

ANMC GUIDELINES FOR MANAGEMENT OF HYPERTENSIVE DISORDERS IN PREGNANCY

KEY POINTS

Definition changes:

- Preeclampsia is a dynamic process, and a diagnosis such as 'mild' preeclampsia (which is discouraged) applies only at the moment the diagnosis is established because preeclampsia by nature is progressive, although at different rates.
- There is a minimal relationship between the quantity of urinary protein and pregnancy outcome in preeclampsia, massive proteinuria (greater than 5 g) has been eliminated from the consideration of preeclampsia as severe.
- As fetal growth restriction is managed similarly in pregnant women with and without preeclampsia, it has been removed as a finding indicative of severe preeclampsia
- Interventions in acutely ill women with multiple organ dysfunction is sometimes delayed because of the absence of proteinuria. Furthermore, accumulating information indicates that the amount of proteinuria does not predict maternal or fetal outcome. It is for these reasons that the ACOG task force recommended that alternative systemic findings with new-onset hypertension can fulfill the diagnosis of preeclampsia even in the absence of proteinuria.

Management changes:

Preeclampsia and HELLP Syndrome

- Platelet counts and liver enzymes (weekly)
- In preeclampsia with systolic BP of less than 160 mm Hg and a diastolic BP less than 110 mm Hg and no maternal symptoms, it is suggested that magnesium sulfate not be administered universally for the prevention of eclampsia.
- If undergoing cesarean delivery with preeclampsia, then continued intraoperative administration of parenteral magnesium sulfate to prevent eclampsia is recommended.
- In HELLP syndrome from the gestational age of fetal viability to 33 6/7 weeks of gestation, it is suggested that delivery be delayed for 24-48 hours if maternal and fetal condition remains stable to complete a course of corticosteroids for fetal benefit
- In gestational hypertension, preeclampsia, or superimposed preeclampsia, it is suggested that BP be monitored in the hospital or that equivalent outpatient surveillance be performed for at least 72 hours postpartum and again 7-10 days after delivery or earlier in women with symptoms.
- In the postpartum period magnesium sulfate is suggested with new-onset hypertension associated with headaches or blurred vision, or preeclampsia with severe hypertension.

Chronic Hypertension (and with Superimposed Preeclampsia)

- For pregnant women with chronic hypertension and BP less than 160 mm Hg systolic or 105 mm Hg diastolic and no evidence of end-organ damage, it is suggested that they not be treated with pharmacologic antihypertensive therapy.
- For pregnant women with chronic hypertension and poorly controlled BP, the use of home BP monitoring is suggested.
- For women with chronic hypertension treated with antihypertensive medication, it is suggested that BP levels be maintained between 120 mm Hg systolic and 80 mm Hg diastolic and 160 mm Hg systolic and 105 mm Hg diastolic.
- For women with chronic hypertension and no additional maternal or fetal complications, delivery before 38 0/7 weeks of gestation is not recommended.

Postpartum

- Over the past 10 years, information has accumulated indicating that a woman who has had a preeclamptic pregnancy is at an increased risk of later-life CV disease. This increase ranges from

a doubling of risk in all cases to an 8-9x increase in women with preeclampsia who gave birth before 34 0/7 weeks of gestation

-In the postpartum period if the is BP of 150 mm Hg systolic or 100 mm Hg diastolic or higher, on at least two occasions that are at least 4-6 hours apart, then antihypertensive therapy is suggested. Persistent BP of 160 mm Hg systolic or 110 mm Hg diastolic or higher should be treated within 1 hour.

-Avoid NSAIDs if BP > 140/90 after 24 hrs PP

-For women in the postpartum period who present with new-onset hypertension associated with headaches or blurred vision or preeclampsia with severe hypertension, the parenteral administration of magnesium sulfate is suggested for up to one month postpartum.

-For women with a medical history of preeclampsia who gave birth preterm (less than 37 0/7 weeks of gestation) or who have a medical history of recurrent preeclampsia, yearly assessment of BP, lipids, fasting blood glucose, and body mass index is suggested.

-If previous preeclampsia, then preconception counseling and assessment are recommended

Prevention

-Low dose aspirin (60 to 150 mg/d) initiated between 12 and 36 weeks of gestation reduces the occurrence of preeclampsia, preterm birth, and IUGR in women at increased risk for preeclampsia.

-The harms of low-dose aspirin in pregnancy are considered to be no greater than small.

-There is a substantial net benefit of daily low-dose aspirin to reduce the risk for preeclampsia, preterm birth, and IUGR in women at high risk for preeclampsia.

Other

Fluid management for the patient with severe preeclampsia presents a challenge for the clinician, and considerable controversy exists in the literature on this topic. The pathophysiology of preeclampsia demonstrates a failure of the normal pregnancy-associated plasma volume expansion due to endothelial damage with capillary leak. Management plans should be tailored to the clinical situation. Maternal death in hypertensive disease of pregnancy is much more the result of pulmonary edema than renal failure, so judicious fluid administration seems prudent. In uncomplicated preeclampsia, total fluids should be restricted to 100 mL/h or less, and the urine output monitored hourly. In certain situations however, intravascular volume expansion may be indicated. Patients whose disease is complicated by severe hypertension requiring a potent vasodilator such as hydralazine, in those demonstrating acute fetal intolerance of labor, in those about to undergo regional anesthesia for cesarean delivery, in those with postpartum hemorrhage, or in those with severe oliguria (<80 mL/4 h), a fluid challenge is appropriate. Depending on the severity of the indication, a 250 mL bolus of lactated Ringer's solution should be administered, monitoring oxygen saturation and checking for the presence of pulmonary crackles. The bolus should be repeated, up to a liter of fluid, to try to correct the underlying problem. Once corrected, fluid restriction should resume.

DEFINITIONS

There are four major hypertensive disorders that occur in pregnant women:

- Preeclampsia / eclampsia
- Preexisting hypertension
- Preeclampsia superimposed upon preexisting hypertension
- Gestational hypertension

I. Pre-eclampsia

Screening

- Screening for preeclampsia is recommended for all pregnant women at the first prenatal visit and throughout the remainder of pregnancy.
- To screen for preeclampsia, measure an upright sitting blood pressure after a 10 minute rest. The BP should be repeated in a similar manner 4 hours later to confirm the diagnosis. (see below)
- There is no role for universal urine dipstick testing to screen for preeclampsia in routine prenatal care in the asymptomatic non-hypertensive patient.

Method of measuring blood pressure in pregnancy

The diastolic blood pressure is that pressure at which the sound disappears (Korotkoff phase V).

To reduce inaccurate readings, an appropriate size cuff should be used (length 1.5 times upper arm circumference or a cuff with a bladder that encircles 80% or more of the arm). The blood pressure level should be taken with the patient in an upright position, after a 10-minute or longer rest period.

For patients in the hospital, the blood pressure can be taken with either the patient sitting up or in the left lateral recumbent position with the patient's arm at the level of the heart. The patient should not use tobacco or caffeine for 30 minutes preceding the measurement. Although validated electronic devices can be used, a mercury sphygmomanometer is preferred because it is the most accurate device.

Routine prenatal care

There is no role for universal urine dipstick testing to screen for preeclampsia in routine prenatal care in the asymptomatic non-hypertensive patient.

On the other hand, do obtain a urine sample* if the patient has:

- BP > 140/90
- Symptoms of preeclampsia
- Signs / symptoms of a urinary tract infection
- Multiple gestation
- Chronic hypertension, or currently on anti-hypertension medication.

*(1+ dipstick urine protein, 0.3 Protein / Creat Ratio, 300 mg 24 hour urine)

A. Preeclampsia

1. Blood pressure of 140 mm Hg systolic or higher, or 90 mm Hg diastolic or higher, in an upright sitting blood pressure after a 10 minute rest, that occurs after 20 weeks of gestation in a woman with previously normal blood pressure.
The BP should be repeated in a similar manner 4 hours later to confirm the diagnosis.
2. NB: Proteinuria can be misrepresented on contaminated urine specimens. Consider a reflex CCUA on all P:C ≥ 0.15 . If necessary, repeat the test on a clean specimen, e.g., 0-1 squamous cells, or on a catheterized specimen.
3. The diagnosis of proteinuria is made with a Total Protein / Creat > 0.3 , or a 24 hour urine specimen > 300 mg, or 1+ dipstick
If Total P/CR < 0.15 \rightarrow negative for significant proteinuria
If > 0.3 \rightarrow positive for significant proteinuria
If $0.16-0.29$ \rightarrow get 24-hour urine for total protein
4. Preeclampsia can be diagnosed in the absence of proteinuria:
if BP $> 140/90$ in association with severe features
-thrombocytopenia (platelet count $< 100,000/\text{microliter}$)

- impaired liver function (LFTs 2x twice normal)
- the new development of renal insufficiency (serum creatinine > than 1.1 mg/dL or a doubling of serum creatinine in the absence of other renal disease)
- pulmonary edema
- new-onset cerebral or visual disturbances

B. Preeclampsia with severe features (any of these)

1. Systolic blood pressure of 160 mm Hg or higher, or diastolic blood pressure of 110 mm Hg or higher on two occasions at least 4 hours apart while the patient is on bed rest (unless antihypertensive therapy is initiated before this time)
2. Thrombocytopenia (platelet count < 100,000/microliter)
3. Impaired liver function (LFTs 2x twice normal)
4. New development of renal insufficiency (serum creatinine > than 1.1 mg/dL or a doubling of serum creatinine in the absence of other renal disease)
5. Pulmonary edema
6. New-onset cerebral or visual disturbances

C. HELLP syndrome (Hemolysis-abnormal peripheral smear, bilirubin, LDH, Elevated Liver enzymes, Low Platelets <100,000)

-This syndrome requires prompt delivery upon diagnosis

D. Eclampsia

1. New onset generalized seizures in pregnancy without CNS lesion.

II. Chronic Hypertension (CHTN)

- A. Hypertension that pre-dates pregnancy
- or
- B. Onset of hypertension before 20th week of gestation
- or
- C. Use of antihypertensive medications before pregnancy
- and
- D. Failure to normalize blood pressure postpartum

Classification

Mild-moderate:	Systolic blood pressure	≥ 140-159 mm Hg
	Diastolic blood pressure	≥ 90-109 mm Hg

Severe:	Systolic blood pressure	≥ 160 mm Hg
	Diastolic blood pressure	≥ 110 mm Hg

-There is no good evidence that antihypertensive therapy will improve perinatal or maternal outcome in mild essential hypertension

-Angiotensin-converting enzyme (ACE) inhibitors are CONTRAINDICATED

(ACE inhibitors are associated with fetal cardiac septal defects in the first trimester, plus fetal renal failure in the second and third trimesters.)

-At risk for IUGR, PTL, abruptio placenta, renal failure, CHF, CVA, and superimposed preeclampsia.

-Women with mild - moderate hypertension (140–159 mmHg systolic or 90–109 mm Hg diastolic pressure) generally do well during pregnancy and do not, as a rule, require antihypertensive medication. There is no conclusive evidence that antihypertensive therapy will improve perinatal outcome

III. Chronic Hypertension plus Superimposed Preeclampsia

Chronic hypertension, as defined above, plus either

- Superimposed preeclampsia
- Superimposed preeclampsia with severe features

IV. Gestational hypertension

Definition:

Blood pressure elevation after 20 weeks GA unaccompanied by proteinuria

Gestational hypertension is a temporary diagnosis for hypertensive pregnant women who do not meet criteria for preeclampsia or chronic hypertension

The diagnosis is changed to:

- Preeclampsia, if proteinuria or severe features develop
- Chronic hypertension, if blood pressure elevation persists ≥ 12 weeks postpartum

Thus, reassessment up to 12 weeks postpartum is necessary to establish a final definitive diagnosis.

One quarter of these women will go on to develop the preeclampsia syndrome and so more frequent monitoring is essential.

There are two situations in which gestational hypertension may NOT be benign:

1.) Mild gestational hypertension that occurs remote from term appears to be associated with the development of preeclampsia and adverse neonatal outcome.

Fifteen to twenty five percent of women with gestational hypertension go on to develop preeclampsia, with the highest risk in women who develop gestational hypertension before 30 weeks .

2.) Severe Features (any of these)

- A. Systolic blood pressure of 160 mm Hg or higher, or diastolic blood pressure of 110 mm Hg or higher on two occasions while the patient is on bed rest (unless antihypertensive therapy is initiated before this time)
- B. Thrombocytopenia (platelet count less than 100,000/microliter)
- C. Impaired liver function (elevated blood levels of liver transaminases to twice the normal concentration)
- D. New development of renal insufficiency (elevated serum creatinine greater than 1.1 mg/dL or a doubling of serum creatinine in the absence of other renal disease)
- E. Pulmonary edema
- F. New-onset cerebral or visual disturbances

Postpartum

If blood pressure elevation persists beyond 12 weeks postpartum, the patient is diagnosed with chronic hypertension.

Gestational hypertension is not an indication for subsequent low dose aspirin prevention.

MANAGEMENT

A. Preeclampsia

The BP should be repeated in 4 hours after the initial BP to confirm the diagnosis BEFORE a laboratory work up is initiated.*

A.

Outpatient management of mild preeclampsia may be considered if medical adherence with home care and follow-up guidelines assured.

Serial assessment of maternal symptoms and fetal movement (daily by the patient), serial measurements of BP (twice weekly)

*baseline studies: CBC, platelets, ALT/AST, Creatinine, Total Protein / Creat ratio (T P/C) with reflex CUA, U/S, initial NST

The diagnosis of proteinuria is made with a Total Protein / Creat > 0.3 , a 24 hour urine specimen > 300 mg, or 1+ urine dipstick protein

If Total P/CR	< 0.15	→ negative for significant proteinuria
If	> 0.3	→ positive for significant proteinuria
If	$0.16-0.29$	→ get 24-hour urine for total protein

If hospitalized:

- Regular diet
- Bed rest should not be recommended routinely for hypertension in pregnancy alone
- BP every 6^o while awake, daily weight
- Daily evaluation for CNS, GI sx, fetal movement, vaginal bleeding and contractions

Prenatal follow-up

Weekly provider visits

Check BP twice a week, e.g., at NST /AFI visits and/or at weekly provider visit

Platelet counts and liver enzymes (weekly)

If NO fetal growth restriction or oligohydramnios, then NST 2x week with weekly amniotic fluid evaluation and daily fetal movements

If persistent BP of less than 160 mm Hg systolic or 110 mm Hg diastolic, it is suggested that anti- hypertensive medications not be administered.

While fetal growth restriction or oligohydramnios rarely develops. If it does, then:

- NST 2x/ wk, amniotic fluid assessment and Dopplers 1x/wk
- US q 3-4 weeks

-Transfer to ANMC at 37 wks GA, if undelivered.

Delivery:

When to deliver:

- Preeclampsia at ≥ 37 0/7 weeks
 - If remote from term: then follow weekly till ≥ 37 weeks
- (Also see corticosteroid administration pre 34 weeks if severe features)

Magnesium sulfate prophylaxis is not indicated if BPs are less than 160/110, unless there is new-onset hypertension associated with headaches or blurred vision

(See dosing under Severe preeclampsia, below)

Careful fluid management is necessary to prevent fluid overload
($<3,000$ cc/24 hrs IV and p.o. combined)

Cervical ripening in <u>weeks</u>	NST	AFI
Preeclampsia ≥ 37	2x/wk	1x/wk

Postpartum

Avoid Methergine

Depending on clinical condition concurrent Pitocin IV drip (Pitocin 30 units in 500 mL NS) needs to be given PP to counter Magnesium Sulfate induced uterine atony

BP should be monitored in the hospital or that equivalent outpatient surveillance be performed for at least 72 hours postpartum and again 7-10 days after delivery or earlier in women with symptoms.

Antihypertensive therapy is suggested for women with persistent postpartum hypertension, BP of :

-150 mm Hg systolic or 100 mm Hg diastolic or higher,
(on at least two occasions that are at least 4-6 hours apart)

Persistent BP of 160 mm Hg systolic or 110 mm Hg diastolic or higher should be treated within 1 hour.

B. Severe

- Prompt OB consultation
- Transfer after stabilization (stretcher, medical escort)

Delivery

Severe Preeclampsia mandates prompt delivery

Initially infuse up to 1,000 cc Lactated Ringers IV as a bolus to decrease vasospasm, if hemoconcentrated or oliguric (UO <80 mL/4 h), but not if SOB or sat $<95\%$.

Magnesium Sulfate prophylaxis

A. Intrapartum

Magnesium Sulfate 40 gram / liter water-intravenous route ideal, infusion pump required

4-6 g loading dose IV over 30 minutes

maintenance rate: 1 to 3gram / hour to depress, not eliminate reflexes

-strict I&O, consider Foley, monitor urine output to monitor renal perfusion

-cardiovascular and respiratory depression unlikely if reflexes still exist

-if Magnesium Sulfate overdose occurs, give 10% Calcium gluconate, 10cc, IV slowly over 2 minutes

-Magnesium Sulfate may be administered IM, if IV access not available

-50% Magnesium Sulfate 10-ml (5g) in each buttock (10g total)

-then 50% Magnesium Sulfate 10ml (5g) IM every 4°-6° depending on reflex activity

-1 ml 1-% lidocaine should be added to each injection to minimize inevitable pain

-Fluid Restriction: Total fluid (IV and po) 3000cc/24°

-continuous fetal monitoring while hospitalized, then every 15-30 minutes during transport

-BP every 15-30 minutes, I&O every hour

-Continue Magnesium sulfate for 24 hrs pp

If undergoing cesarean delivery, then continued intraoperative administration of parenteral magnesium sulfate to prevent eclampsia is recommended.

B. Starting postpartum magnesium sulfate

Start magnesium sulfate if:

BP > 140/90 or preeclampsia with postpartum HAs, visual changes, altered mental status, epigastric pain, or SOB

-Continue Magnesium sulfate for 24 hrs after initiation

Management remote from term:

If NO fetal growth restriction or oligohydramnios, then NST q week as appropriate for EGA and daily fetal movements

If fetal growth restriction or oligohydramnios develops

-NST every 3-4 days, amniotic fluid assessment, and Dopplers every week

-US q 3-4 weeks

If preeclampsia < 34 weeks, then consider antenatal corticosteroids to promote fetal lung maturity since preterm delivery is common.

Corticosteroids

It is suggested that corticosteroids be administered and delivery deferred for 48 hours if maternal and fetal conditions remain stable for women with severe preeclampsia and a viable fetus at 33 6/7 weeks or less of gestation with any of the following:

- preterm premature rupture of membranes
- labor
- low platelet count (less than 100,000/microliter)
- persistently abnormal hepatic enzyme concentrations (twice or more the upper normal values)
- fetal growth restriction (less than the fifth percentile)
- severe oligohydramnios (amniotic fluid index less than 5 cm)
- reversed end-diastolic flow on umbilical artery Doppler studies
- new-onset renal dysfunction or increasing renal dysfunction

It is recommended that corticosteroids be given if the fetus is viable and at 33 6/7 weeks or less of gestation, but that delivery not be delayed after initial maternal stabilization regardless of gestational age for women with severe preeclampsia that is complicated further with any of the following:

- uncontrollable severe hypertension
- eclampsia
- pulmonary edema
- abruptio placentae
- disseminated intravascular coagulation
- evidence of nonreassuring fetal status
- intrapartum fetal demise

If Systolic BP > 160 or sustained diastolic > 110:

and the patient has received an initial 1000 cc of Lactated Ringers or equivalent IVF

if hemoconcentrated or oliguric (UO <80 mL/4 h) , but not if SOB or sat < 95%.

and the patient has received initial magnesium bolus and drip

Then treat to BP 140-150 systolic, 90-100 diastolic with:

Labetalol 20 mg IV bolus followed by 40 mg if not effective within 10 minutes; then 80 mg in 10 minutes if not effective to maximum total dose of 300 mg

or

Hydralazine 5-10 mg IV, repeat after 20 minutes followed by 10 mg if not effective within 20 minutes; followed by 20 mg if not effective within 20 minutes.

Measure BP every 5 minutes following / avoid precipitous BP drop to prevent maternal cerebral or placental hypoperfusion

or

Nifedipine 10 mg orally, followed by 20 mg if not effective within 20 minutes; followed by 20 mg if not effective within 20 minutes; then 10-20 mg q 2-6 hrs

Once the aforementioned BP thresholds are achieved, repeat BP measurement every 10 minutes for 1 hour, then every 15 minutes for 1 hour, then every 30 minutes for 1 hour, and then every hour for 4 hours.

Postpartum

Avoid Methergine (could cause vasospasm and increase BP)

-Magnesium Sulfate is usually continued at least 24° PP

-Depending on clinical condition concurrent oxytocin IV drip (20 U/liter LR at 25-50cc/hr) needs to be given PP to counter Magnesium Sulfate induced uterine atony

-Avoid NSAIDs if BP > 140/90 after 24 hrs PP

-BP should be monitored in the hospital or that equivalent outpatient surveillance be performed for at least 72 hours postpartum and again 7-10 days after delivery or earlier in women with symptoms.

Antihypertensive therapy is suggested for women with persistent postpartum hypertension, BP of :

-150 mm Hg systolic or 100 mm Hg diastolic or higher,
(on at least two occasions that are at least 4-6 hours apart)

Persistent BP of 160 mm Hg systolic or 110 mm Hg diastolic or higher should be treated within 1 hour.

-For women in the postpartum period who present with new-onset hypertension associated with headaches or blurred vision or preeclampsia with severe hypertension, the parenteral administration of magnesium sulfate can be considered for up to one month postpartum.

Next Pregnancy: Prevention

-Give prophylactic low dose, ASA 81 mg po, every day starting after 12 weeks GA until 36 wks to reduce risk of preeclampsia, if patients have 1 or more of the following risk factors:

-History of early-onset preeclampsia and preterm delivery at less than 34 0/7 weeks of Gestation

-Past severe preeclampsia

-Preeclampsia in more than one prior pregnancy

-CHTN

-Pre-existing diabetes on insulin, e. g., Type I or Type II on insulin

- Multifetal gestation
- Chronic renal disease
- Autoimmune disease (i.e., systemic lupus erythematosus, antiphospholipid syndrome)

Other preventive measure

Alaska Native pregnant women should take 1.5 to 2 g of supplemental calcium carbonate per day in divided doses especially if the patient is lactose intolerant, or have a known low dietary calcium intake.

II. Eclampsia

- Initiate Magnesium Sulfate as above, STAT IM/IV.
 - If eclampsia recurs while on Magnesium Sulfate then re-bolus with 6 gm and increase drip to 3gm/hr IV
 - Goal: urine output is greater than 20cc/hr, Creatinine is < 1.0, and Sat > 95 %
 - Oxygen by mask at 8 L/minute when seizures resolved
 - Remember 'Primum non nocere' a.k.a. 'do no harm', most eclamptic seizures resolve spontaneously
 - Place patient in 'position of safety' until more alert
 - anticipate postictal non-reassuring fetal heart rate monitoring allow in utero resuscitation (with standard measures) if non-reassuring FHR persists after 20 to 30 minutes, stat OB consultation
 - transport to tertiary care center after stabilization (stretcher, medical escort, magnesium sulfate, oxygen, IV Fluids)
 - Urgent cesarean delivery as a result of responding to the non-reassuring fetal tracing immediately after a seizure is cautioned, as the risk of maternal cerebrovascular hemorrhage is extremely high at this time.
- Please stabilize with adequate magnesium sulfate first if a cesarean delivery must be done despite the risk, e. g., status epilepticus

III. Chronic Hypertension (CHTN)

- For pregnant women with chronic hypertension and poorly controlled BP, the use of home BP monitoring is suggested.
- For women with well controlled CHTN who are accustomed to exercising, it is recommended that moderate exercise be continued during pregnancy.

Anti-hypertensive therapy

ACE inhibitors contraindicated 2° fetal, neonatal complications

Best to stop all medications initially and recheck BP in one week

If BP less than 160 mm Hg systolic or 105 mm Hg diastolic, and no evidence of end-organ damage, it is suggested that patients with CHTN not be treated with pharmacologic antihypertensive therapy

-Antihypertensive therapy could be reinstated for women with blood pressures exceeding:

Systolic 160 mm Hg or diastolic BP of at least 105 mm Hg

-with a goal of 120/80 -160/105

Consider:

Labetolol 200-2400 mg orally in two or three times divided doses

Nifedipine 30 to 120 mg once daily as a sustained release tablet, increase at 7 to 14 day intervals

Methyldopa 250-3000 mg orally in two or three times divided doses

Prevention of superimposed preeclampsia

--Give prophylactic low dose, ASA 81 mg po, every day starting after 12 weeks GA until 36 wks to reduce risk of preeclampsia, if patients have 1 or more of the following risk factors:

- History of early-onset preeclampsia and preterm delivery at less than 34 0/7 weeks of gestation
- Past severe preeclampsia
- Preeclampsia in more than one prior pregnancy
- CHTN
- Pre-existing diabetes on insulin, e. g., Type I or Type II on insulin
- Multifetal gestation
- Chronic renal disease
- Autoimmune disease (i.e., systemic lupus erythematosus, antiphospholipid syndrome)

Monitoring

- Baseline ultrasonography be obtained at 18–20 weeks of gestation
- Ultrasonography should be repeated at 28–32 weeks of gestation and monthly thereafter
- Antenatal testing: see Table below
- If fetal growth restriction is detected or suspected, fetal status should be monitored twice weekly with nonstress testing, plus fluid assessment, and Dopplers each week.

Labs

- Baseline labs at initial prenatal visit:
Creatinine, electrolytes, LFTs, CBC, if initial dipstick urine has + protein then obtain Total P/C
- Pt. seen every 4 weeks until 32 weeks, then every 2 weeks after 32 weeks, if BP control satisfactory.
- If controlled on NO medication: No antenatal testing (See table below)
- If well controlled on medication: Begin weekly antenatal testing-NST plus amniotic fluid assessment starting at 36 weeks
- If NOT well controlled on medication: Begin weekly antenatal testing-NST plus Amniotic fluid assessment starting at 32 weeks
- If IUGR: NST 2x / wk, fluid evaluation and Doppler q wk

Chronic hypertensive patients with severe hypertension and/or cardiac, renal, or connective tissue disorders generally have more complications.

These patients should be co-managed with earlier OB consultation and referral to a tertiary care center.

Delivery

If well controlled, then allow spontaneous labor or begin cervical ripening on the schedule below

If NOT well controlled, then individualize care

	Cervical ripening in weeks	NST	AFI	Start
Chr HTN – controlled NO meds	≥ 39	-	-	-
Chr HTN – controlled on meds	≥ 39	1x/wk	1x/wk	36
Chr HTN – difficult to control	≥ 37	2x/wk	1x/wk	32

Postpartum

-Avoid NSAIDs if BP > 140/90 after 24 hrs PP

Antihypertensive therapy is suggested for women with persistent postpartum hypertension, BP of :

-150 mm Hg systolic or 100 mm Hg diastolic or higher,
(on at least two occasions that are at least 4-6 hours apart)

Persistent BP of 160 mm Hg systolic or 110 mm Hg diastolic or higher should be treated within 1 hour.

For women with a medical history of preeclampsia who gave birth preterm (less than 37 0/7 weeks of gestation) or who have a medical history of recurrent preeclampsia, yearly assessment of BP, lipids, fasting blood glucose, and body mass index is suggested.

IV. Chronic hypertension (CHTN) with superimposed preeclampsia

Prenatal course:

-Give prophylactic low dose ASA 65-85 mg. po every day starting after 12 weeks GA until 36 wks to reduce risk of preeclampsia, if

- History of early-onset preeclampsia and preterm delivery at less than 34 0/7 weeks of gestation
- Preeclampsia in more than one prior pregnancy
- CHTN
- Past severe preeclampsia
- Pre-existing Diabetes on insulin

Delivery

A. Delivery should be considered in:

- superimposed preeclampsia at ≥ 37 weeks of gestation
- superimposed severe preeclampsia at or beyond 34 weeks of gestation
- superimposed severe preeclampsia < 34 weeks –See corticosteroid therapy

Delivery soon after maternal stabilization is recommended irrespective of gestational age or full corticosteroid benefit for women with superimposed preeclampsia that is complicated further by any of the following:

- uncontrollable severe hypertension
- eclampsia
- pulmonary edema
- abruptio placentae
- disseminated intravascular coagulation
- nonreassuring fetal status

B. If it is elected to continue the pregnancy:

Women with superimposed severe preeclampsia should be monitored in a center with maternal and neonatal intensive care capability, e.g., ANMC

C. Superimposed HELLP syndrome.

In HELLP, from the gestational age of fetal viability to 33 6/7 weeks of gestation, it is suggested that delivery be delayed for 24-48 hours if maternal and fetal condition remains stable to complete a course of corticosteroids for fetal benefit

Postpartum

-Rule out chronic hypertension postpartum with subsequent pregnancies:

- monitor closely for recurrent preeclampsia
- early baseline U/S to confirm dates, in case later suspected fetal growth restriction develops.

-manage as preeclampsia or preeclampsia with severe features

-Avoid NSAIDs if BP > 140/90 after 24 hrs PP

-BP should be monitored in the hospital or that equivalent outpatient surveillance be performed for at least 72 hours postpartum and again 7-10 days after delivery or earlier in women with symptoms.

Antihypertensive therapy is suggested for women with persistent postpartum hypertension, BP of :

- 150 mm Hg systolic or 100 mm Hg diastolic or higher, (on at least two occasions that are at least 4-6 hours apart)

Persistent BP of 160 mm Hg systolic or 110 mm Hg diastolic or higher should be treated within 1 hour.

For women with a medical history of preeclampsia who gave birth preterm (less than 37 0/7 weeks of gestation) or who have a medical history of recurrent preeclampsia:

- yearly assessment of BP, lipids, fasting blood glucose, and body mass index

V. Gestational hypertension

Prenatal course

-15-25 % of these women will go on to develop the preeclampsia syndrome

Management

Manage the same as preeclampsia without severe features, except:

- obtain urine Preeclampsia screen q visit
- weekly NST/AFI

If persistent BP of less than 160 mm Hg systolic or 110 mm Hg diastolic, it is suggested that anti- hypertensive medications not be administered.

If sustained systolic BP of at least 160 mm Hg or diastolic BP of at least 110 mm Hg, the use of antihypertensive therapy is recommended.

Delivery

-If proteinuria does not develop these patients can be monitored and delivered as below.

	Cervical ripening in weeks	NST	AFI
Gestational HTN	≥ 37 0/7	1x/wk	1x/wk

Postpartum

- If blood pressure elevation persists beyond 12 weeks postpartum, the patient is diagnosed with chronic hypertension.
- Avoid NSAIDs if BP > 140/90 after 24 hrs PP
- BP should be monitored in the hospital or that equivalent outpatient surveillance be performed for at least 72 hours postpartum and again 7-10 days after delivery or earlier in women with symptoms.

Antihypertensive therapy is suggested for women with persistent postpartum hypertension, BP of :

- 150 mm Hg systolic or 100 mm Hg diastolic or higher, (on at least two occasions that are at least 4-6 hours apart)

Persistent BP of 160 mm Hg systolic or 110 mm Hg diastolic or higher should be treated within 1 hour.

- For women in the postpartum period who present with new-onset hypertension associated with headaches or blurred vision or preeclampsia with severe hypertension, the parenteral administration of magnesium sulfate can be considered for up to one month postpartum.

In summary, here are the recommended monitoring and delivery schedules:

	Cervical ripening in <u>weeks</u>	NST	AFI	Start
Chr HTN – no meds	≥ 39	-	-	-
Chr HTN – controlled on meds	≥ 39	1x/wk	1x/wk	36
Chr HTN – difficult to control	≥ 37	2x/wk	1x/wk	32
Gestational HTN	≥ 37	1x/wk	1x/wk	36
Preeclampsia	≥ 37	2x/wk	1x/wk	Dx
Preeclampsia, severe < 34 wks	Steroids	Hosp	Hosp	Dx
Preeclampsia, severe > 34 wks	at Dx	Hosp	Hosp	Dx

Summary of Evidence

Prevention

Quality of evidence: Moderate

For women with a medical history of early-onset preeclampsia and preterm delivery at less than 34 0/7 weeks of gestation or preeclampsia in more than one prior pregnancy, initiating the administration of daily low-dose (60-80 mg) aspirin beginning in the late first trimester is suggested.

Preeclampsia

Quality of evidence: High

For women with severe preeclampsia receiving expectant management at 34 0/7 weeks or less of gestation, the administration of corticosteroids for fetal lung maturity benefit is recommended.

For women with severe preeclampsia, the administration of intrapartum-postpartum magnesium sulfate to prevent eclampsia is recommended.

Quality of evidence: Moderate

For women with preeclampsia, it is suggested that a delivery decision should not be based on the amount of proteinuria or change in the amount of proteinuria.

For women in whom gestational hypertension, preeclampsia, or superimposed preeclampsia is diagnosed, it is suggested that BP be monitored in the hospital or that equivalent outpatient surveillance be performed for at least 72 hours postpartum and again 7-10 days after delivery or earlier in women with symptoms.

The close monitoring of women with gestational hyper tension or preeclampsia without severe features, with serial assessment of maternal symptoms and fetal movement (daily by the woman), serial measurements of BP (twice weekly), and assessment of platelet counts and liver enzymes (weekly) is suggested.

For women with mild gestational hypertension or preeclampsia with a persistent BP of less than 160 mm Hg systolic or 110 mm Hg diastolic, it is suggested that anti- hypertensive medications not be administered.

For women with mild gestational hypertension or preeclampsia without severe features at or beyond 37 0/7 weeks of gestation, delivery rather than continued observation is suggested.

For women with severe preeclampsia at or beyond 34 0/7 weeks of gestation, and in those with unstable maternal or fetal conditions irrespective of gestational age, delivery soon after maternal stabilization is recommended.

For women with preeclampsia with severe hypertension during pregnancy (sustained systolic BP of at least 160 mm Hg or diastolic BP of at least 110 mm Hg), the use of antihypertensive therapy is recommended.

It is suggested that corticosteroids be administered and delivery deferred for 48 hours if maternal and fetal conditions remain stable for women with severe preeclampsia and a viable fetus at 33 6/7 weeks or less of gestation with any of the following:

- preterm premature rupture of membranes
- labor
- low platelet count (less than 100,000/microliter)
- persistently abnormal hepatic enzyme concentrations (> 2x the upper normal values)
- fetal growth restriction (less than the fifth percentile)
- severe oligohydramnios (amniotic fluid index less than 5 cm)
- reversed end-diastolic flow on umbilical artery Doppler studies
- new-onset renal dysfunction or increasing renal dysfunction

It is recommended that corticosteroids be given if the fetus is viable and at 33 6/7 weeks or less of gestation, but that delivery not be delayed after initial maternal stabilization regardless of gestational age for women with severe preeclampsia that is complicated further with any of the following:

- uncontrollable severe hypertension
- eclampsia
- pulmonary edema
- abruptio placentae
- disseminated intravascular coagulation
- evidence of nonreassuring fetal status
- intrapartum fetal demise

For women with preeclampsia undergoing cesarean delivery, the continued intraoperative administration of parenteral magnesium sulfate to prevent eclampsia is recommended.

Quality of evidence: Low

For women with mild gestational hypertension or preeclampsia without severe features and no indication for delivery at less than 37 0/7 weeks of gestation, expectant management with maternal and fetal monitoring is suggested.

For women with preeclampsia with systolic BP of less than 160 mm Hg and a diastolic BP less than 110 mm Hg and no maternal symptoms, it is suggested that magnesium sulfate not be administered universally for the prevention of eclampsia.

For women with HELLP syndrome from the gestational age of fetal viability to 33 6/7 weeks of gestation, it is suggested that delivery be delayed for 24-48 hours if maternal and fetal condition remains stable to complete a course of corticosteroids for fetal benefit.

For women in the postpartum period who present with new-onset hypertension associated with headaches or blurred vision or preeclampsia with severe hypertension, the parenteral administration of magnesium sulfate is suggested.

For women with persistent postpartum hypertension, BP of 150 mm Hg systolic or 100 mm Hg diastolic or higher, on at least two occasions that are at least 4-6 hours apart, antihypertensive therapy is suggested. Persistent BP of 160 mm Hg systolic or 110 mm Hg diastolic or higher should be treated within 1 hour.

For women in the postpartum period who present with new-onset hypertension associated with headaches or blurred vision or preeclampsia with severe hypertension, the parenteral administration of magnesium sulfate can be considered for up to one month postpartum.

Chronic hypertension**Quality of evidence: High**

For women with superimposed preeclampsia who receive expectant management at less than 34 0/7 weeks of gestation, the administration of corticosteroids for fetal lung maturity benefit is recommended.

Quality of evidence: Moderate

For pregnant women with chronic hypertension and poorly controlled BP, the use of home BP monitoring is suggested.

For pregnant women with persistent chronic hypertension with systolic BP of 160 mm Hg or higher or diastolic BP of 105 mm Hg or higher, antihypertensive therapy is recommended.

For the initial treatment of pregnant women with chronic hypertension who require pharmacologic therapy, labetalol, nifedipine, or methyldopa are recommended above all other antihypertensive drugs.

For women with chronic hypertension and no additional maternal or fetal complications, delivery before 38 0/7 weeks of gestation is not recommended

For women with chronic hypertension and superimposed preeclampsia with severe features, the administration of intrapartum-postpartum parenteral magnesium sulfate to prevent eclampsia is recommended.

Delivery soon after maternal stabilization is recommended irrespective of gestational age or full corticosteroid benefit for women with superimposed preeclampsia that is complicated further by any of the following:

- uncontrollable severe hypertension
- eclampsia
- pulmonary edema
- abruptio placentae
- disseminated intravascular coagulation
- nonreassuring fetal status

Quality of evidence: Low

For pregnant women with chronic hypertension treated with antihypertensive medication, it is suggested that BP levels be maintained between 120 mm Hg systolic and 80 mm Hg diastolic and 160 mm Hg systolic and 105 mm Hg diastolic.

Gestational hypertension

Quality of evidence: Moderate

For women with gestational hypertension, monitoring BP at least once weekly with proteinuria assessment in the office and with an additional weekly measurement of BP at home or in the office is suggested.

For women with mild gestational hypertension or preeclampsia with a persistent BP of less than 160 mm Hg systolic or 110 mm Hg diastolic, it is suggested that anti- hypertensive medications not be administered.

For women with mild gestational hypertension or preeclampsia without severe features at or beyond 37 0/7 weeks of gestation, delivery rather than continued observation is suggested.

Quality of evidence: Low

For women with mild gestational hypertension or preeclampsia without severe features and no indication for delivery at less than 37 0/7 weeks of gestation, expectant management with maternal and fetal monitoring is suggested.

For women in the postpartum period who present with new-onset hypertension associated with headaches or blurred vision or preeclampsia with severe hypertension, the parenteral administration of magnesium sulfate can be considered for up to one month postpartum.

Later-Life Cardiovascular Disease in Women With Prior Preeclampsia

Quality of evidence: Low

For women with a medical history of preeclampsia who gave birth preterm (less than 37 0/7 weeks of gestation) or who have a medical history of recurrent preeclampsia

- yearly assessment of BP, lipids, fasting blood glucose, and body mass index

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