabetes
 - Type II diabetes
 - Renal disease
 - Autoimmune disease
- Moderate risk factors:
 - Nulliparity
 - Obesity (body mass index greater than 30)
 - African American race
 - Age 35 or older
 - Low socioeconomic status
 - >10-year interpregnancy interval
 - BMI >30
 - Mother or sister with history of preeclampsia
 - Prior low birthweight, previous adverse pregnancy outcome, more than 10-year pregnancy interval

7 | Appendix B: Postpartum Surveillance for Severe Hypertension

Goal: Standardization of care resulting in reduction of harm (mortality/morbidity) through avoidance and timely management of severe hypertension in postpartum women.

Adapted from Safe Motherhood Initiative: [Maternal Safety Bundle for Severe Hypertension in Pregnancy](#)

Postpartum surveillance:

- Inpatient
 - Measure BP every 4 hours after delivery until stable
 - Do not discharge patient until BP is well controlled (SBP < 150 and DBP < 100) for at least 24 hours
- Outpatient
 - For patients with preeclampsia, visiting nurse or clinic evaluation recommended within 3-5 days
 - Follow-up visit in 7-10 days or earlier if persistent symptoms

Antihypertensive therapy:

- Recommended for persistent postpartum hypertension: SBP \geq 150 or DBP \geq 100 on at least 2 occasions at least 4 hours apart
- Persistent SBP \geq 160 or DBP \geq 110 should be treated within 30 to 60 minutes

Discharge planning:

- For all patients
 - Provide education to all patients and families on signs and symptoms of preeclampsia with culturally competent, easy to read guidance
 - Stress importance of timely reporting of symptoms or concerns to provider
 - Educate patient about new hypertension criteria (SPB \geq 130 and DBP \geq 80) from the US Preventative Services Task Force (USPSTF), the American Health Association and the American College of Cardiology
- For patients with preeclampsia
 - BP monitoring recommended 72 hours after delivery
 - Outpatient surveillance with visiting nurse recommended within 3-5 days and 7-10 days after delivery; earlier if persistent symptoms

Post-discharge evaluation in ED:

- Patient should be advised to seek further evaluation if blood pressure is $\geq 160/110$ or if blood pressure is $\geq 140-159/90-109$ with unremitting headaches, visual disturbances or epigastric/RUQ pain
- ACOG [Emergency Department Postpartum Preeclampsia Checklist](#) revised January 2019
- Antihypertensive therapy suggested for persistent blood pressure of $\geq 150/100$ on two occasions at least 4 hours apart; persistent blood pressure $\geq 160/110$ should be treated within 1 hour
 - With good response, patient should be admitted for further observation and management (L&D, ICU, telemetry)
 - For patients with signs and symptoms of eclampsia, abnormal neurological evaluation, congestive heart failure, renal failure, coagulopathy, poor response to antihypertensive treatment: emergency consult for further evaluation with MFM, Internal Medicine, OB anesthesiology, critical care

8 | Appendix C: Patient Education Materials

American College of Obstetrics and Gynecology (ACOG)

www.acog.org

These frequently asked questions for patients are available as a website or PDF and address:

- Explanation of high blood pressure, chronic hypertension, gestational hypertension, preeclampsia and HELLP syndrome
- Risk for the patient and the fetus if preeclampsia occurs
- Signs and symptoms of preeclampsia
- A glossary of medical terms

Available in both [English](#) and [Spanish](#).

March of Dimes

www.marchofdimes.org

Included with information on [pregnancy complications](#), the March of Dimes provides an explanation of the physiology of [high blood pressure](#) during pregnancy in plain English addressing the following topics:

- What is blood pressure
- What the blood pressure numbers represent and what is considered a normal value in pregnancy
- Complications associated with high blood pressure in pregnancy including preeclampsia, premature birth, low birth weight and placental abruption
- How to manage high blood pressure during and before pregnancy

The March of Dimes also provides information on [HELLP syndrome](#) and [preeclampsia](#), accompanied by a [4-minute video](#) featuring a provider explaining preeclampsia.

Preeclampsia Foundation

www.preeclampsia.org

This organization provides information for patients about preeclampsia, HELLP syndrome, and heart disease.

- [Information](#) on differentiating symptoms of pregnancy from symptoms of pre-eclampsia
- This [animated 3-minute video](#) identifies the 7 preeclampsia symptoms that pregnant woman should be aware of
- [Information](#) for women who have experienced preeclampsia during pregnancy on how to modify lifestyle to reduce that risk
 - They also discuss the importance of advocating for your health by mentioning your history preeclampsia to future healthcare providers even if your experience occurred years ago or you have finished having children

The CDC provides information for patients about hypertension during pregnancy.

- There are additional links for information on preeclampsia, eclampsia, stroke and preterm delivery
- Guidance on what women should do before, during and after pregnancy are highlighted
- High blood pressure during pregnancy [factsheet](#)

9 | Appendix D: Provider Resources

American College of Obstetrics and Gynecology (ACOG)

www.acog.org

In December 2018, the ACOG released two new pieces of guidance on one of the leading causes of maternal deaths—hypertension or high blood pressure in pregnancy:

- [Gestational Hypertension and Preeclampsia](#) and [Chronic Hypertension in Pregnancy](#) will update and replace the ACOG’s Hypertension in Pregnancy task force report developed in 2013
 - A woman is considered to have gestational hypertension, or high blood pressure developed in pregnancy, after the first 20 weeks
 - Prior to that, hypertension is generally deemed to have predated the pregnancy and is considered chronic hypertension
- [ACOG Practice Bulletin Number 202](#) (January 2019): Gestational Hypertension and Preeclampsia
 - This practice bulletin provides guidelines for the diagnosis and management of gestational hypertension and preeclampsia
- [ACOG Practice Bulletin Number 203](#): Chronic Hypertension in Pregnancy
 - This practice bulletin provides a rational approach to chronic hypertension in pregnancy based on new research data and relevant pathophysiologic and pharmacologic considerations
- [ACOG Committee Opinion 743](#) (July 2018): Low Dose Aspirin Use During Pregnancy
 - This committee opinion includes recommendations for daily low-dose aspirin for women at high risk of preeclampsia and for low-dose aspirin to be considered in women with more than one of several moderate risk factors for preeclampsia.
- [ACOG Committee Opinion 767](#) (February 2019): Emergent Therapy for Acute-Onset, Severe Hypertension During Pregnancy and the Postpartum Period
 - Replaces Committee Opinion 692 (September 2017)
 - This committee opinion includes recommended order sets for the pharmacologic management of severe hypertension during pregnancy.
- [ACOG Committee Opinion 638](#) (September 2015): First Trimester Risk Assessment for Early-Onset Preeclampsia
 - This committee opinion includes the importance of a detailed medical history for evaluation of risk factors for preeclampsia
 - Predictive tests for preeclampsia are not recommended as they may harm more women than they benefit

California Maternal Quality Care Collaborative (CMQCC)

www.cmqcc.org

CMQCC published a [Preeclampsia Toolkit](#) that is available free of charge after registering with the site. Notable tools include the guide to [Accurate Blood Pressure Measurement](#) toolkit which reviews the techniques for measuring blood pressure as well as the appropriate cuff sizes by

arm circumference and considerations for patients whose arm circumference exceed available cuff sizes.

NIH U.S. National Library of Medicine Medline Plus

www.nlm.nih.gov

This site includes a summary of [high blood pressure in pregnancy](#) with sections including current news relevant to high blood pressure in pregnancy and links to pertinent clinical trial sites.

The site provides patient education materials in English and Spanish including:

- Information on preeclampsia, including [images](#) accompanying key terms for blood pressure, edema and weight gain to aid in counseling patients
 - Available in both [English](#) and [Spanish](#)
- A 30 second animation that explains the link between preeclampsia and the placenta
 - Available in both [English](#) and [Spanish](#)

Perinatology.com - UPC Ratio Calculator

www.perinatology.com

This site includes multiple clinical calculators, including a [Urine Protein to Creatinine Ratio \(UPCR\) calculator](#) to aid in management of proteinuria.

ACOG's Safe Motherhood Initiative

www.acog.org

[ACOG's District II Safe Motherhood Initiative](#) published a slide set (April 2018) and treatment algorithms for labetalol, hydralazine and nifedipine use in severe hypertension.

The treatment algorithms and following sample checklists are available free of charge online:

- Hypertensive Emergency Checklist
- Eclampsia Checklist
 - Emergency Department Postpartum Preeclampsia Checklist (January 2019)

UNC School of Medicine, Center for Maternal and Infant Health

www.mombaby.org

The University Of North Carolina School of Medicine at Chapel Hill publishes [obstetric treatment algorithms](#). Several pertain to management of hypertensive disorders in pregnancy, including:

- [New Onset Hypertension Postpartum](#)
 - Includes table of antihypertensive medications, dosing, side effects, and considerations for lactation
- [Thromboembolic Disease: Outpatient](#)
 - Includes anticoagulation regimen for conditions at increased risk of hypertension during pregnancy
- [Thromboembolic Disease: Inpatient](#)
 - Includes VTE Prophylaxis Guidelines for Inpatient Obstetrics

10 | Appendix E: Steps for Obtaining Accurate Blood Pressure Measurement

Adapted from California Maternal Quality Collaborative, Accurate Blood Pressure Measurement and Peters RM (2008) High blood pressure in pregnancy. Nursing for Women's Health, Oct/Nov, pp. 410-422.

Step 1: Prepare equipment

- Use equipment that has been calibrated and validated as accurate
 - Mercury sphygmomanometer is gold standard
 - May use validated automated equipment
- Obtain appropriate cuff size:
 - Arm circumference of 22-26 cm: small adult cuff
 - Arm circumference of 27-34 cm: adult cuff
 - Arm circumference of 35-44 cm: large adult cuff
 - Arm circumference of 45-52 cm: adult thigh cuff

Step 2: Prepare patient

- Sitting or semi-reclining position with back supported and arm at heart level
- Patient to sit quietly for 5 minutes prior to measurement
- Bare upper arm of restrictive clothing
- Feet should be uncrossed and flat without dangling from bed or exam table
- Assess recent tobacco or caffeine use (within previous 30 minutes preceding the measurement)
 - If blood pressure is at the level that requires treatment, consumption of a nicotine or caffeine should not lead to delay in treatment with appropriate anti-hypertensive therapies

Step 3: Take measurement

- Support patient's arm at heart level, seated in semi-fowlers position
 - Instruct patient not to talk
- For auscultatory measurement
 - Deflate the cuff slowly at a rate of 2-3 mm Hg per second
 - Use first audible sound (Kortokoff 1) as systolic pressure and use disappearance of sound (Kortokoff V) as diastolic
 - Read to nearest 2 mm HG
 - At least two readings should be taken, one minute apart
 - Use the highest reading

- If greater than or equal to 140/90, repeat within 15 minutes and if still elevated, further evaluation for preeclampsia is warranted
- Do not reposition patient to either side to obtain a lower BP
 - Doing so will give you a false reading
- Inpatient setting: Measurement may be taken either sitting up or left lateral recumbent with arm at the level of the heart

Step 4: Record measurement

- Document BP, patient position and arm in which the BP is taken