



NORTHERN NEW ENGLAND
PERINATAL QUALITY IMPROVEMENT NETWORK

The following guidelines are intended only as a general educational resource for hospitals and clinicians, and are not intended to reflect or establish a standard of care or to replace individual clinician judgment and medical decision making for specific healthcare environments and patient situations.

Guideline for the Management of Hypertensive Disorders of Pregnancy

Draft #5 May 1, 2015

In November of 2013 the ACOG Task Force on Hypertension published an Executive Summary statement regarding the management of hypertension in pregnancy (1). The Task Force used strategies from the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Working Group to evaluate the available evidence and make recommendations for care. In many instances recommendations are based on expert opinion as evidence regarding optimal care is lacking.

All recommendations made are considered appropriate care; however, recommendations are graded as “strong” or “qualified” based on the available evidence. Strong recommendations are well supported, are seen as appropriate for virtually all patients, and are intended to serve as the basis for health care policy. Qualified recommendations are also considered appropriate, but may not always be optimal, especially for patients with differing value preferences or attitudes regarding effectiveness. All recommendations noted below are “qualified” unless designated as “strong”.

Unit Structure

Each delivery unit should maintain standardized policy and procedure regarding the management of hypertensive disorders of pregnancy. Special consideration should be given toward the development of guidelines and order sets for the management of acute onset of severe hypertension with preeclampsia or eclampsia (2). Units should consider special training and simulated exercises in the care of patients with these conditions. Front-line staff performing patient assessment should be trained to recognize the signs and symptoms that indicate deterioration in the patient condition.

Measuring Blood Pressure in the Pregnant Woman

Blood pressure measurements are optimally taken with the woman seated with good back and arm support, with legs uncrossed, and the middle of the cuff positioned at the level of the right atrium (midpoint of the sternum). The patient should be instructed to relax and not talk during measurement. Measurements should be taken ideally after 5 minutes of rest in a seated position, with the heart rate at baseline. If the blood pressure is elevated initially, measurement should be repeated after several minutes. Blood pressure measurement with the woman lying on her left side and with the cuff on the upper arm may result in falsely lowered readings. (Appendix 1)

Definitions:

- Gestational Hypertension: Blood pressure ≥ 140 mmHg systolic or ≥ 90 mmHg diastolic after 20 weeks gestation without preeclampsia. Blood pressure elevation should be sustained over 4 hours.
- Preeclampsia: Blood pressure ≥ 140 mmHg systolic or ≥ 90 mmHg diastolic on two occasions at least 4 hours apart with patient at rest after 20 weeks gestation in a woman with previously normal blood pressure with:
 - proteinuria (24 hour urine protein ≥ 300 mg (or extrapolated by a shorter duration collection), urine protein/creatinine ratio ≥ 0.3 or 1+ dipstick)
- Preeclampsia with Severe Features - Any of the following:
 - Blood pressure ≥ 160 mmHg systolic or ≥ 110 mmHg diastolic on two occasions at least 4 hours apart with patient at rest. (Preeclampsia with severe features is considered present when antihypertensive medications are used to treat severe hypertension prior to a 4 hour period of time.)
 - Thrombocytopenia: platelet count $< 100,000$ /microliter
 - Renal insufficiency: creatinine 1.1 mg/dl or doubling of serum creatinine in the absence of other renal disease
 - Impaired liver function: elevated hepatic transaminases to twice upper limit of normal, severe persistent right upper quadrant or epigastric pain unresponsive to medication and not accounted for by alternative diagnosis, or both
 - Pulmonary edema
 - New-onset cerebral or visual disturbance (including persistent severe headache and scotoma)
- Chronic hypertension: Blood pressure ≥ 140 mmHg systolic or ≥ 90 mmHg diastolic prior to 20 weeks gestation
- Superimposed preeclampsia: Diagnosis of preeclampsia in a woman with chronic hypertension
- Eclampsia: New onset grand mal seizures in a woman with preeclampsia or gestational hypertension

- HELLP syndrome: Particular set of laboratory abnormalities considered to be a preeclampsia subtype, consisting of hemolysis, elevated liver enzymes and low platelets.

Summary of Recommendations of the ACOG Task Force on Hypertension in Pregnancy (2013)

Prevention of Preeclampsia

The following is the recommendation of the U.S. Preventive Services Task Force Recommendation Statement on Pre-eclampsia. (See reference #5)

Patients at high risk of developing pre-eclampsia may benefit from low dose aspirin beginning at 12-13 weeks. Any women at high risk should be offered prophylaxis. Any women with 3 risk factors as shown in the table below may also benefit.

High Risk	>= 3 Low Risk
Offer ASA	With 3 of the risk factors below, offer ASA
History preeclampsia	Nulliparity
Multifetal gestation	Age >= 35 years
Chronic hypertension	>10 year interval between pregnancy
Pregestational diabetes	BMI > 30 kg/m ²
Renal disease	African American ethnicity
Systemic lupus	Mother or sister with preeclampsia
Antiphospholipid Antibody Syndrome	Previous pregnancy with IUGR

Outpatient Initial Assessment

- Women with normal blood pressure prior to 20th week of gestation who develop either systolic BP ≥ 140 or diastolic BP ≥ 90 on two occasions at least 4 hours apart require evaluation including:
 - Review for symptoms of preeclampsia with severe features
 - CBC, creatinine, liver enzyme studies
 - Proteinuria assessment
 - Ultrasound for EFW and AFI
 - NST; BPP if nonreactive
- Women with normal blood pressure prior to 20th week of gestation who develop either systolic BP ≥ 160 or diastolic BP ≥ 110 require hospitalization. The definitive diagnosis requires elevated BP on 2 occasions at least 4 hours apart.

Surveillance for Outpatient Expectant Management

- All women with gestational hypertension or preeclampsia without severe features should have:
 - Daily assessment (by the woman) of fetal movement and symptoms (headache, visual changes, epigastric/RUQ pain and shortness of breath),
 - Twice weekly assessment of BP
 - Weekly assessment of urine protein, platelet count, creatinine and liver function
 - Weekly assessment of AFI and ultrasound for fetal growth every 3 weeks
- Women with gestational hypertension should have weekly NST, and weekly office evaluation of BP, while other BP assessment can occur in a home setting
- Women with preeclampsia without severe features should have twice weekly office NST with BP assessment
- If fetal growth restriction is identified (EFW < 10% for gestational age), umbilical artery doppler studies should be included with antenatal testing (*strong*)

General Issues of Expectant Management

- Medical treatment should not be initiated when gestational hypertension or preeclampsia with blood pressure < 160 mmHg systolic or <110 mmHg diastolic is present. (*moderate*)
- Strict bed rest is not indicated.
- Preeclampsia with severe features < 34 0/7 weeks with stable maternal and fetal condition should be managed at facilities with adequate maternal and neonatal intensive care resources. (*strong*)
- Hospitalization is indicated when preeclampsia with severe features is present, or if fetal growth restriction or nonreassuring fetal testing is present.
- Hospitalization for delivery is recommended at 37 0/7 weeks for women with gestational hypertension or preeclampsia without severe features.

Inpatient Assessment and General Management

- Upon admission:
 - Evaluate for symptoms of severe preeclampsia
 - CBC, creatinine, liver enzyme studies
 - Proteinuria assessment
 - Ultrasound for EFW and AFI, if not recently performed.
 - NST, BPP if nonreactive.
- Women with systolic BP \geq 160 or diastolic BP \geq 110, persisting for longer than 15 minutes require urgent medical treatment. (*strong*) First line medications include IV labetalol or IV hydralazine. When IV access is not available, oral therapy can be initiated with nifedipine or labetalol. (Appendix 2, 3 and 4)

- The target blood pressure for treatment is systolic BP 140-160 and diastolic BP 90-100.
- When first line therapies as detailed above with the use of 2 anti-hypertensive agents do not result in sufficient control of BP, consultation for further management should be obtained. Consultation with anesthesia, critical care, cardiology or a maternal-fetal medicine specialist (Reference 2) will depend on practice setting. Second line medical treatments to consider are IV infusions of labetalol or nicardipine.
- Magnesium sulfate administration:
 - Magnesium sulfate is indicated for seizure prophylaxis when preeclampsia with severe features or eclampsia is present (*strong*).
 - Magnesium sulfate should be continued during cesarean delivery (*strong*).
 - When magnesium is administered it should be discontinued after steroid administration (48 hours) if delivery is not indicated.
 - Magnesium sulfate should not be universally administered for seizure prophylaxis to women with preeclampsia without severe features.
- Neuraxial anesthesia is recommended for labor analgesia and cesarean delivery. (*strong*)
- Mode of delivery with preeclampsia should be determined by fetal gestational age, fetal presentation, cervical status, and maternal and fetal condition. (Appendix 5)

Delivery Timing and Steroid Administration

- Regardless of gestational age, if unstable maternal or fetal condition, deliver soon after maternal stabilization is achieved (*strong*)
- For women with gestational hypertension or preeclampsia without severe features at ≥ 37 0/7 weeks, delivery is indicated.
- For women with gestational hypertension or preeclampsia without severe features at ≥ 34 0/7 weeks, and associated with the following conditions, delivery is indicated.
 - PPROM or labor
 - EFW $< 5^{\text{th}}$ percentile
 - Oligohydramnios (persistent AFI < 5 cm)
 - Persistent BPP 6/10 or less
 - Suspected placental abruption
- For women with preeclampsia with severe features or HELLP syndrome at ≥ 34 0/7 weeks, delivery is indicated soon after maternal stabilization is achieved (*strong*)
- For women with preeclampsia with severe features at < 34 0/7 weeks, and associated with the following conditions, administer corticosteroids and do not delay delivery after maternal stabilization. (*strong*)
 - Uncontrollable severe hypertension
 - Eclampsia
 - Pulmonary edema

- Placental abruption
- DIC
- Nonreassuring fetal testing
- For women with preeclampsia with severe features or HELLP syndrome and stable maternal and fetal condition at < 34 0/7 weeks, and associated with the following conditions, administer corticosteroids and await 48 hours prior to delivery.
 - 33 5/7 weeks gestation
 - Persistent maternal symptoms
 - PPROM
 - Labor (do not augment spontaneous labor)
 - Platelet count < 100,000/microliter
 - Persistently abnormal hepatic enzyme concentration (twice or more times the upper limit of normal)
 - Fetal growth restriction (EFW at < 5th percentile)
 - Severe oligohydramnios (AFI < 5 cm)
 - Reversed end diastolic flow of umbilical artery Doppler study
 - New onset renal dysfunction (creatinine 1.1 mg/dl or doubling of serum creatinine in the absence of other renal disease) or increasing renal dysfunction.
- For women with preeclampsia with severe features and an otherwise stable maternal and fetal condition exists at < 33 5/7 weeks, continued expectant management in hospital can be considered.
 - Adequate maternal and neonatal intensive care resources should be available. (*strong*)
 - Magnesium should be discontinued after 48 hours.
 - Oral antihypertensive medications may be utilized if indicated.
- For women with preeclampsia with severe features or HELLP syndrome prior to fetal viability, delivery soon after maternal stabilization is recommended. Expectant management is not recommended. (*strong*) (See Appendix 6 for Eclampsia Checklist)

Postpartum

- Consider discontinuation of NSAIDs if hypertension persists more than 24 hours after delivery.
- Anti-hypertension medication is recommended for
 - Persistent blood pressure ≥ 150 mmHg systolic or ≥ 100 mmHg diastolic on two occasions at least 4-6 hours apart. Note treatment BP lower than pregnancy recommendations.
 - Persistent blood pressure ≥ 160 mmHg systolic or ≥ 110 mmHg diastolic should be treated within one hour.
- Blood pressure monitored in the hospital or by visiting nurse or equivalent outpatient setting:
 - For 72 hours after delivery
 - At 7-10 days after delivery
 - At any time after discharge if development of preeclampsia symptoms
- Parenteral magnesium sulfate is recommended for women who progress from mild to severe pre-eclampsia postpartum or who present with new onset hypertension associated with
 - Headaches
 - Blurred vision, scotoma
 - Preeclampsia with severe features

(Appendix 7: Outpatient Checklist & Appendix 8: Sample Discharge Instructions)

Chronic Hypertension and Superimposed Preeclampsia

Prevention of Preeclampsia in Women with Chronic Hypertension

- For women with chronic hypertension, recommend low dose (60-80 mg) aspirin in the late first trimester (≥ 13 weeks) if there is a history of early onset preeclampsia and preterm delivery at less than 34 0/7 weeks or preeclampsia in more than one prior pregnancy.

Medication

- Pregnant women with persistent chronic hypertension of ≥ 160 mmHg systolic or ≥ 105 mmHg diastolic, medical antihypertensive therapy is indicated. (*strong*)
- Antihypertensive therapy is not indicated for chronic hypertension < 160 mmHg systolic or < 105 mmHg diastolic and no evidence of end-organ damage
- The target blood pressure for chronic hypertension treated with medication is between 120 mmHg systolic/ 80 mmHg diastolic and 160 mmHg systolic/ 105 mmHg diastolic
- For the initial pharmacologic treatment of pregnant women with uncomplicated chronic hypertension, labetalol, nifedipine, or methyldopa is recommended. (*strong*) ACE inhibitors, angiotensin receptor blockers, renin inhibitors, and mineralocorticoid receptor antagonists should not be used unless there is a compelling reason. (*strong*)

Pregnancy Surveillance

- Ultrasound is suggested for screening for fetal growth restriction.
- If fetal growth restriction is identified, umbilical artery Doppler studies should be included with antenatal testing. (*strong*)
- Antenatal testing is recommended for
 - Requirement for antihypertensive medications
 - Fetal growth restriction
 - Other maternal medical conditions that can affect outcome (diabetes, renal disease)
 - Superimposed preeclampsia
- For women with chronic hypertension with no additional maternal or fetal complications, delivery before 38 0/7 weeks is not recommended. (*strong*)
- For women with chronic hypertension who develop superimposed preeclampsia, management is determined according to the recommendations for patients with preeclampsia.

APPENDICES

Appendix 1: Measuring Blood Pressure in Women (Page 2)



CMQCC PREECLAMPSIA TOOLKIT
PREECLAMPSIA CARE GUIDELINES
CDPH-MCAH Approved: 12/20/13

PATIENT CARE AND TREATMENT RECOMMENDATIONS

ACCURATE BLOOD PRESSURE MEASUREMENT

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BACKGROUND

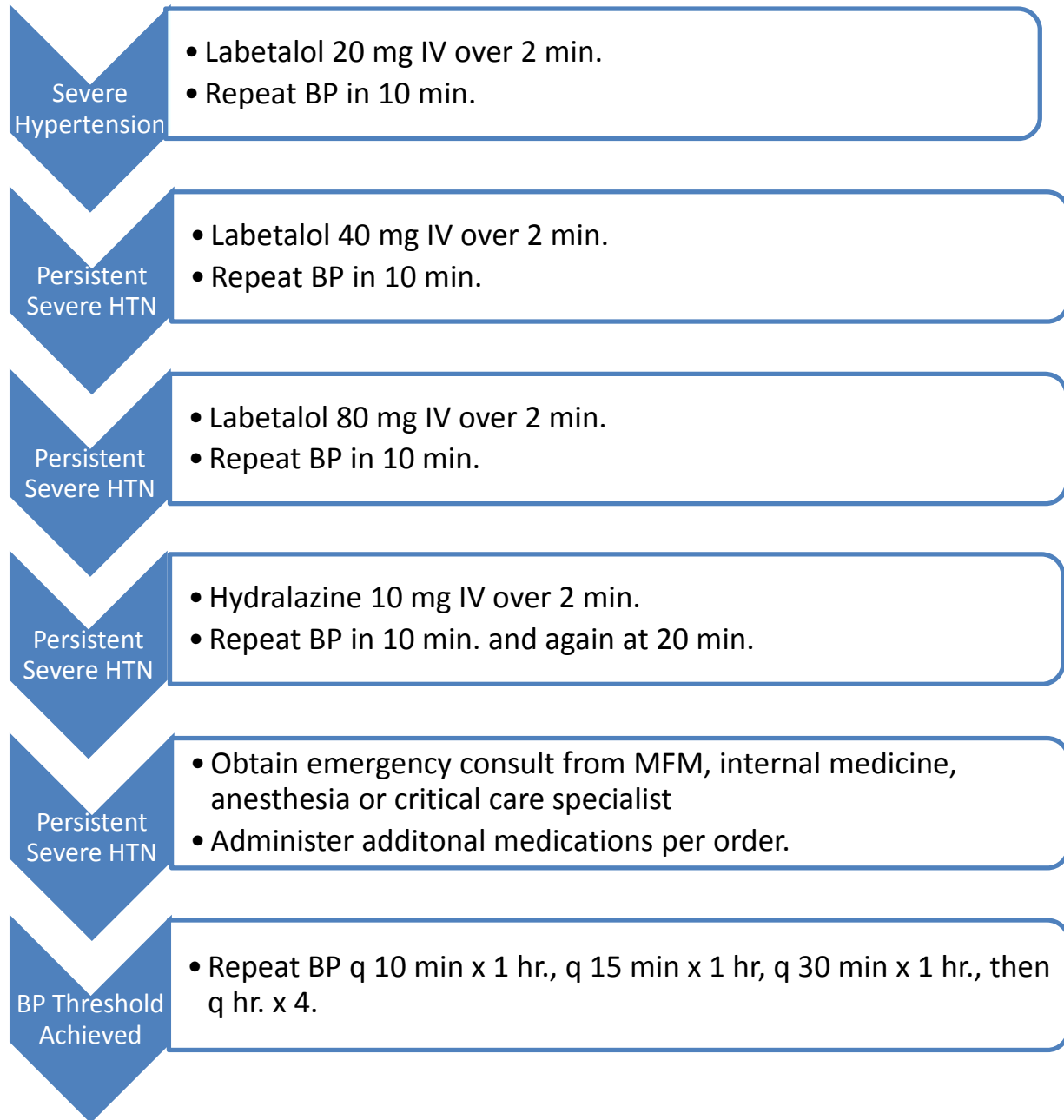
The current method used most often in the hospital setting for accurate measurement of blood pressure is the oscillatory method, or automated blood pressure machine, which tends to underestimate both systolic and diastolic readings by as much as 10 mm Hg^{1,2}. In the clinic setting and physician offices, blood pressure measurement is often used with the aneroid (mechanical type with a dial) sphygmomanometer. Refer to Table 1 for steps in obtaining accurate blood pressure measurement and Figure 1 for recommended cuff sizes.

Table 1: Steps for Obtaining Accurate Blood Pressure Measurements³

Step 1: Prepare equipment	<ul style="list-style-type: none"> a. Mercury sphygmomanometer is gold standard, can use validated equivalent automated equipment b. Check cuff for any defaults c. Obtain correct size cuff: width of bladder 40% of circumference and encircle 80% of arm (See Figure 1)
Step 2: Prepare the patient:	<ul style="list-style-type: none"> a. Use a sitting or semi-reclining position with back supported and arm at heart level b. Patient to sit quietly for 5 minutes prior to measurement c. Bare upper arm of any restrictive clothing d. Patients feet should be flat, not dangling from examination table or bed, and her legs uncrossed e. Assess any recent (within previous 30 minutes) consumption of caffeine or nicotine. If blood pressures are at the level that requires treatment, consumption of nicotine or caffeine should not lead to delays in instituting appropriate anti-hypertensive therapies
Step 3: Take measurement	<ul style="list-style-type: none"> a. Support patients arm at heart level, seated in semi-fowlers position b. For auscultatory measurement: use first audible sound (Kortokoff I) as systolic pressure and use disappearance of sound (Kortokoff V) as diastolic pressure c. Read to the nearest 2 mm Hg d. Instruct the patient not to talk e. At least one additional readings should be taken within 15 minutes f. Use the highest reading g. If greater than or equal to 140/90, repeat within 15 minutes and if still elevated, further evaluation for preeclampsia is warranted. <p>Do not reposition patient to either side to obtain a lower BP. This will give you a false reading.</p>
Step 4: Record Measurement	Document BP, patient position, and arm in which taken

Adapted from Peters RM (2008) High blood pressure in pregnancy. Nursing for Women's Health, Oct/Nov, pp. 410-422. Photo courtesy of and printed with permission by Kristi Gabel, RNC-OB, C-EFM, MSN, CNS, Sutter Roseville Medical Center 2013.

Appendix 2: First Line Management of Severe Hypertension with Labetalol (Page 2)

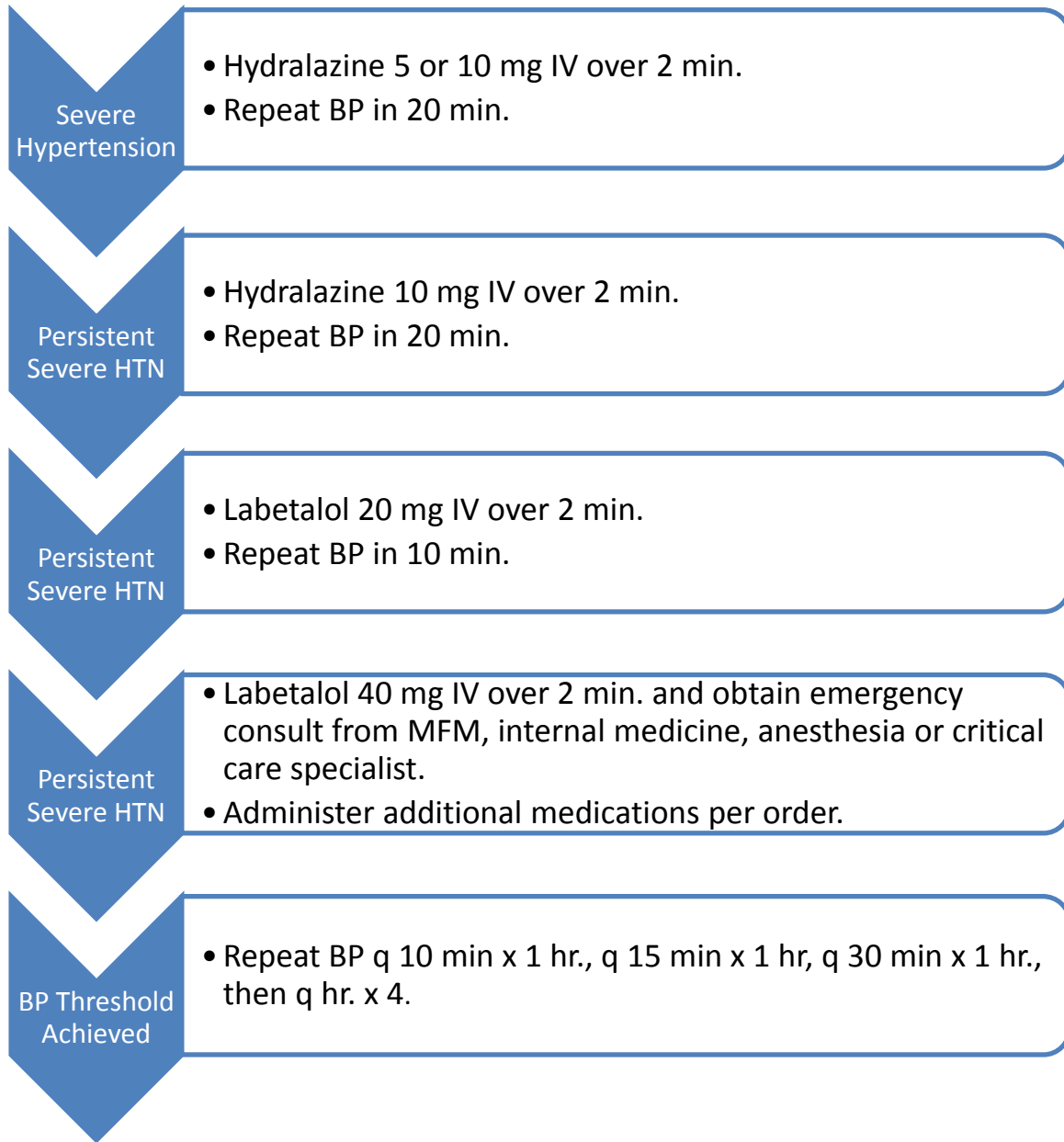


ACOG Committee Opinion #623 – February 2015

Avoid with asthma, heart disease or congestive heart failure

Women with pre-eclampsia with severe features should be started on Magnesium Sulphate for seizure prophylaxis. This can be initiated at any time in the above treatment algorithm. The dose with normal renal function is a 4 gm bolus IV followed by 2 gms/hr IV.

Appendix 3: First Line Management of Severe Hypertension with Hydralazine (Page 3)



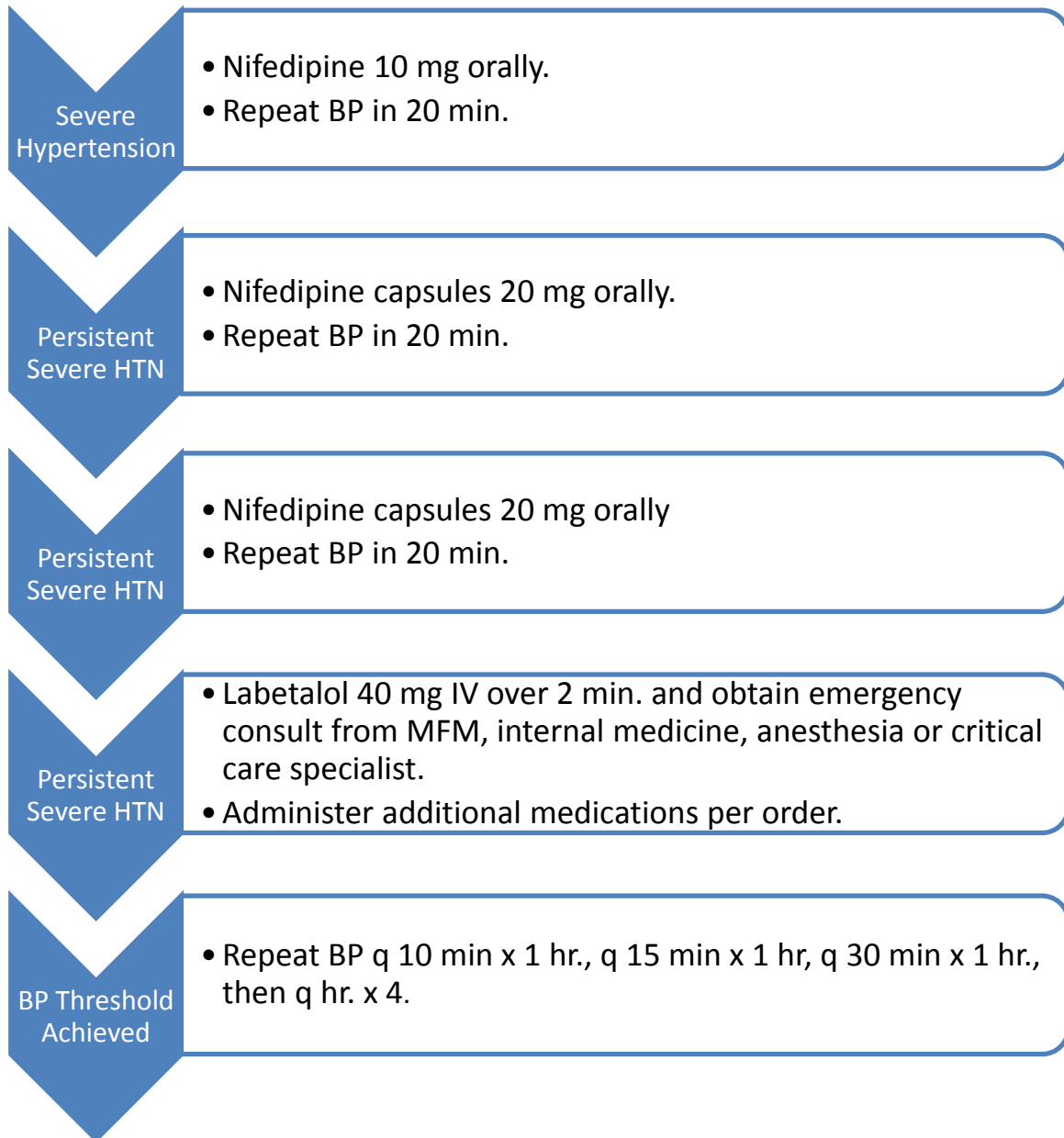
ACOG Committee Opinion #623 – February 2015

Monitor closely for hypotension

Nifedipine associated with increased maternal heart rate and overshoot hypotension

Women with pre-eclampsia with severe features should be started on Magnesium Sulphate for seizure prophylaxis. This can be initiated at any time in the above treatment algorithm. The dose with normal renal function is a 4 gm bolus IV followed by 2 gms/hr IV.

Appendix 4: First Line Management of Severe Hypertension with Oral Nifedipine (Page 4)



Committee Opinion #623 – February 2015

Women with pre-eclampsia with severe features should be started on Magnesium Sulphate for seizure prophylaxis. This can be initiated at any time in the above treatment algorithm. The dose with normal renal function is a 4 gm bolus IV followed by 2 gms/hr IV.

Appendix 5: Admission Assessment Checklist for Preeclampsia (Page 5)

If BP systolic ≥ 140 or diastolic ≥ 90 , minimal BP frequency is every 4 hours.

If BP systolic ≥ 160 or diastolic ≥ 110 , repeat BP in 15 minutes. Minimal BP frequency is every 30 minutes until consistently below threshold for severe hypertension.

If severe hypertension is persistent, urgent medical treatment is administered per algorithm, with frequency of vital signs depending on response.

If BP systolic ≥ 140 or diastolic ≥ 90 , assess for preeclampsia:

- Vital signs including oxygen saturation and urine output

- Unremitting headache, vision changes

- Epigastric or RUQ pain

- Vaginal bleeding

- Fetal movement

- CBC, creatinine, LFTs

- Proteinuria

- Nonstress test

If gestational hypertension or preeclampsia without severe features is present at ≥ 37 weeks, anticipate delivery. Anticipate potential complications and/or clinical escalation:

- CNS: Unremitting headache, visual changes, seizure

- Respiratory: Tachypnea, cyanosis, pulmonary edema

- GI: Epigastric or RUQ pain, impaired liver function

- Coagulopathy, thrombocytopenia, hemolysis

- Renal: Oliguria of <30 cc/hr. in 2 consecutive hours

- Nonreassuring fetal status

If preeclampsia with severe features is present, anticipate:

- Treatment of BP with IV medications, per algorithm

- Initiation of magnesium sulfate prophylaxis

- Emergent delivery regardless of gestational age if: eclampsia, unresponsive severe hypertension, pulmonary edema, abruption, DIC, nonreassuring fetal status

- Delivery if ≥ 34 weeks

- Corticosteroids and observation if < 34 weeks

Appendix 6: Eclampsia Checklist (Page 6)

Call for assistance (Rapid Response Team)

Adequate personnel: OB attending/assistants, 3 RNs, Anesthesia, Neonatology

Appoint roles: leader, recorder, primary RN, secondary personnel

Protect the airway

Secure patient in bed, rails up on bed, padding, lateral decubitus position

Maternal pulse oximetry

IV access, send preeclampsia labs

Supplemental Oxygen (100% non-rebreather)

Bag-mask ventilation and suction available

Continuous fetal monitoring (if appropriate)

Magnesium sulfate loading dose of 4-6 grams (10% in 100 ml solution) IV over 20 minutes, on infusion pump, medication and pump labeled.

If no IV access: Magnesium sulfate 10 grams of 50% solution (5 gm each buttock).

Magnesium sulfate maintenance 1-2 grams/hour continuous infusion

Anticonvulsant medications (for recurrent seizures or when magnesium sulfate is contraindicated):

- Lorazepam 2-4 mg IV x 1, may repeat x 1 after 10-15 minutes
- Diazepam 5-10 mg IV every 5-10 minutes to maximum dose of 30 mg
- Phenytoin 15-20 mg/kg IV x 1, may repeat 10 mg/kg IV after 20 minutes, avoid with hypotension, may cause cardiac arrhythmias
- Keppra 500 mg IV or orally, may repeat in 12 hours; dose adjustment needed if renal impairment.

Persistent seizures:

- Neuromuscular blockade and intubate
- Obtain radiographic imaging
- ICU admission

Treat hypertension with appropriate first and second line therapies

Ensure that there is an appropriate delivery plan

Post-seizure assessments:

- Assess neurologic status every 15 minutes
- Labs: CBC, chemistries, LFT, uric acid, LDH, T&S, PT/PTT, fibrinogen, magnesium
- Foley catheter, hourly I&O, report < 30 ml/hr

Magnesium toxicity:

- Stop magnesium maintenance
- Calcium gluconate 1 gram (10 ml of 10% solution) IV over 1-2 min

Appendix 7: Assessment Checklist for Postpartum Hypertension (Page 7)

For postpartum women with hypertension, the minimal frequency of BP assessment is every 4 hours, until stable.

If BP is elevated > 24 hours postpartum, consider discontinuation of NSAID medications.

If BP systolic \geq 150 or diastolic \geq 100 on two occasions 4 hours apart, initiate medical treatment.

If BP systolic \geq 160 or diastolic \geq 110, treatment should be initiated within one hour.

Magnesium sulfate should be continued until 24 hours postpartum, and then may be discontinued if the patient is in stable condition.

The patient should not be discharged until the BP is well controlled (systolic < 150 and diastolic < 100) for at least 24 hours.

BP should be monitored in the hospital, or by VNA or equivalent outpatient setting for 72 hours after delivery, and at 7-10 days after delivery, and if preeclampsia symptoms develop.

Women with new onset of hypertension postpartum associated with headache, visual symptoms or other findings consistent with preeclampsia with severe features should be hospitalized and treated with parenteral magnesium sulfate.

All women in the postpartum period, not just those with hypertensive disorders, should be provided with discharge instructions that include information about the signs and symptoms of preeclampsia as well as the importance of prompt reporting of this information to their health care providers.

Appendix 8: Discharge Instructions for Patients with Hypertension

Your Medications include the following:

- 1) _____ to be taken every ____ hours.
- 2) _____ to be taken every ____ hours.
- 3) _____ to be taken every ____ hours.

Your postpartum follow-up appointment has been made with Dr.

On Date: _____ Time: _____

You have been instructed to check your blood pressure at home daily: Yes _____ No _____

Call your healthcare provider _____ Phone Number: _____

If your blood pressure is greater than _____ systolic (top number)

and/or

If your blood pressure is greater than _____ diastolic (bottom number)

Call your healthcare provider if:

- Your temperature is greater than 100.4.
- Your bleeding is greater than a heavy menses.
- You have any headache that is not relieved with Tylenol or ibuprofen (e.g., Advil, Motrin).
- You have pain in your belly, especially the upper area below your ribs.
- You have blurry or double vision, see spots or flashing lights.
- Your swelling is worse.
- You gain more than 3 pounds in 3 days.
- You have serious difficulty catching your breath.
- You have any new or unusual symptoms.
- You have any questions or concerns.

Modified from the California Quality Care Collaborative Toolkit 2014

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Preeclampsia Care guidelines , CDPH-MCAH Approved 12/20/2013

PATIENT CARE AND TREATMENT RECOMMENDATIONS


ACCURATE BLOOD PRESSURE MEASUREMENT

Kristi Gabel, RNC-OB, C-EFM, MSN, CNS, Sutter Roseville Medical Center

BACKGROUND

The current method used most often in the hospital setting for accurate measurement of blood pressure is the oscillatory method, or automated blood pressure machine, which tends to underestimate both systolic and diastolic readings by as much as 10 mm Hg^{1,2}. In the clinic setting and physician offices, blood pressure measurement is often used with the aneroid (mechanical type with a dial) sphygmomanometer. Refer to Table 1 for steps in obtaining accurate blood pressure measurement and Figure 1 for recommended cuff sizes.

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