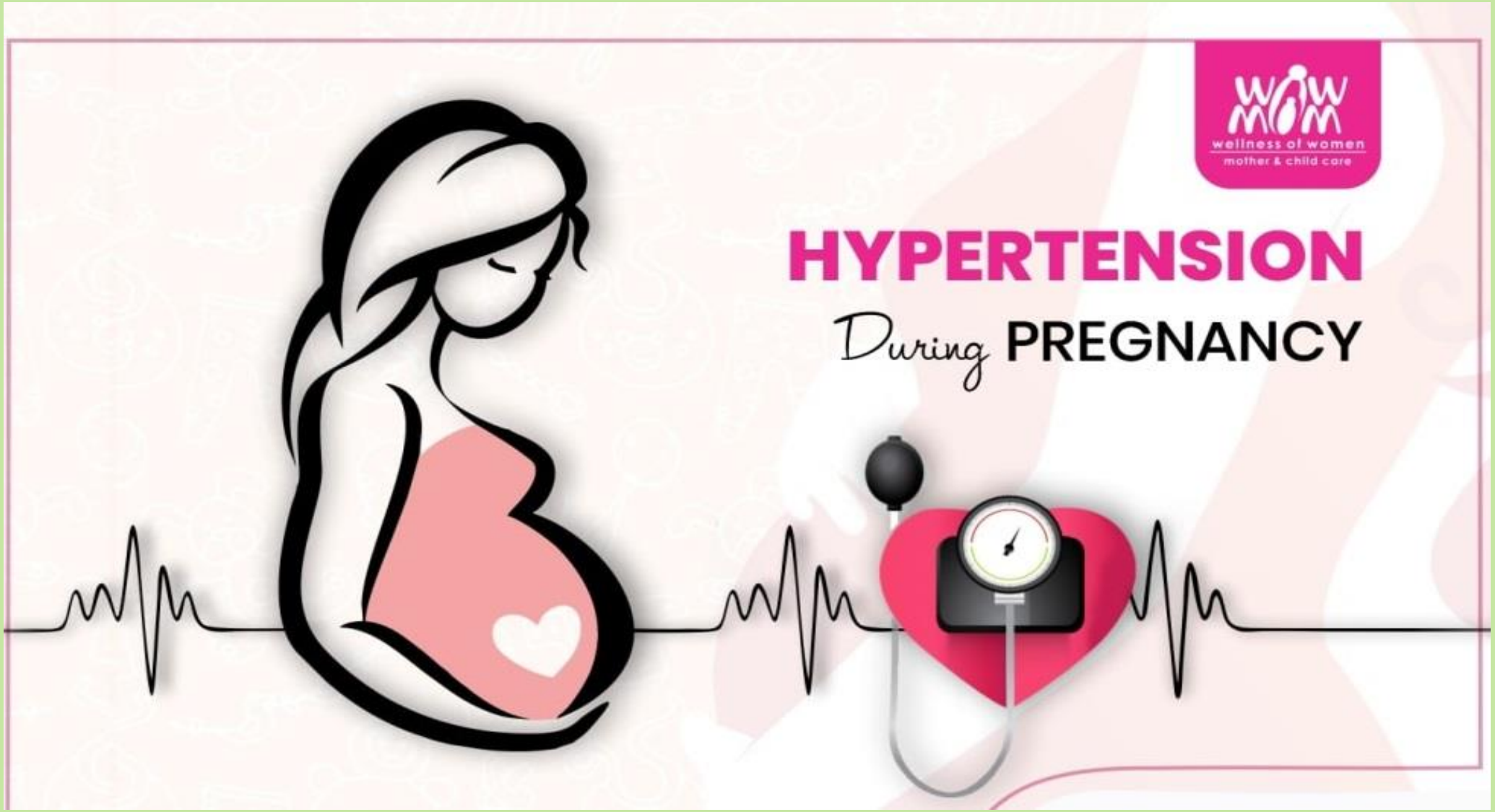

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OBJECTIVES

- Know criteria for the diagnosis of hypertensive disorders during pregnancy.
- Discuss current management considerations.
- Discuss about some practical points to reduced maternal mortality & morbidity related to our topic.

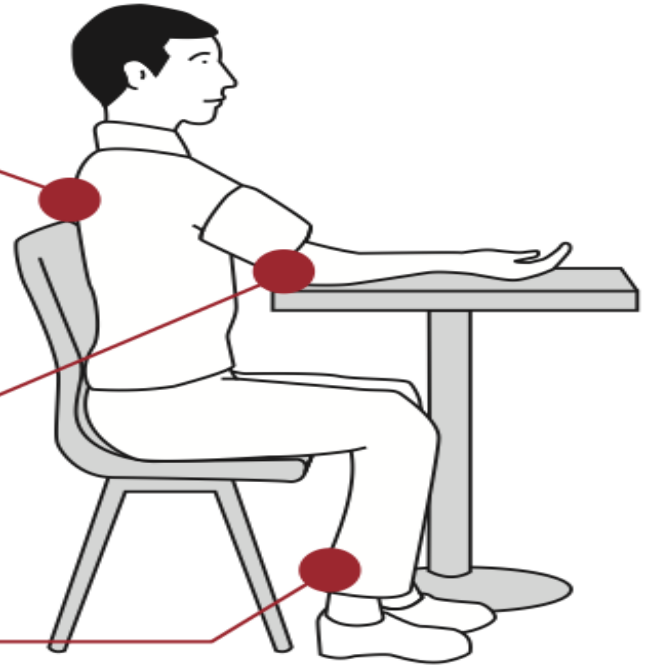
Blood pressure measurement

- Patient should rest for 10 minutes
- Put feet on the ground
- Legs or arms should not cross over each other
- Arms should be horizontal at the heart level
- Cigarrete smoking and alcohol consumption should be avoided for at least 30 minutes before measurement
- At the first visit measure BP in both arms
- The monitor should be placed at the doctor’s eyes level
- Doctor-patient distance should not be more than 1meter
- Appropriate cuff should be used
- Minimally measure BP twice(1-2 minute interval should be considered between measurements)
- Use mean BP as the patient’s BP

BLOOD PRESSURE MEASUREMENT

When you measure your blood pressure:

- ✓ Sitting position
- ✓ Back supported
- ✓ Arm bare and supported
- ✓ Use a cuff size appropriate for your arm
- ✓ Middle of the cuff at heart level
- ✓ Lower edge of cuff 3 cm above elbow crease
- ✓ Do not talk or move before or during the measurement
- ✓ Legs uncrossed
- ✓ Feet flat on the floor



Hypertension CANADA

What is hypertension definition in pregnancy?

During pregnancy, hypertension is defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg.

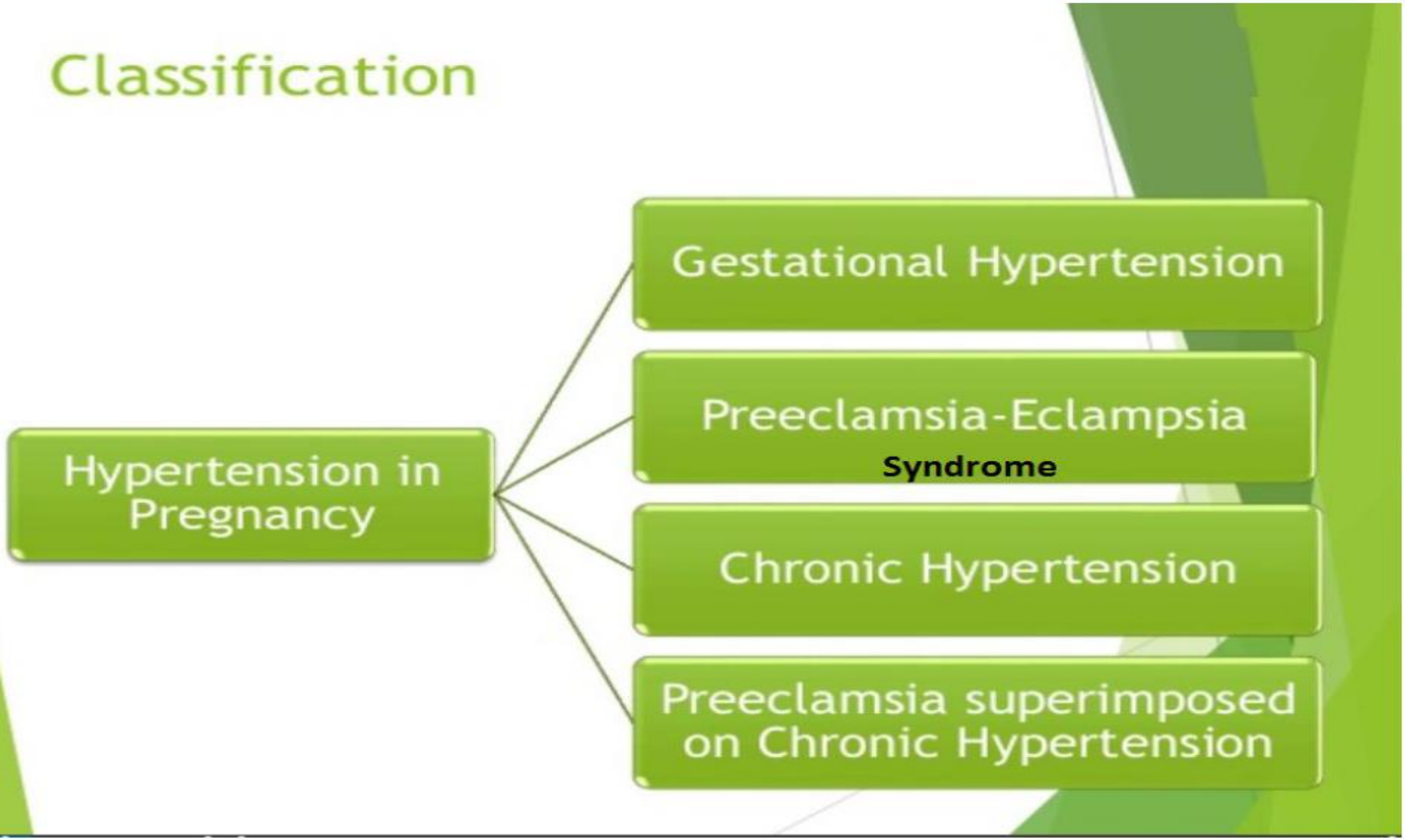
Severe hypertension is defined as systolic blood pressure ≥160 mmHg and/or diastolic blood pressure ≥110 mmHg.

The American College of Cardiology and the American Heart Association have endorsed a lower cutoff point (SBP blood 130 to 139 or DBP 80 to 89) for diagnosing hypertension in nonpregnant patients in 2017

Elevated blood pressure :SBP120 to 129 and DBP<80/ **Stage 1 hypertension** : SBP130 to 139 or DBP 80 to 89/ **Stage 2 hypertension**

- These new criteria are estimated to at least double the number of reproductive-age women in the United States diagnosed with chronic hypertension but the pregnancy implications remain unclear.
- Emerging evidence suggests that women with stage 1 hypertension may be at increased risk of preeclampsia, gestational diabetes, small for gestational age newborn, and indicated preterm birth compared with women with normal blood pressures at the first-trimester visit

Classification



Gestational hypertension refers to hypertension without proteinuria or other signs/symptoms of preeclampsia-related end-organ dysfunction that develops after 20 weeks of gestation.

10 to 25 percent of these patients may ultimately develop signs and symptoms of preeclampsia. Development of proteinuria upgrades the diagnosis to preeclampsia. Even without proteinuria, patients who develop severe hypertension or other features of severe disease are managed in the same way as those with preeclampsia with severe features

Even without proteinuria, patients who develop severe hypertension or other features of severe disease are managed in the same way as those with preeclampsia with severe features.

True gestational hypertension should resolve by 12 weeks postpartum. If it persists beyond 12 weeks postpartum, the diagnosis is revised to chronic hypertension. If it resolves postpartum and signs and symptoms of preeclampsia did not develop, the diagnosis can be revised to transient hypertension of pregnancy

Preeclampsia is a multisystem progressive disorder characterized by the new onset of hypertension and proteinuria or the new onset of hypertension and significant end-organ dysfunction with or without proteinuria in the last half of pregnancy or postpartum

approximately 90 percent of cases present in the late preterm, term, or postpartum period

The remaining 10 percent of cases have an early presentation (<34 weeks)

In approximately 5 percent of preeclampsia cases, the signs and symptoms are first recognized postpartum usually within 48 hours of delivery

Eclampsia refers to the occurrence of a grand mal seizure in a woman with preeclampsia in the absence of other neurologic conditions that could account for the seizure

- HELLP syndrome (hemolysis, elevated liver enzymes, low platelets) probably represents a type of preeclampsia with severe features in which hemolysis, elevated liver enzymes, and thrombocytopenia are the predominant features rather than hypertension or central nervous system or renal dysfunction, although the latter do occur.
- The majority of patients, but not all, have hypertension (82 to 88 percent) and/or proteinuria (86 to 100 percent). Rare patients have neither

Preeclampsia superimposed on chronic HTN

- it occurs in a woman with preexisting chronic hypertension
- It is characterized by worsening or resistant hypertension (especially acutely), the new onset of proteinuria or a sudden increase in proteinuria, and/or significant new end-organ dysfunction after 20 weeks of gestation or postpartum in a woman with chronic hypertension

What is proteinuria during pregnancy?

Standard urine dipstick test

- Negative
- Trace - between 15 and 30 mg/dL
- **1+ - between 30 and 100 mg/dL**
- 2+ - between 100 and 300 mg/dL
- 3+ - between 300 and 1000 mg/dL
- 4+ - >1000 mg/dL

- A positive reaction (+1) for protein develops at the threshold concentration of 30 mg/dL, which roughly corresponds to a 24-hour urinary protein excretion of 300 mg/day, depending on urine volume.

Protein ≥2+ on a paper test strip dipped into a fresh, clean voided midstream urine specimen (only if one of the above quantitative methods is not available. (2+ is equivalent to 100 to 300 mg/dL and performs better than 1+, which does not accurately detect or exclude the protein threshold for preeclampsia

24hour urine proteinuria

- When interpreting the results of a 24-hour urine collection, it is critical to assess the adequacy of collection:
- By quantifying the 24-hour urine creatinine excretion, which is based on muscle mass.
- The 24-hour urine creatinine excretion should be between 15 and 20 mg/kg body weight, calculated using pre-pregnancy weight.
- Values substantially above or below this estimate suggest over- and undercollection, respectively, and should call into question the accuracy of the 24-hour urine protein result.

Pr/cr ratio in random urine

new versus old classification

- In 2013, the ACOG removed proteinuria as an essential criterion for the diagnosis of preeclampsia.
- They also removed massive proteinuria (5 g/24 hours) and FGR as possible features of severe disease because massive proteinuria has a poor correlation with outcome, and FGR is managed similarly whether or not preeclampsia is diagnosed.
- Oliguria was also removed as a characteristic of severe disease

Alarm findings

- Approximately 25 percent of affected women develop severe hypertension and/or one or more of the following nonspecific symptoms
- Persistent and/ or severe headache
- Visual abnormalities (scotomata, photophobia, blurred vision, or temporary blindness rare)
- Upper abdominal, retrosternal, or epigastric pain
- Altered mental status
- New dyspnea, orthopnea

PATIENT EVALUATION; lab test

- following laboratory tests when preeclampsia is suspected:

  Complete blood count with platelets

  Serum creatinine level

  Liver chemistries

  Urinary protein determination

Coagulation studies (prothrombin time, partial thromboplastin time, fibrinogen) are not routinely obtained but are indicated in patients with additional complications, such as abruptio placentae, severe bleeding, thrombocytopenia, or severe liver dysfunction.

Other tests

- neurology consultation:

The neurology service should be consulted to evaluate women with neurologic deficits/abnormal neurologic examination, ocular signs and symptoms, or a severe persistent headache that does not respond to repeat doses of acetaminophen and initial routine management of preeclampsia.

Treatment of acute sever HTN

- BP>=160/110 persistent for more than 15-20 minutes
- The goal is maximum 25% reduction in BP in first 2 hour
- 140/90 to 160/110
- Drug of choice:

  labetalol

  Hydralazine

  nifedipine

Algorithm: First Line Management with Labetalol*

SBP ≥ 160 or DBP ≥ 110 →

Notify a provider and institute fetal surveillance if viable →

Labetalol 20 mg IV over 2 minutes →

Repeat BP in 10 minutes →

If SBP ≥ 160 or DBP ≥ 110, administer labetalol 40 mg IV over 2 minutes; if BP is below threshold, continue to monitor BP closely →

Repeat BP in 10 minutes →

If SBP ≥ 160 or DBP ≥ 110, administer labetalol 80 mg IV over 2 minutes; if BP is below threshold, continue to monitor BP closely →

Repeat BP in 10 minutes →

If SBP ≥ 160 or DBP ≥ 110, administer labetalol 80 mg IV over 2 minutes; if BP is below threshold, continue to monitor BP closely →

If SBP ≥ 160 or DBP ≥ 110, administer **hydralazine** 10 mg IV over 2 minutes; if below threshold, continue to monitor BP closely →

Repeat BP in 10 minutes and again in 20 minutes →

If SBP ≥ 160 or DBP ≥ 110 at 20 minutes, obtain emergency consultation from specialist in MFM, internal medicine, anesthesiology, or critical care →

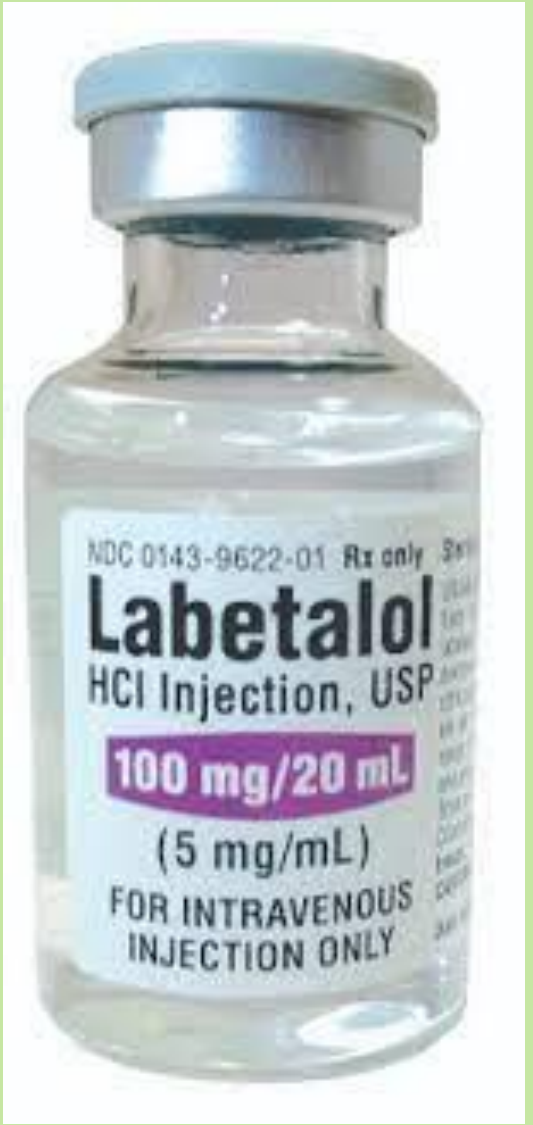
Give additional antihypertensive medication per specific order as recommended by specialist →

Once BP thresholds are achieved, repeat BP
- every 10 minutes for 1 hour
- then every 15 minutes for 1 hour
- then every 30 minutes for 1 hour
- then every hour for 4 hours →

Institute additional BP monitoring per specific order

*Maximum cumulative IV administered doses should not exceed the following: hydralazine 25 mg; labetalol 220 mg in 24 hours.

- The fall in blood pressure begins within 5 to 10 minutes and lasts from 3 to 6 hours. Continuous **cardiac monitoring** is not necessary routinely, but should be used in patients with relevant co-morbidities (eg, coronary artery disease).
- If labetalol alone is ineffective, the American College of Obstetricians and Gynecologists (ACOG) suggests switching to hydralazine .Alternatively, **oral extended-release nifedipine** or intravenous nicardipine can be used



Hydralazine Algorithm

EXAMPLE

Trigger: If severe elevations (SBP ≥160 or DBP ≥ 110) persist for 15 min or more **OR** if two severe elevations are obtained within 15 min and tx is clinically indicated

1. Administer **hydralazine 5 mg or 10 mg** IV over 2 minutes
2. Repeat BP in 20 minutes
3. If SBP ≥ 160 or DBP ≥ 110, administer **hydralazine 10 mg** IV over 2 minutes
4. Repeat BP in 20 minutes
5. If SBP ≥ 160 or DBP ≥ 110, administer **labetalol 20 mg** IV over 2 minutes; if BP below threshold, continue to monitor BP closely
6. Repeat BP in 10 minutes
7. If SBP ≥ 160 or DBP ≥ 110, administer **labetalol 40 mg** IV over 2 minutes, and obtain emergency consultation from specialist in MFM, internal medicine, anesthesiology, or critical care
8. Give additional antihypertensive medication per specific order as recommended by specialist
9. Once BP thresholds are achieved, repeat BP:
10. - Every 10 minutes for 1 hour
    - Then every 15 minutes for 1 hour
    - Then every 30 minutes for 1 hour
    - Then every hour for 4 hours
11. Institute additional BP monitoring per specific order

- Notify provider after one severe BP value is obtained
- Institute fetal surveillance if viable
- Hold IV labetalol for maternal pulse under 60
- Maximum cumulative IV-administered dose of hydralazine should not exceed 25 mg in 24 hours
- There may be adverse effects and contraindications. Clinical judgement should prevail.

- If a total cumulative dose of 20 to 30 mg in 24 hours does not achieve optimal blood pressure control, another agent should be used.
- The fall in blood pressure begins **within 10 to 30 minutes** and lasts from 2 to 4 hours.
- If hydralazine is ineffective, ACOG suggests switching to labetalol

Calcium channel blockers

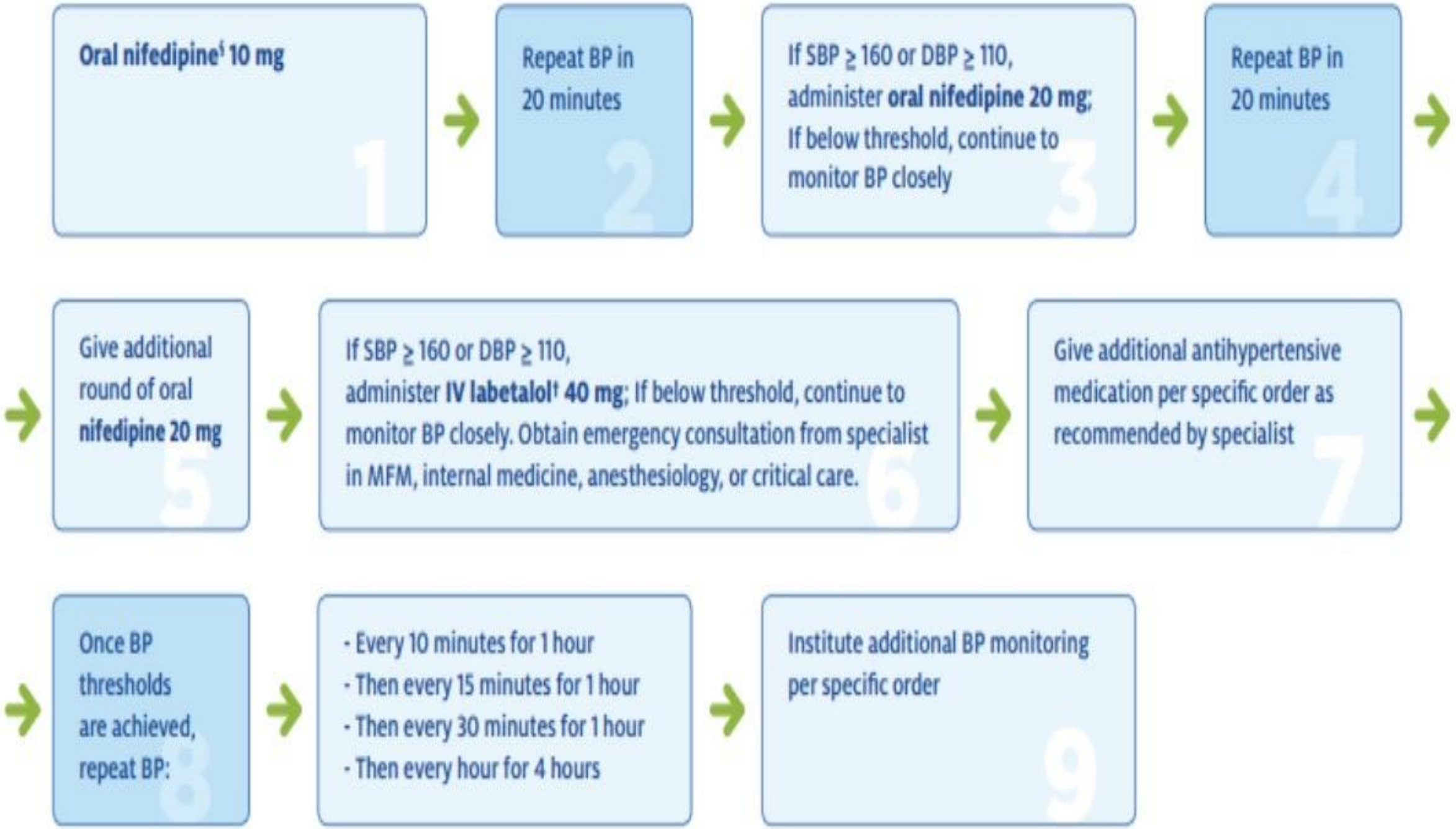
- **Extended-release nifedipine:**

Extended-release nifedipine 30 mg oral tablet is an effective antihypertensive agent that is less likely to result in a rapid and severe fall in blood pressure than the oral capsule and provides antihypertensive effects over several hours.

- **Immediate-release nifedipine**

- In a study comparing **10 mg nifedipine tablets (slow release)** with **10 mg capsules (immediate release)** for acute treatment of severe hypertension in pregnancy, at 45 minutes and at 90 minutes, women who received capsules had a significantly greater fall in blood pressure and a rise in heart rate compared with women who received tablets .
- we caution against the use of **immediate-release oral nifedipine**, although ACOG endorsed its use as an option for emergent treatment of acute, severe hypertension in pregnancy or postpartum.

- If used, a common dose for immediate-release nifedipine is 10 mg orally initially; if target blood pressure is not achieved in 20 minutes, administer 10 to 20 mg depending on initial response and repeat blood pressure 20 minutes later; if target blood pressure is not achieved, administer another 10 to 20 mg depending on previous responses. If target blood is still not achieved in 20 minutes, then switch to another agent (eg, intravenous labetalol).
- 10mg→10-20mg→10-20mg→switch to another agent
- RCOG→10mg→10-20mg→labetolol


Oral nifedipine[‡] 10 mg
1
Repeat BP in 20 minutes
2
If SBP ≥ 160 or DBP ≥ 110, administer oral nifedipine 20 mg; If below threshold, continue to monitor BP closely
3
Repeat BP in 20 minutes
4
Give additional round of oral nifedipine 20 mg
5
If SBP ≥ 160 or DBP ≥ 110, administer IV labetalol[†] 40 mg; If below threshold, continue to monitor BP closely. Obtain emergency consultation from specialist in MFM, internal medicine, anesthesiology, or critical care.
6
Give additional antihypertensive medication per specific order as recommended by specialist
7
Once BP thresholds are achieved, repeat BP:
8
- Every 10 minutes for 1 hour
- Then every 15 minutes for 1 hour
- Then every 30 minutes for 1 hour
- Then every hour for 4 hours
Institute additional BP monitoring per specific order
9

- Nitroglycerin (glyceryl trinitrate) is an option for treatment of hypertension associated with **pulmonary edema** in the rare occasion when intravenous diuretics are not effective
- It is given as an intravenous infusion of **5 mcg/min and gradually increased every 3 to 5 minutes to a maximum dose of 100 mcg/min.**
- Nitroprusside is administered as a last resort.
- Magnesium sulfate, which is usually administered to women with preeclampsia, eclampsia, or gestational hypertension with severe features, is never a substitute for prompt initiation of antihypertensive treatment of severe hypertension as it has minimal effects on blood pressure

NATURAL HISTORY/COURSE OF DISEASE

- resolution of the maternal signs and symptoms of the disease occurs variably in the postpartum period, with some symptoms disappearing in a matter of hours (eg, headache), while others may take weeks or months (eg, proteinuria). Typically, mobilization of third-space fluid and diuresis begin within 48 hours of delivery. Hypertension may worsen during the first, and occasionally the second, postpartum week but normalizes in most women within four weeks postpartum. Proteinuria usually begins to improve within a few days; however, in women with several grams of protein excretion, complete resolution may take weeks to months.
- patients with preeclampsia are at increased risk for developing **cardiovascular and renal disease.**

Chronic hypertension in pregnancy

Chronic hypertension is defined as hypertension that precedes pregnancy or is present on at least two occasions before the 20 week of gestation or persists longer than 12 weeks postpartum. It can be primary or secondary to a variety of medical disorders.

- While the majority of hypertensive, reproductive-age women with chronic hypertension have essential (idiopathic or primary) hypertension, consideration of secondary causes of hypertension is important if not already evaluated
- since these causes can require specific testing and therapy, ideally before pregnancy. A finding suggestive of secondary hypertension is resistant hypertension, particularly in younger women

approach for initiating or continuing therapy

- **Patients not on antihypertensive therapy and without end-organ disease** :

For women with non-severe hypertension who are not on antihypertensive therapy and have no end-organ involvement, we generally initiate this therapy when blood pressures approach the severe range in order to prevent development of severe maternal hypertension while minimizing fetal exposure.

After initiation of therapy, target blood pressure continues to be an area of controversy. Our target blood pressure range is 120 to 150/80 to 95 mmHg; a target range of 130 to 150/80 to 100 mmHg is also common.

- **non-severe on antihypertensive therapy without no end-organ involvement:**

it is individualized. For most women with well-controlled blood pressures on an antihypertensive medication regimen with a good safety profile, it is reasonable to continue medications to decrease the occurrence of severe hypertension. target blood pressure range is 120 to 150/80 to 95 mmHg; a target range of 130 to 150/80 to 100 mmHg is also common.

However, it is also reasonable to discontinue medications during the first trimester to minimize fetal exposure and restart them if blood pressures approach the severe range. With this approach, close blood pressure monitoring is imperative, and the blood pressure changes, such as the decline in the midtrimester and rise in the third trimester, must be considered.

Patients with end-organ disease

- **For women with end-organ involvement, such as cardiac or renal disease:**

the threshold for initiating or continuing antihypertensive therapy is lower: SBP≥150 mmHg or DBP≥100 mmHg. After initiation of therapy, it may be desirable to maintain blood pressure at 120 to 140/80 to 90 mmHg, though whether lowering blood pressure to a "normal" level (would confer maternal benefit is unresolved

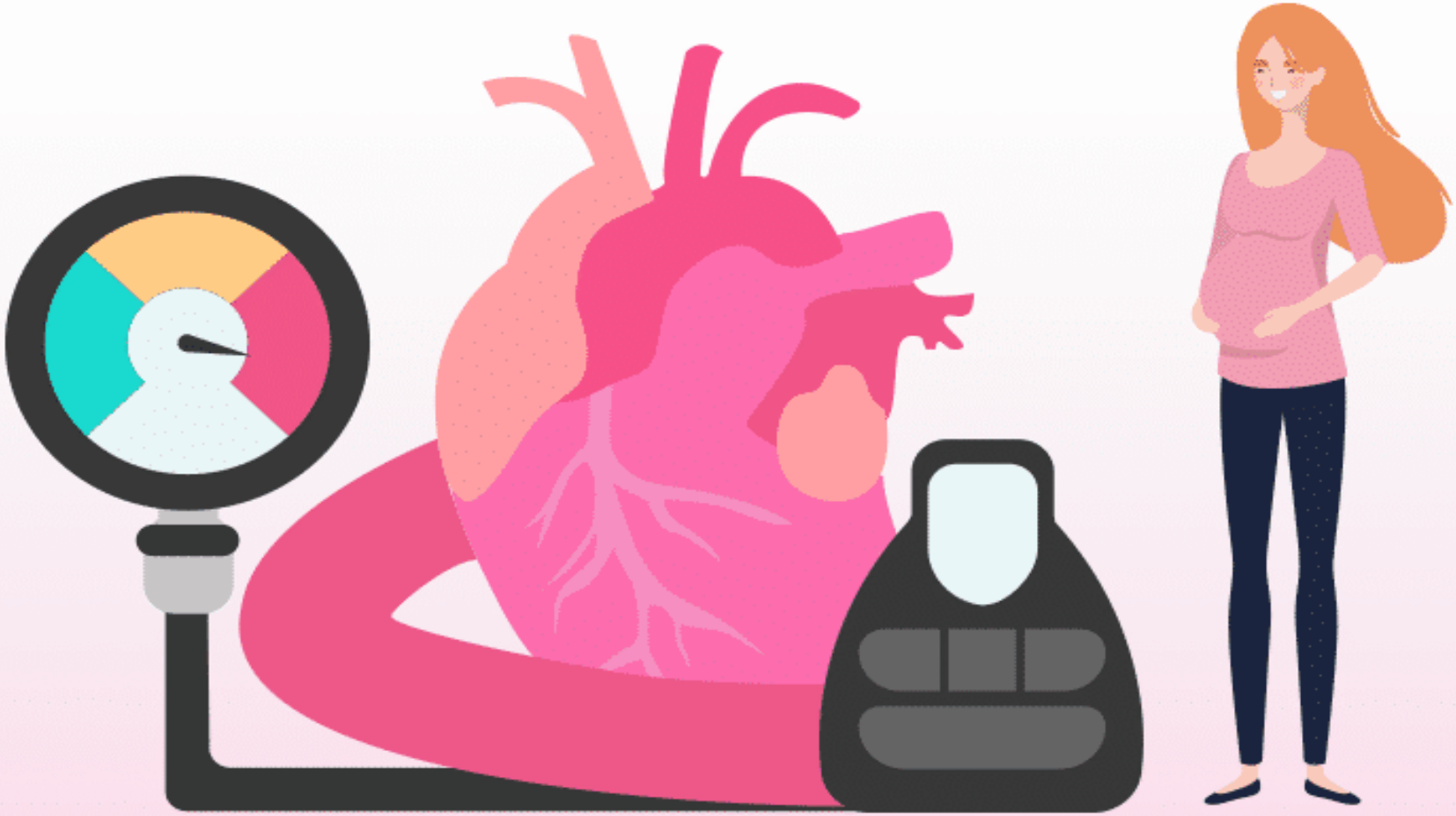
Choice of drug and dosing

- start treatment with either labetalol, a long-acting calcium channel blocker (eg, extended-release nifedipine), or methyldopa
- If maximum doses of one drug are ineffective to achieve the goal blood pressure range, then a second or third drug can be added.
- It is important to closely monitor women in whom blood pressure is not responding well to antihypertensive therapy since this may be a sign of preeclampsia.

TABLE 22.3 TREATMENT OF CHRONIC HYPERTENSION IN PREGNANCY

Drug	Dosage	Maternal Side Effects
Oral antihypertensives used commonly in pregnancy		
Labetalol	200–2,400 mg per day in 2–3 divided doses	Dizziness, fatigue, orthostatic hypotension, nausea
Nifedipine	30–120 mg per day of a slow-release preparation	Headache, flushing, peripheral edema, orthostatic hypotension
Amlodipine	5-10 mg per day	Same as nifedipine
Methyldopa	0.5–3.0 g per day in 2–3 divided doses	Maternal sedation, elevated LFTs, depression
Adjunctive agents		
Hydralazine	50–300 mg per day in 2–4 divided doses	Use with methyldopa or labetalol to prevent reflextachycardia; risk of neonatal thrombocytopenia

- Early postpartum visits for a blood pressure check (within 3 to 10 days after delivery) or home blood pressure monitoring, particularly in the first two weeks post-delivery, is recommended.
- Choice of medications for blood pressure control is the same as during pregnancy, or the patient's prepregnancy antihypertensive regimen can be resumed after delivery, with consideration of safety in breastfeeding. Dose adjustments of antepartum regimens may be needed to reflect the decrease in volume of distribution and glomerular filtration rate that occurs after delivery
- If volume overload is suspected or diagnosed, then diuresis should be considered



Be Aware of Hypertension During Pregnancy

What is your first differential diagnosis and how do you approach to the patient?

- A 22-year-old woman , GA: 35 weeks, was admitted to emergency department because of sever abdominal pain in epigastric region plus nausea. She had no other symptoms in this pregnancy except for lower extremities edema since 10 days ago.
- At presentation, she had a blood pressure of 165/100 mmHg, PR: 98, T:37 oral, RR:14, O2 saturation:98%
- In abdominal exam no mass was palpable but she had tenderness at epigastric region
- Uterine tone was normal and fetal heart was auscultated
- No focal neurologic deficit was evident