Emergency Care for the OB Patient: Hypertension in Pregnancy

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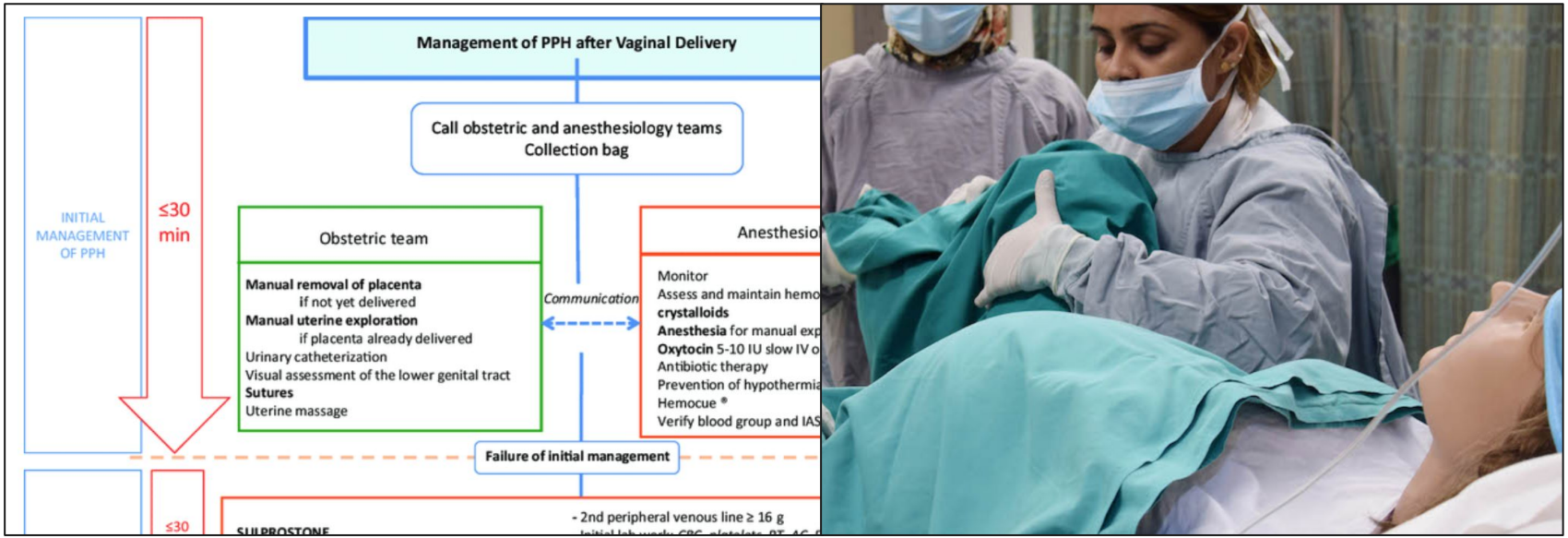
I have no financial interests or relationships to disclose.

Context: OB ED Readiness



Context: OB ED Readiness

- Postpartum hemorrhage
- Breech vaginal delivery
- Shoulder dystocia
- Trauma in pregnancy
- Hypertension in pregnancy
- Normal labor and delivery

Objectives: Hypertension in pregnancy

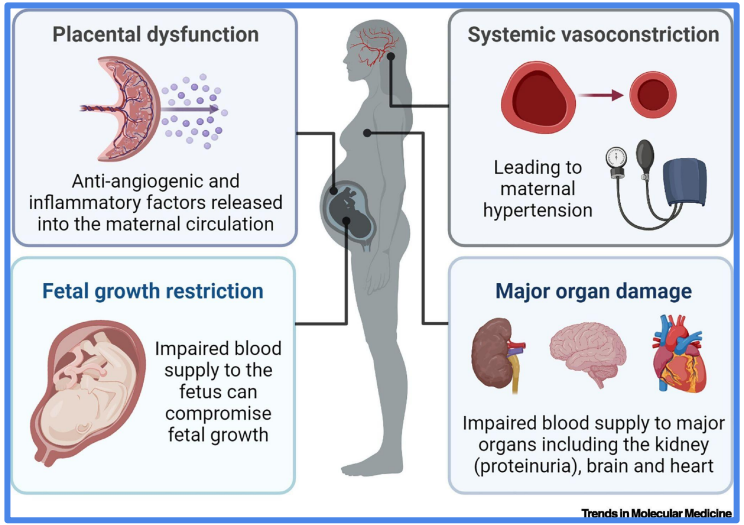
- (1) the Ob-Gyn perspective
  - Epidemiology, pathophysiology, diagnosis, management
- (2) the ED perspective
  - Discuss an approach to identifying, triaging, managing OB HTN in the ED
  - Additional thoughts on OB HTN
- (3) COVID in pregnancy
  - Complications, ED considerations, vaccination, antibodies

(1) Ob-Gyn

Epidemiology

- Hypertensive disorders of pregnancy (preeclampsia and related diagnoses) are a leading cause of maternal and perinatal morbidity and mortality
    - Seizures, strokes, IUFD
- 16% of maternal deaths and ~9% of fetal demises
- HTN complicates 2-8% of pregnancies globally
- Rates are increasing

Pathophysiology



New-onset hypertension in pregnancy

Sometimes accompanied by proteinuria

Sometimes accompanied by signs of damage to other organs (liver, kidney)

Mechanism not well-understood, but a disorder of placental → vascular dysfunction

Diagnosis and Management

Condition	Diagnosis	Treatment	Delivery
Gestational hypertension	Systolic BP >/= 140 or diastolic BP >/= 90 on two occasions at least 4 hours apart after 20 weeks' gestation	No antihypertensive treatment unless BPs become severe-range (>/= 160 systolic or >/= 110 diastolic) Blood pressure monitoring Antenatal testing Growth ultrasounds	Without other comorbidities, 37wga

Diagnosis and Management

Condition	Diagnosis	Treatment	Delivery
Preeclampsia without severe features	Gestational hypertension PLUS proteinuria: >/=300mg on a 24h urine collection, P:C ratio of >/= 0.3, Urine dip with >/= 2+ protein	No antihypertensive treatment unless BPs become severe-range (>/= 160 systolic or >/= 110 diastolic) Blood pressure monitoring Antenatal testing Growth ultrasounds	Without other comorbidities, 37wga

Diagnosis and Management

Condition	Diagnosis	Treatment	Delivery
Preeclampsia with severe features	Severe-range blood pressures (systolic BP >/= 160 or diastolic BP >/= 110; do not need to wait 4h) OR mild-range BPs plus any of the following: – Plts <100k – Cr >1.1 or 2x baseline – LFTs 2x ULN – Persistent RUQ/epigastric pain – Persistent headache – Visual changes – Pulmonary edema	Antihypertensives for severe-range blood pressures Magnesium sulfate infusion for seizure prophylaxis If not delivering immediately, inpatient management for BP monitoring, antenatal testing, growth US, labs at least q12h until stable.	If stable and without other comorbidities, expectant management until 34wga.

Diagnosis and Management

Condition	Diagnosis	Treatment	Delivery
HELLP (hemolysis, elevated liver enzymes, low platelets syndrome)	Considered a severe form of pre-E, but can present without HTN or proteinuria. Main presenting symptoms are RUQ pain and malaise (90%) and N/V (50%). ACOG's criteria (need 3/3): (1) LDH >/= 600IU/L (2) AST/ALT >/= 2x ULN (3) Plts <100k	Antihypertensives if indicated for severe-range BPs Magnesium sulfate infusion for seizure prophylaxis Labs at least q12h (usually q6h)	After maternal stabilization.

Diagnosis and Management

Condition	Diagnosis	Treatment	Delivery
Eclampsia	New-onset tonic-clonic, focal, or multifocal seizures in pregnancy in the absence of other causative conditions	Maternal stabilization Magnesium sulfate IM vs IV	After maternal stabilization.

(2) ED

OB ED Algorithm: HTN in Pregnancy

Pregnant >20wga with:
Elevated BPs (>/=140/90)
RUQ/epigastric pain
HA or visual changes
Significant or new-onset edema

Evaluation:
Serial BP measurements
Labs: CBC, CMP, **LDH, P:C**
History: Evaluate for severe features
- RUQ/epigastric pain
- HA/visual changes

Exam: Pulmonary, reflexes, extremities
Fetal assessment

No severe features:

No immediate treatment
Consult OB
Inpt vs outpatient follow-up

Any severe features:
BPs >/= 160/110 OR:
– Plts <100k
– Cr >1.1 or 2x baseline
– LFTs 2x ULN or RUQ pain (persistent)
– Pulmonary edema
– Headache (persistent)
– Visual changes (persistent)
– HELLP criteria met (LDH>/=600 +plts +LFTs)

Initiate antihypertensives for severe-range BPs:
- Labetalol 20mg IV
- Hydralazine 5mg IV,
- Nifedipine 10mg PO

Serial BP monitoring
$MgSO_4$ 4-6g loading dose → 1-2g/hr
Fetal monitoring
Consult OB
Inpatient management vs delivery

Antihypertensive agents

Table 3. Antihypertensive Agents Used for Urgent Blood Pressure Control in Pregnancy

Drug	Dose	Comments	Onset of Action
Labetalol	10–20 mg IV, then 20–80 mg every 10–30 minutes to a maximum cumulative dosage of 300 mg; or constant infusion 1–2 mg/min IV	Tachycardia is less common with fewer adverse effects. Avoid in women with asthma, preexisting myocardial disease, decompensated cardiac function, and heart block and bradycardia.	1–2 minutes
Hydralazine	5 mg IV or IM, then 5–10 mg IV every 20–40 minutes to a maximum cumulative dosage of 20 mg; or constant infusion of 0.5–10 mg/hr	Higher or frequent dosage associated with maternal hypotension, headaches, and abnormal fetal heart rate tracings; may be more common than other agents.	10–20 minutes
Nifedipine (immediate release)	10–20 mg orally, repeat in 20 minutes if needed; then 10–20 mg every 2–6 hours; maximum daily dose is 180 mg	May observe reflex tachycardia and headaches	5–10 minutes

Abbreviations: IM, intramuscularly; IV, intravenously.

Labetalol 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. Labetalol 20 mg† IV over 2 minutes
2. Repeat BP in 10 minutes
3. If SBP ≥ 160 or DBP ≥ 110, administer labetalol 40 mg IV over 2 minutes; If BP below threshold, continue to monitor BP closely
4. Repeat BP in 10 minutes
5. If SBP ≥ 160 or DBP ≥ 110, administer labetalol 80 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 hydralazine§ 10 mg IV over 2 minutes; If below threshold, continue to monitor BP closely
8. Repeat BP in 20 minutes
9. If SBP ≥ 160 or DBP ≥ 110 at 20 minutes, obtain emergency consultation from specialist in MFM, internal medicine, anesthesiology, or critical care
10. Give additional antihypertensive medication per specific order as recommended by specialist
11. Once BP thresholds are achieved, repeat BP:
12. - 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
13. 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 labetalol should not exceed 300 mg in 24 hours
- There may be adverse effects and contraindications. Clinical judgement should prevail.

* Two severe readings more than 15 minutes and less than 60 minutes apart

† **Avoid parenteral labetalol with active‡ asthma, heart disease, or congestive heart failure; use with caution with history of asthma. May cause neonatal bradycardia.**

‡ "Active asthma" is defined as:
Ⓐ symptoms at least once a week, or
Ⓑ use of an inhaler, corticosteroids for asthma during the pregnancy, or
Ⓒ any history of intubation or hospitalization for asthma.

§ Hydralazine may increase risk of maternal hypotension.

Magnesium sulfate

- The first-line medication for prevention of seizures (NNT = 63 with severe features)
- Prevents seizures and seizure recurrences; does not stop an ongoing seizure
- Inhibits NMDA receptors → Decreases neuronal excitability? Causes cerebral vasodilation?
- Dosing:
  - 4-6g 10% MgSO4 IV (100mL solution) over 10 min → maintenance 1-2g/hr
  - No IV: 10g IM (5g in each buttock)
- Monitor for toxicity (UOP, VS, reflexes), especially with renal impairment:
  - 5-9 mg/dL therapeutic
  - >9 loss of patellar reflexes
  - >12 respiratory paralysis
  - >30 cardiac arrest
- Antidote: Calcium gluconate 10mL (10% IV, 1g total, over 3 min)

Eclampsia

- New-onset, tonic-clonic, multifocal seizure in pregnancy in the absence of other causes
- Basic supportive measures
- Magnesium sulfate:
  - If already infusing: +2g IV over 15-20min
  - If IV access: 6g IV bolus over 15-20 min, then 2g/hr ongoing
  - If no IV: 10g IM (5g IM in each buttock)
- If recurrent: give an additional 2-4g IV bolus / 5min
- If refractory (still seizing 20min after bolus or >2 recurrences)
  - alternate medications: Lorazepam 2-4mg IV x1, repeat 10-15 min (?sodium amobarbital, ?thiopental, ?phenytoin)
  - intubation
  - imaging
  - ICU admission
- Deliver promptly after maternal stabilization
  - Eclampsia is *not* always an indication for cesarean delivery

EXAMPLE

Eclampsia Checklist

- ☐ Call for Assistance
- ☐ Designate
  - ○ Team leader
  - ○ Checklist reader/recorder
  - ○ Primary RN
- ☐ Ensure side rails up
- ☐ Protect airway and improve oxygenation:
  - ○ Maternal pulse oximetry
  - ○ Supplemental oxygen (100% non-rebreather)
    - ☐ Lateral decubitis position
    - ☐ Bag-mask ventilation available
    - ☐ Suction available
- ☐ Continuous fetal monitoring
- ☐ Place IV; Draw preeclampsia labs
- ☐ Ensure medications appropriate given patient history
- ☐ Administer magnesium sulfate
- ☐ Administer antihypertensive therapy if appropriate
- ☐ Develop delivery plan, if appropriate
- ☐ Debrief patient, family, and obstetric team

† "Active asthma" is defined as:
Ⓐ symptoms at least once a week, or
Ⓑ use of an inhaler, corticosteroids for asthma during the pregnancy, or
Ⓒ any history of intubation or hospitalization for asthma.

Magnesium Sulfate

Contraindications: Myasthenia gravis; avoid with pulmonary edema, use caution with renal failure

IV access:

- ☐ Load 4-6 grams 10% magnesium sulfate in 100 mL solution over 20 min
- ☐ Label magnesium sulfate; Connect to labeled infusion pump
- ☐ Magnesium sulfate maintenance 1-2 grams/hour

No IV access:

- ☐ 10 grams of 50% solution IM (5 g in each buttock)

Antihypertensive Medications

For SBP ≥ 160 or DBP ≥ 110
(See SMI algorithms for complete management when necessary to move to another agent after 2 doses.)

- ☐ **Labetalol** (initial dose: 20mg); **Avoid parenteral labetalol with active asthma, heart disease, or congestive heart failure; use with caution with history of asthma**
- ☐ **Hydralazine** (5-10 mg IV* over 2 min); **May increase risk of maternal hypotension**
- ☐ **Oral Nifedipine** (10 mg capsules); Capsules should be administered orally, not punctured or otherwise administered sublingually

** Maximum cumulative IV-administered doses should not exceed 220 mg labetalol or 25 mg hydralazine in 24 hours*

***Note:** If persistent seizures, consider anticonvulsant medications and additional workup*

Anticonvulsant Medications

For recurrent seizures or when magnesium sulfate contraindicated

- ☐ **Lorazepam (Ativan)**: 2-4 mg IV x 1, may repeat once after 10-15 min
- ☐ **Diazepam (Valium)**: 5-10 mg IV q 5-10 min to maximum dose 30 mg

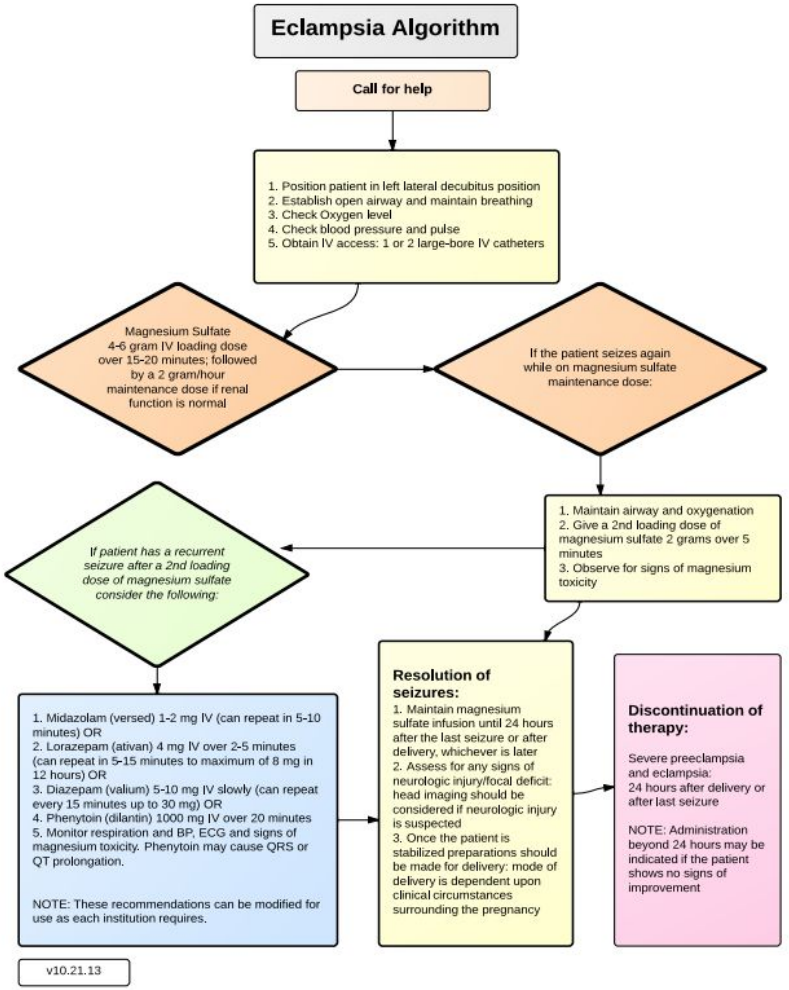
For Persistent Seizures

- ☐ Neuromuscular block and intubate
- ☐ Obtain radiographic imaging
- ☐ ICU admission
- ☐ Consider anticonvulsant medications

Safe Motherhood Initiative

ACOG

Revised January 2019



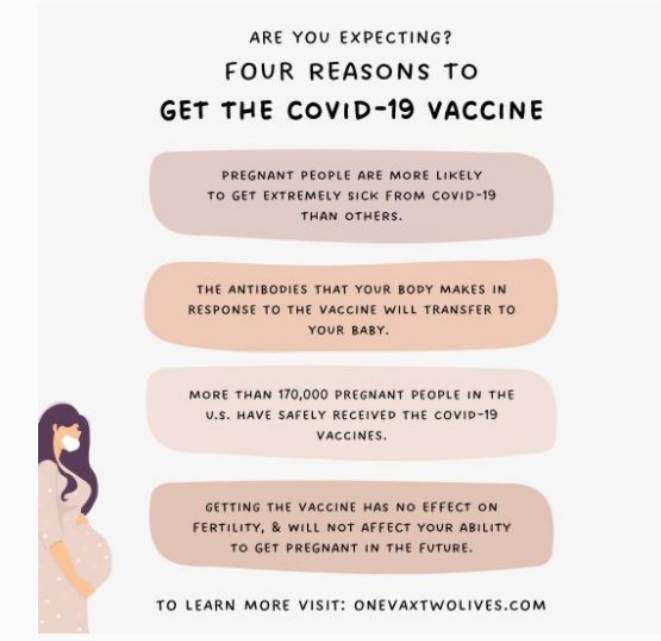
Final thoughts on OB HTN…

- Not always stepwise
  - 20-38% of women with eclampsia did not have preceding HTN or proteinuria
  - 78-83% had neurologic sx (severe/persistent HA, visual changes)
- Don't forget postpartum
  - HELLP: 30% of cases first expressed or progress postpartum
  - Most common first week, but at risk up to 6 weeks
- Consider ddx
  - Acute fatty liver of pregnancy: Rare condition characterized by severe liver dysfunction in pregnancy; markedly elevated LFTs; can lead to liver failure, requires immediate delivery
  - TTP/HUS (hemolysis, thrombocytopenia, renal dysfunction)
  - The usual causes of renal or hepatic dysfunction (substance use, viral hepatitis, etc)

COVID and Pregnancy

- People who are pregnant or recently pregnant are at an increased risk for severe illness from COVID-19, as well as for pregnancy complications (including preterm birth, stillbirth, preeclampsia)
    - Low threshold for transfer and inpatient care
- Depending on your site and policies, if a pregnant patient presents with respiratory distress or chest pain (and no OB complaints) may be better to stabilize in the ED (versus L&D)

COVID and Pregnancy



- Vaccines (and boosters) are safe and recommended in pregnancy!
  - We should counsel patients on this at every possible point of care
  - #onevaxtwolives campaign—the passive immunity argument
- Depending on site policies and availability, pregnant women otherwise meeting criteria should be offered monoclonal antibodies for prevention of severe disease.

Thank you!

ACOG Safe Motherhood Initiative: Severe Hypertension in Pregnancy Bundle:
https://www.acog.org/community/districts-and-sections/district-ii/programs-and-resources/safe-motherhood-initiative/severe-hypertension

ACOG PB 222: Gestational Hypertension and Preeclampsia (June 2020)

Creogs over Coffee: Hypertension and Pregnancy Trio (March 2019):
https://creogsovercoffee.com/notes/2019/3/3/hypertension-and-pregnancy-trio

California Maternal Quality Care Collaborative: Eclampsia Algorithm
https://www.cmqcc.org/resource/preeclampsia-toolkit-appendix-e-eclampsia-algorithm