UT Southwestern Medical Center

Hypertensive disorders of pregnancy:

Recognition and timely treatment to prevent perinatal morbidity

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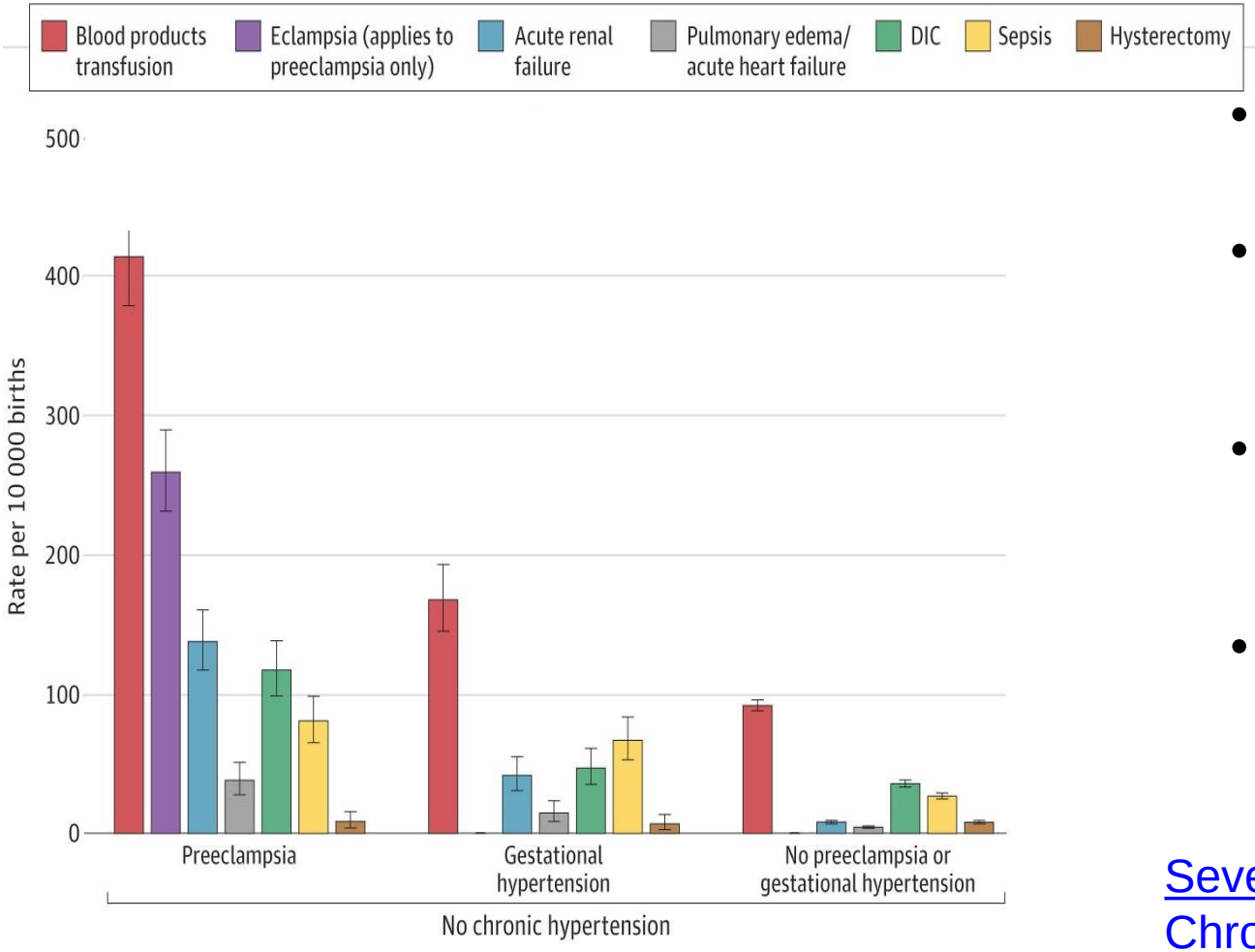
Objectives

- Identify and treat acute-onset severe hypertension (≥ 160 and or 110) by understanding treatment algorithms including hydralazine, labetalol, and the use of immediate release nifedipine.

- Recognize and implement maternal stabilization for eclamptic seizure to include acute treatment of seizure, treatment of repetitive seizures, and delivery planning.

Introduction and Epidemiology



- Preeclampsia impacts 5-7% of pregnancies
- Incidence has increased likely due to risk factors such as obesity, diabetes mellitus, and advanced maternal age
- Hypertensive disorders and massive transfusion are two of the most common causes of ICU admission
- Hypertensive disorders are responsible for 14% of maternal deaths worldwide

Severe Maternal Morbidity Associated With Chronic Hypertension, Preeclampsia, and Gestational Hypertension. JAMA Netw Open. January 1, 2025.

Definitions

- **Preeclampsia with Severe Features:**
- Systolic BP ≥160 mm Hg OR diastolic BP ≥110 mm Hg
- - Confirmed within 15 minutes (persistent)
- - Requires treatment within 30-60 minutes
- Thrombocytopenia (platelets 100,000/μL)
- Impaired liver function (transaminases 2× upper limit normal) or severe persistent RUQ/epigastric pain
- Renal insufficiency (creatinine ≥1.1 mg/dL or doubling)
- Pulmonary edema
- New-onset headache unresponsive to medication
- Visual disturbances

Critical Concept: The majority of fatal maternal strokes are deemed preventable with earlier and more aggressive blood pressure control. Severe hypertension persisting for 15 minutes constitutes a medical emergency.

- **Eclampsia:**
- Tonic-clonic, focal, or multifocal seizures in the setting of preeclampsia

Treatment of acute hypertension in pregnancy

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.

- **IV Labetalol Dosing Protocol:**
- **Initial dose:** 20 mg IV
- **If BP threshold still exceeded after 10 minutes:** 40 mg IV
- **If BP threshold still exceeded after 10 minutes:** 80 mg IV
- **If BP threshold still exceeded:** Switch to hydralazine 10 mg IV
- **Maximum cumulative dose:** 300 mg

- **IV Hydralazine Dosing Protocol:**
- **Initial dose:** 5 mg
- **If BP threshold still exceeded after 20 minutes:** 10 mg IV
- **If BP threshold still exceeded after 20 minutes:** Switch to labetalol 20 mg IV
- **If BP threshold still exceeded after 10 minutes:** Labetalol 40 mg IV
- **Maximum cumulative dose:** 20 mg (per ACOG protocol)

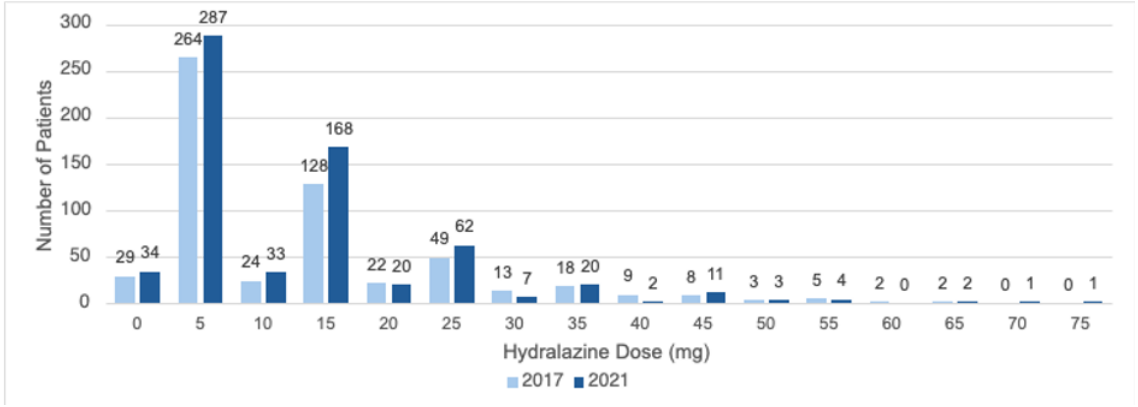
- **Oral Nifedipine Dosing Protocol:**
- **Initial dose:** 10 mg immediate-release nifedipine capsules orally
- **If BP threshold still exceeded after 20 minutes:** 20 mg immediate-release nifedipine orally
- **If BP threshold still exceeded after 20 minutes:** 20 mg immediate-release nifedipine orally
- **If BP threshold still exceeded after 20 minutes:** Switch to labetalol 20 mg IV
- **Maximum cumulative dose:** 50 mg

Treatment of acute hypertension in pregnancy

- At Parkland we have historically followed a protocol established by Dr. Pritchard where hydralazine is given first line and did not define an upper limit
- ACOG published recommendations in 2020 and thus, a retrospective review was conducted by Dr. Tao to determine practice changes

- Administration during 2017 and 2021 was explored
  - More than 80% of patients required less than 20 mg of IV apresoline during any 24h period
  - Those who received >20 mg were older, obese, and delivered at earlier GAs
  - These patients did not have more ICU admissions than those who received <20 mg

Thank you to Dr. Amy Tao and Dr. Seth Hawkins



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Infusion of magnesium sulfate

- **Magnesium Sulfate Administration:**
- *Standard US Regimen:*
- - **Loading dose:** 4-6 g IV over 15-20 minutes
- - **Maintenance:** 1-2 g/hour continuous IV infusion
- - **Duration:** Continue for 24 hours postpartum (or 24 hours after last seizure)
- - **Alternative IM route:** 10 g loading (5 g in each buttock), then 5 g IM every 4 hours

- *Monitoring During Magnesium Therapy:*
- - Deep tendon reflexes
- - Respiratory rate
- - Urine output
- - Oxygen saturation
- - Serum magnesium levels if renal dysfunction present

- - **Antidote:** Calcium gluconate 10% solution, 10 mL IV over 3 minutes. SHUT OFF THE MAG

- *Renal Dosing Adjustments:*
- - Loading dose 4-6 g and monitor magnesium levels
- - Monitor serum magnesium levels every 4 hours with renal dysfunction

Serum Magnesium Concentration

mmol/L	mEq/L	mg/dL	Effect
2–3.5	4–7	5–9	Therapeutic range
>3.5	>7	>9	Loss of patellar reflexes
>5	>10	>12	Respiratory paralysis
>12.5	>25	>30	Cardiac arrest

Data from Duley L. Magnesium sulphate regimens for women with eclampsia: messages from the Collaborative Eclampsia Trial. Br J Obstet Gynaecol 1996;103:103–5 *and* Lu JF, Nightingale CH. Magnesium sulfate in eclampsia and pre-eclampsia: pharmacokinetic principles. Clin Pharmacokinet 2000;38:305–14.

More detailed look at magnesium sulfate

Evidence Base:

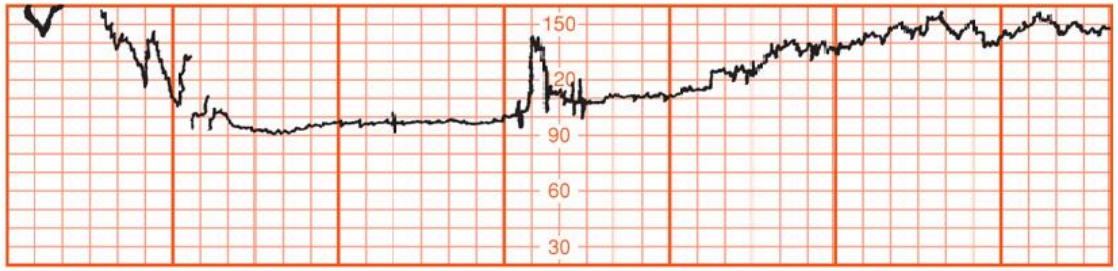
- - Magnesium sulfate superior to phenytoin, diazepam, and nimodipine for preventing recurrent seizures
- - Benzodiazepines and phenytoin are not utilized as first line unless mag unavailable or contraindicated
- - Reduces eclampsia-related maternal mortality
- - More than halves the risk of eclampsia (RR 0.41, 95% CI 0.29-0.58)

Magnesium sulfate:

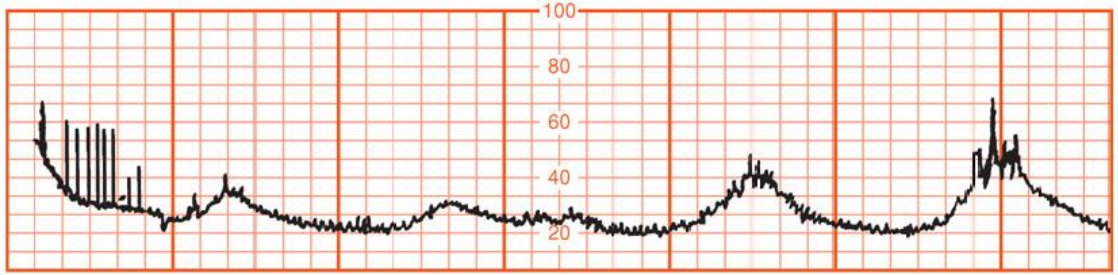
- - Mag is cleared almost completely by renal excretion
- - Supratherapeutic levels are unusual if normal GFR
  - Adequate urine output usually correlates with preserved GFR
  - Mag excretion is not urine flow dependent
  - If plasma creatinine level is >1 mg/mL, really do need mag levels
- ->60% of women who had a BMI >30 with 2g/hr had sub therapeutic levels at 4 hours

Labor and fetal implications

- **Fetal Considerations during Eclampsia**
- -Fetal: Mag sulfate has impacts on variability
- -In a Parkland study of 6,654 mostly term exposed newborns
  - 6 percent had hypotonia, higher intubation and more admissions to nursery.
  - Neonatal depression occurs only with hypermagnesemia at delivery



- **Fetal Considerations during Eclampsia**
- - Expect prolonged fetal heart rate decelerations or bradycardia during seizure
- - Maternal resuscitation takes priority
- - Fetal heart rate tracing typically normalizes after maternal stabilization
- - At >10 minutes, need to be concerned about abruption
- - Do not proceed to emergency cesarean delivery until mother is stabilized



- **Delivery Planning:**
- - Eclampsia is NOT an automatic indication for cesarean delivery
- - Deliver after maternal stabilization
- - Method of delivery depends on gestational age, fetal presentation, cervical exam

Eclampsia

- Magnesium doses are the same for eclampsia
- 15 percent of women will have a subsequent seizure
- In that case, an additional IV 2 g dose of mag sulfate is administered
- If higher BMI, can consider an additional dose if further seizures
- If alternative regimen needed, Ativan is usually given IV
  - Prolonged use or use of benzos preferentially is avoided due to a higher risk of mortality from aspiration pneumonia

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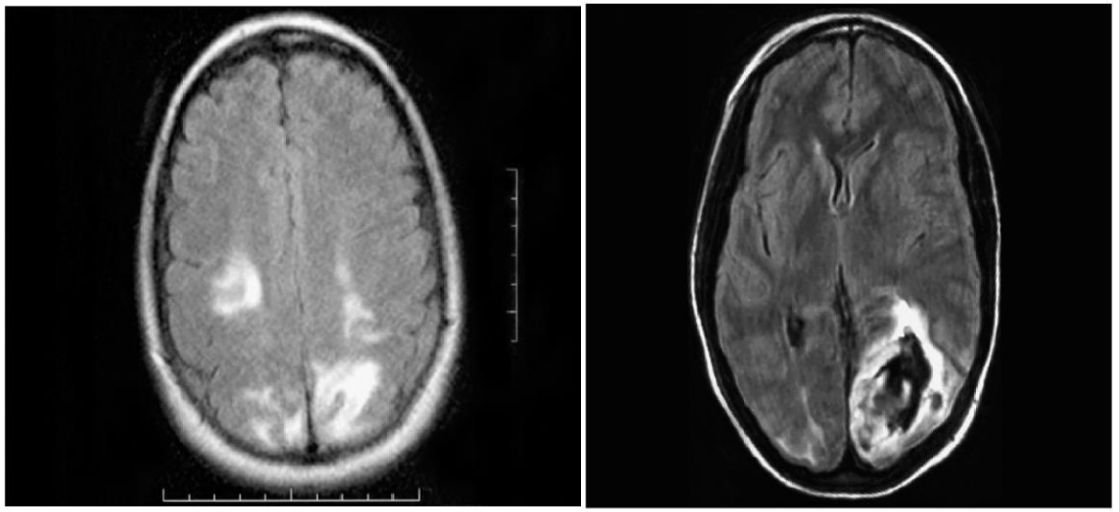

Eclampsia initial resuscitation

- **Initial Stabilization (ABCs):**
- 1. **Call for help -** Activate multidisciplinary team (obstetrics, anesthesia, ICU)
- 2. **Airway protection -** Position patient in left lateral decubitus to prevent aspiration
- 3. **Prevent maternal injury -** Pad side rails, protect from falls
- 4. **Oxygen administration -** Apply supplemental oxygen, monitor oxygen saturation
- 5. **Vital signs monitoring -** Continuous cardiac monitoring, pulse oximetry

- **Key Concept:** Most eclamptic seizures are self-limited (typically 2-3 minutes). Magnesium sulfate prevents recurrent seizures rather than arrests the initial seizure.

Postpartum preeclampsia

- **Key Concepts:**
- - Preeclampsia and eclampsia can develop de novo postpartum
- - Blood pressure typically peaks on postpartum days 3-6
- - Most delayed-onset postpartum preeclampsia presents within first 7-10 days
- **Postpartum Antihypertensive Management:**
- - Initiate or titrate medications to maintain systolic BP 150 mm Hg and diastolic BP 100 mm Hg
- - Most antihypertensive agents safe during breastfeeding
- - NSAIDs safe for postpartum analgesia (do not worsen hypertension)
- **Warning Signs for Patients:**
- - Severe headache unresponsive to medication
- - Visual changes (blurred vision, scotomata)
- - Right upper quadrant or epigastric pain
- - Shortness of breath
- - Chest pain

Summary

- Severe hypertension (≥160/110 mm Hg) is an emergency requiring treatment within 30-60 min
- First-line agents include IV labetalol, IV hydralazine, and oral immediate-release nifedipine
- Magnesium dosing for the prevention of eclampsia and for eclampsia to prevent recurrent seizure is the same
- Magnesium sulfate monitoring includes assessment of reflexes, respiratory rate, and urine output. Because it is renally cleared, be careful in those with renal insufficiency
- Eclamptic seizures require immediate supportive care with magnesium sulfate as the drug of choice for preventing recurrent seizures
- Preeclampsia and eclampsia can develop de novo in the postpartum period, with peak blood pressure on days 3-6
- Multidisciplinary care is essential for optimal maternal and fetal outcomes