



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.

NNEPQIN Guideline for the Management of Hypertensive Disorders of Pregnancy Revised 5/5/2017

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.

Definitions:

- **Gestational hypertension:** Blood pressure ≥ 140 mmHg systolic or ≥ 90 mmHg diastolic on two occasions at least 4 hours apart, after 20 weeks gestation in a woman with previously normal blood pressure without significant proteinuria or severe features of preeclampsia.

- **Preeclampsia:** Blood pressure ≥ 140 mmHg systolic or ≥ 90 mmHg diastolic on two occasions at least 4 hours apart 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)

 - OR

 - features of severe preeclampsia

Proteinuria is no longer required for a diagnosis of preeclampsia if severe features (including severe hypertension) are present

- **Severe features of preeclampsia:** any of the following:
 - Blood pressure \geq 160 mmHg systolic or \geq 110 mmHg diastolic on two occasions at least 4 hours apart. (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 \geq 1.1 mg/dl or doubling of serum creatinine in the absence of other renal disease
 - Impaired liver function: elevated hepatic transaminases to twice the upper limit of normal and/or severe persistent right upper quadrant or epigastric pain unresponsive to medication and not accounted for by alternative diagnosis
 - Pulmonary edema
 - New-onset cerebral or visual disturbance (including persistent severe headache and scotomata)
- **Chronic hypertension:** Diagnosis of hypertension prior to pregnancy or blood pressure \geq 140 mmHg systolic or \geq 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

Prevention of preeclampsia

- Recommend low dose aspirin (81 mg/day), initiated in the late first trimester, (between 12 and 28 weeks gestation), for the prevention of preeclampsia in women who have one or more high risk factors for preeclampsia or who have several moderate risk factors (3).

Table 1. Clinical Risk Assessment for Preeclampsia

High Risk Factors	Recommendation
History of preeclampsia Multifetal gestation Chronic hypertension Type 1 or type 2 diabetes Renal disease Autoimmune disease (i.e. lupus, antiphospholipid syndrome)	Recommend low-dose aspirin if the patient has \geq 1 of these high-risk factors
Moderate Risk Factors Nulliparity Obesity (BMI $>$ 30 kg/m ²) Family history of preeclampsia (mother or sister) Age \geq 35 years Sociodemographic characteristics (African American race, low SES) Personal history factors (e.g. prior SGA infant, prior adverse pregnancy outcome, $>$ 10 year interval since last pregnancy)	Consider low-dose aspirin if the patient has several of these moderate-risk factors*

* Moderate risk factors vary in their association with preeclampsia risk. Consider low-dose aspirin in patients with \geq 2 or 3 moderate risk factors depending on the perceived level of risk.

Initial assessment of hypertension in pregnancy (Appendix 1)

- Women with normal blood pressure until after the 20th week of gestation who develop either systolic BP \geq 140 or diastolic BP \geq 90 on two occasions at least 4 hours apart require evaluation including:
 - Evaluation for the symptoms of severe preeclampsia
 - CBC, creatinine, liver enzyme studies
 - Proteinuria assessment
 - Ultrasound for EFW and AFI
 - NST, BPP if nonreactive.
- Women with normal blood pressure until after the 20th week of gestation who develop either systolic BP \geq 160 or diastolic BP \geq 110 on 2 occasions at least 4 hours apart require hospitalization. (*strong*)

Surveillance for outpatient expectant management

- All women with gestational hypertension or preeclampsia without severe features should have:
 - Daily maternal assessment of fetal movement and symptoms (headache, visual changes, epigastric/RUQ pain and shortness of breath)
 - Weekly or twice weekly assessment of blood pressure
 - Weekly or twice weekly NST
 - Weekly ultrasound for AFI
 - Weekly assessment of urine protein, platelet count, creatinine and liver function
 - Ultrasound for fetal growth every 3 weeks
- Women with gestational hypertension are candidates for weekly fetal testing (BPP), and weekly office evaluation of blood pressure, while other blood pressure monitoring can occur in a home setting.
- Women with preeclampsia without severe features should have twice weekly office NST with blood pressure assessment.
- If fetal growth restriction is identified, umbilical artery Doppler studies should be included with antenatal testing. (*strong*)

General issues of expectant management

- For women with gestational hypertension or preeclampsia with a persistent blood pressure $<$ 160 mmHg systolic and $<$ 110 mmHg diastolic, it is suggested that antihypertensive medications not be administered.
- Strict bed rest should not be prescribed
- Hospitalization is indicated when preeclampsia with severe features is present, or if fetal growth restriction or nonreassuring fetal testing is present.
- Severe preeclampsia $<$ 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 for delivery is recommended at 37 0/7 weeks for women with gestational hypertension or preeclampsia without severe features.

Inpatient Assessment and General Management (Appendix 1)

- 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 antihypertensive treatment. (*strong*) Options for medication include IV labetalol, IV hydralazine and oral nifedipine. (Algorithm 4 and 5)
 - The target blood pressure for treatment is systolic BP 140-160 and diastolic BP 90-100.
- Magnesium Sulfate
 - Magnesium sulfate is indicated for seizure prophylaxis when preeclampsia with severe features or eclampsia is present (*strong*).
 - Universal use of magnesium sulfate is not recommended for women with preeclampsia without severe features, but should be considered with certain signs or symptoms, including headache, altered mental status, blurred vision, scotomata, clonus and right upper quadrant pain.
 - Magnesium sulfate should be continued in the operating room during cesarean delivery (*strong*).
 - When magnesium is administered it should be discontinued after steroid administration if delivery is not indicated.
- 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.

Delivery Timing and Corticosteroids

- Regardless of gestational age, if unstable maternal or fetal condition, deliver soon after maternal stabilization is achieved (*strong*)
- If \geq 37 0/7 weeks, deliver if gestational hypertension or preeclampsia without severe features is present.
- If \geq 34 0/7 weeks, deliver if gestational hypertension or preeclampsia without severe features is associated with:
 - PPROM or labor
 - EFW $<$ 5th percentile
 - Oligohydramnios (persistent AFI $<$ 5 cm)
 - Persistent BPP 6/10 or less
 - Suspected placental abruption
- If \geq 34 0/7 weeks, deliver if severe preeclampsia or HELLP syndrome is present, soon after maternal stabilization is achieved (*strong*).
- If $<$ 34 0/7 weeks, administer first corticosteroid dose, but do not delay delivery after maternal stabilization for preeclampsia with severe features with: (*strong*)
 - Uncontrollable severe hypertension
 - Eclampsia
 - Pulmonary edema
 - Placental abruption
 - DIC
 - Nonreassuring fetal testing
- If $<$ 34 0/7 weeks with preeclampsia with severe features or HELLP syndrome and stable maternal and fetal condition, administer corticosteroids and await 48 hours with:
 - 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.
- If < 33 5/7 weeks with preeclampsia with severe features and an otherwise stable maternal and fetal condition exists, 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.
- Prior to fetal viability: Delivery soon after maternal stabilization is recommended for women with severe preeclampsia or HELLP syndrome. Expectant management is not recommended. (*strong*)
- Late preterm corticosteroids may be administered between 34 and 36 5/7 weeks if induction of labor is being undertaken and delivery is not anticipated within 12 hours, but delivery should not be delayed for corticosteroid administration at this gestational age.

Postpartum (Appendix 2)

- After delivery, all women with hypertensive disorders of pregnancy should have blood pressure monitoring 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 symptoms of preeclampsia develop (Appendix 3)
- Consider discontinuation of NSAID's if hypertension persists more than 24 hours after delivery.
- Anti-hypertensive therapy is recommended for
 - Persistent blood pressure ≥ 150 mmHg systolic or ≥ 100 mmHg diastolic on two occasions at least 4-6 hours apart.
 - Persistent blood pressure ≥ 160 mmHg systolic or ≥ 100 mmHg diastolic should be treated within one hour.
- Hospitalize women for parenteral magnesium sulfate administration who present postpartum with hypertension associated with:
 - Headaches, visual changes, altered mental status, epigastric pain or shortness of breath
 - Severe features of preeclampsia
 - Magnesium sulfate should be given for at least 24 hours in this setting

Chronic hypertension and chronic hypertension with superimposed preeclampsia

Prevention of preeclampsia in women with chronic hypertension

- For women with chronic hypertension, recommend low dose aspirin (81 mg/day), initiated in the late first trimester, (between 12 and 28 weeks gestation), for the prevention of preeclampsia. (3)

Antihypertensive therapy

- 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

- In women with chronic hypertension, ultrasound is suggested to screen for fetal growth restriction in the third trimester.
- If fetal growth restriction is identified, umbilical artery Doppler studies should be included with antenatal testing. (*strong*)
- Antenatal testing is recommended in the following settings:
 - Women requiring treatment with antihypertensive medications
 - Fetal growth restriction
 - Women with co-morbid medical conditions that can affect fetal 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.
- Women with superimposed preeclampsia with worsening disease, severe features or concern for fetal well-being should be monitored as inpatients.

Appendix 1: Assessment Checklist for Preeclampsia

- Routine vital signs are once per shift (every 8 hours).
- 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 (>15 min), 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
 - Non-reassuring fetal status
- If preeclampsia with severe features is present, anticipate:
 - Treatment of BP with IV medications, per algorithm
 - Initiation of magnesium sulfate prophylaxis
 - Immediate 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 2: Assessment Checklist for Postpartum Hypertension

- 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 ≥ 150 or diastolic ≥ 100 on two occasions 4 hours apart, initiate antihypertensive therapy.
- If BP systolic ≥ 160 or diastolic ≥ 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, 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.

Appendix 3: 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

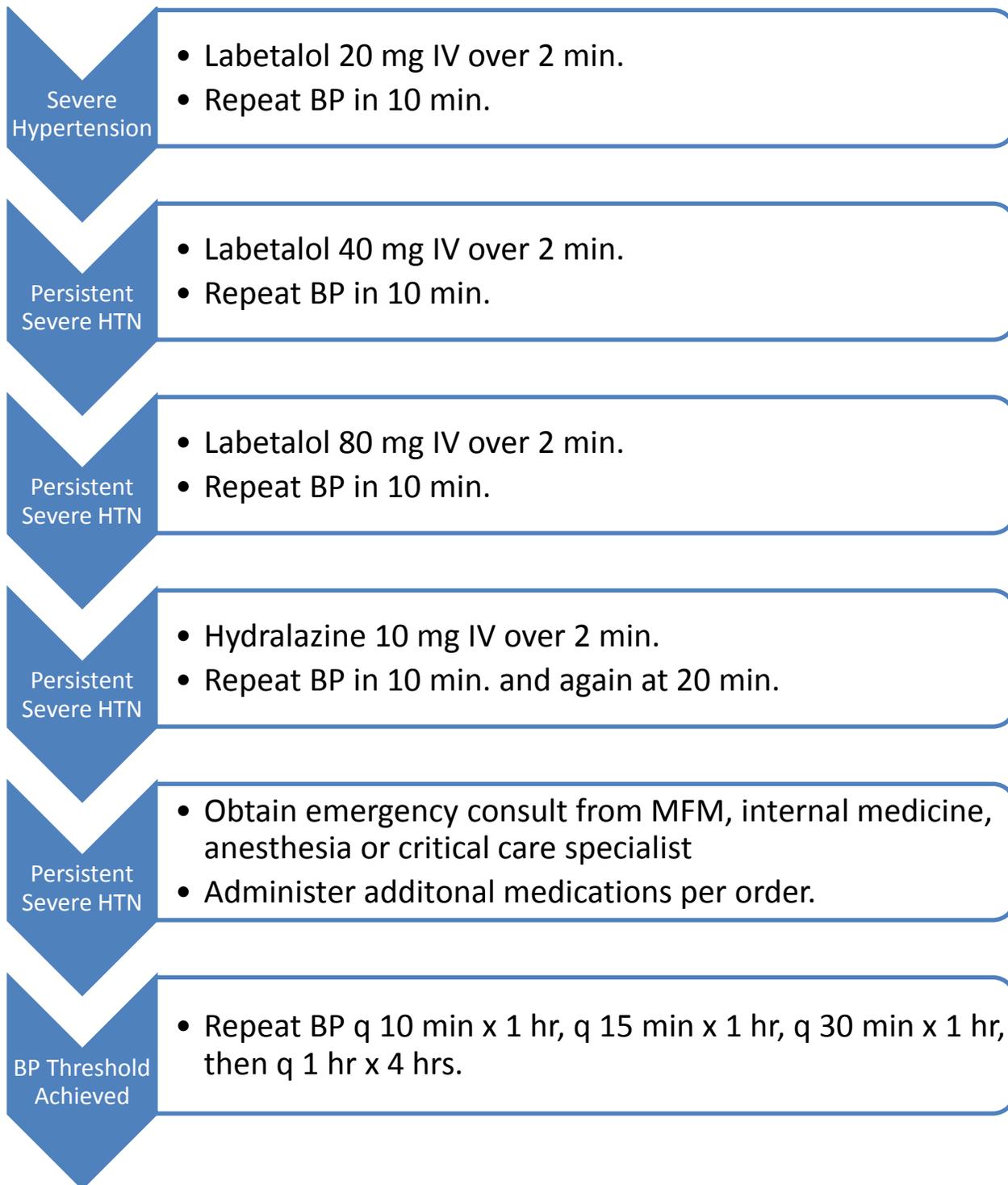
If your blood pressure is greater than _____ diastolic (bottom number)

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.

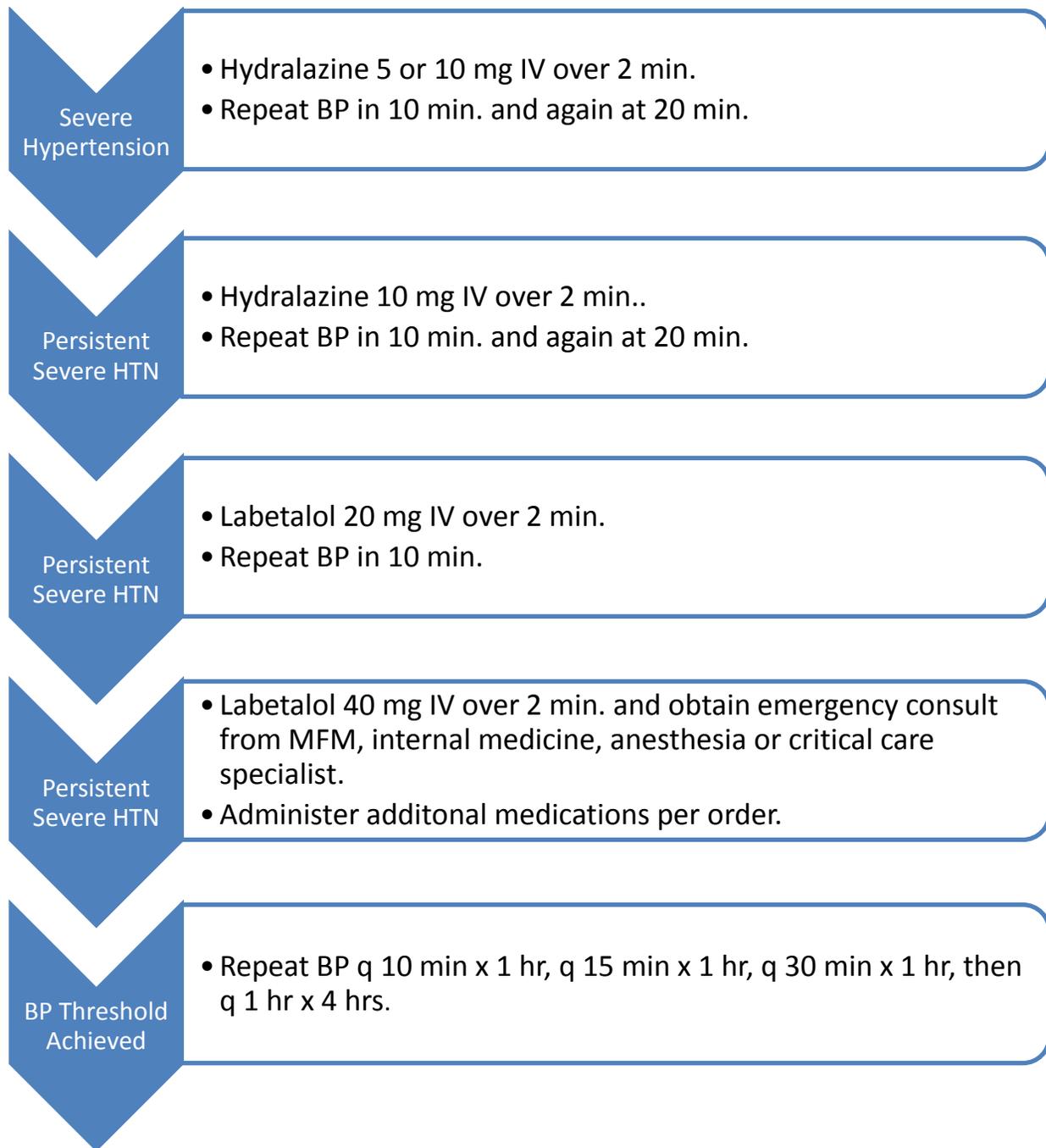
Modified from the California Quality Care Collaborative Toolkit, 2014

Appendix 4: First Line Management of Severe Hypertension with IV Labetalol



ACOG Committee Opinion #692, April 2017

Appendix 5: First-Line Management of Severe Hypertension with IV Hydralazine



ACOG Committee Opinion #692, April 2017

***First-Line Treatment of Severe Hypertension may also be initiated with Nifedipine 10 mg PO, and repeated every 20-30 minutes, when there is no IV access. (4)**

References

1. American College of Obstetricians and Gynecologists. Hypertension in pregnancy. Washington, DC: American College of Obstetricians and Gynecologists; 2013. Available at: <http://www.acog.org/Resources-And-Publications/Task-Force-and-Work-Group-Reports/Hypertension-in-Pregnancy>.
2. Executive Summary in *Obstet Gynecol* 2013;122:1122ACOG Committee Opinion No. 514, December 2011
3. LeFevre ML. Low-dose aspirin use for the prevention of morbidity and mortality from preeclampsia: U.S. Preventive Services Task Force recommendation statement. U.S. Preventive Services Task Force. *Annals of internal medicine* 2014; 161:819-26.
4. Duley L, Meher S, Jones L, Drugs for treatment of very high blood pressure during pregnancy. *Chochrane Database of Systematic Reviews* 2013, July 31;7:CD001449