

HYPERTENSIVE DISORDERS OF PREGNANCY

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Hypertensive disorders in pregnancy

- One of the leading causes of maternal morbidity and mortality
 - Renal damage
 - Liver damage
 - Seizure/ Stroke
 - DIC
- Fetal complications
 - Preterm birth
 - Growth restriction
 - Placental abruption
 - Stillbirth



Classification

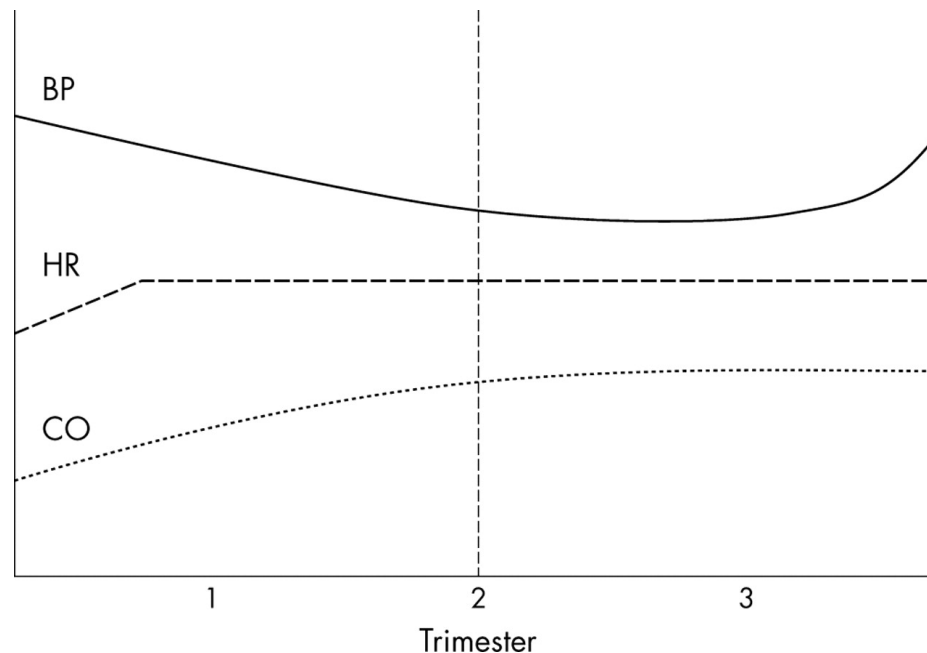
- Chronic hypertension
- Gestational hypertension
- Preeclampsia
- Eclampsia
- Chronic hypertension with superimposed preeclampsia



Occur only in pregnancy and postpartum period

Chronic hypertension

- Hypertension that predates pregnancy or detected before 20 weeks
 - Can be confusing when women present in 2nd trimester and have normal BP due to the physiologic decrease in pregnancy
 - Stop ACE Inhibitors and ARBs



Chronic hypertension

- Increased risk of preeclampsia
 - Baseline labs: CBC, Cr, AST/ALT, 24h urine or PC ratio
 - EKG or echocardiogram in women with severe hypertension for >4yrs
- Increased risk of fetal growth restriction
 - Due to preeclampsia and antihypertensive medications
 - May be as high as 40% in women with severe hypertension
 - Growth ultrasounds and antenatal testing
- Studies suggest delivery b/w 38-39 weeks is optimal in women with uncomplicated CHTN

Chronic hypertension

- Home BP monitoring is suggested
- For women with persistent SBP ≥ 160 or DBP ≥ 105 , antihypertensive therapy is recommended
 - Treatment goal SBP 120-160
DBP 80-105
- If a woman starts pregnancy on an antihypertensive discontinuation in the 1st trimester and restarting them if BP becomes severe is reasonable
- In women with end-organ damage such as CKD and cardiac disease (CHF, prior MI) BP should be kept $< 140/90$

Antihypertensive therapy

- Treatment has been shown to:
 - Decrease risk of severe hypertension
 - Increase the rate of SGA infants
 - No effect on development of preeclampsia, fetal or neonatal death, preterm birth
 - Conflicting data as to increased cardiac malformations
- Reviews have concluded that there is insufficient evidence that treatment of nonsevere hypertension improves maternal or neonatal outcomes

Antihypertensives in pregnancy

- Labetalol (β blocker with vascular α blocking ability)
 - 200-2,400mg daily divided in 2-3 doses
 - Fatigue, sleep disturbances, bronchoconstriction
 - Avoid in asthma and CHF
 - May increase risk of SGA
- Methyldopa (α -2 adrenergic agonist)
 - 0.5-3gm daily divided in 2-3 doses
 - Childhood safety data up to 7yo
 - May not be effective for control of severe hypertension
- Nifedipine (Ca channel blocker)
 - 30-120mg daily extended release
 - Does not appear to adversely affect uterine blood flow

Antihypertensives in pregnancy

- Diuretics (HCTZ)
 - Considered a 2nd line agent
 - Theoretical concerns about intravascular volume restriction and FGR have not been shown in meta-analysis
- ACE In/ ARB
 - 2nd and 3rd trimester use associated with fetal renal failure, oligohydramnios, pulmonary hypoplasia, and FGR
 - 1st trimester use associated with an increase in cardiac and CNS malformations

Gestational hypertension

- Blood pressure elevation $\geq 140/90$ in a previously normotensive woman
- Absence of proteinuria
- Development of hypertension after 20 weeks and resolves < 12 weeks postpartum

Gestational hypertension

- Can progress to preeclampsia
- 10% of eclamptic seizures occurred before proteinuria
- Assessment of BP and proteinuria weekly in office with additional weekly measurement of BP at home
- Timing of delivery: 37 0/7 weeks

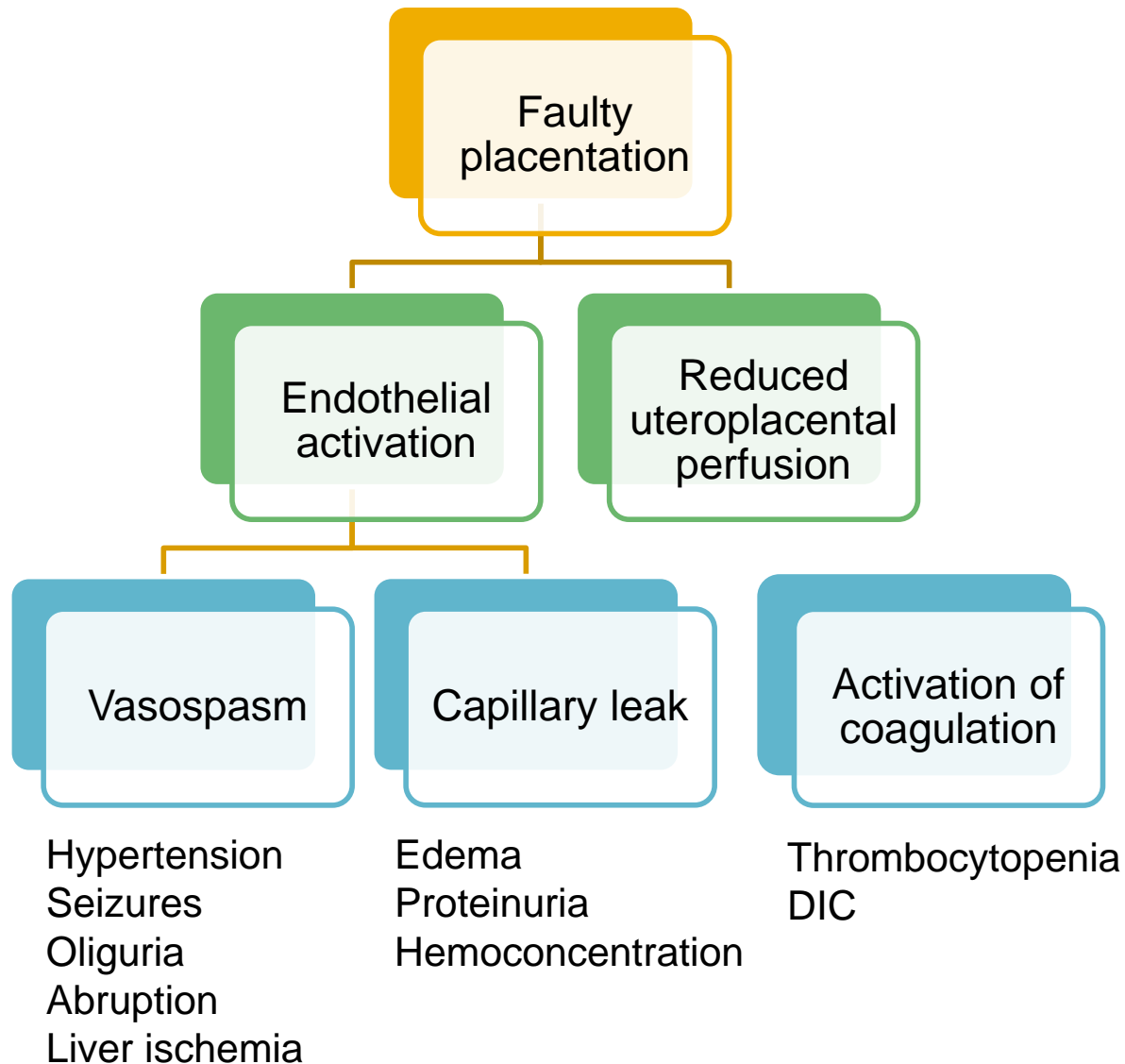
Risk factors for preeclampsia

- Nulliparity
- Age > 35 years
- Connective tissue disorders
- CHTN
- Diabetes
- Renal disease
- Obesity
- Multiple gestations



**Occurs in 3-8%
of pregnancies**

Cause of preeclampsia



Diagnosis of Preeclampsia

- SBP ≥ 140 or DBP ≥ 90 on 2 occasions at least 4 hours apart after 20 weeks
- Proteinuria:
 - ≥ 300 mg protein in a 24h urine collection
 - ≥ 0.3 mg/dL on protein/creatinine ratio
 - $\geq +2$ on dipstick (high FP and FN rate)
- Amount of proteinuria does not predict maternal or fetal outcomes

Diagnosis of Preeclampsia

- In the absence of proteinuria, new onset hypertension and any of the following:
 - Platelet $< 100,000$
 - Creatinine $> 1.1\text{mg/dL}$ or doubling of creatinine
 - AST/ALT $> 2\times$ ULN
 - Pulmonary edema
 - New-onset cerebral or visual disturbances

Additional signs/symptoms of preeclampsia

- Epigastric or RUQ pain
- Headache or visual disturbances
- Thrombocytopenia
- Hemolysis
- Elevated creatinine
- Elevated AST/ALT
- Seizures
- Pulmonary edema
- Fetal growth restriction



Initial evaluation for preeclampsia

- Initial evaluation:
 - Ask about symptoms
 - Vitals and physical exam
 - CBC, Cr, AST/ALT, 24h urine for protein or PC ratio
 - Fetal EFW and AFI, NST

Management of preeclampsia without severe features

- “Mild preeclampsia” should be replaced with “Preeclampsia without severe features”
- Can rapidly progress to severe preeclampsia
- Daily assessment of symptoms and fetal movement (by the woman)
- Twice weekly measurement of BP
- Weekly assessment of CBC, Cr, and AST/ALT
- Ultrasound to assess fetal growth (every 3-4 weeks) and antenatal testing to assess fetal status
- Timing of delivery: 37 0/7 weeks

Diagnosis of severe preeclampsia

- SBP ≥ 160 or DBP ≥ 110 on 2 occasions a least 4 hours apart while on bed rest (unless antihypertensives started before this time)
- Platelet count $< 100,000$
- AST/ALT $> 2 \times$ ULN or severe, persistent RUQ/epigastric pain
- Creatinine $> 1.1 \text{ mg/dL}$ or doubling of creatinine
- Pulmonary edema
- New-onset cerebral or visual disturbances

Maternal complications of severe preeclampsia

- Pulmonary edema
- MI
- Stroke
- ARDS
- Coagulopathy
- Renal failure
- Retinal injury

Initial evaluation < 34 weeks

- Observe in L&D for first 24-48 hours
- Administer antenatal corticosteroids
- Magnesium sulfate for seizure prophylaxis
- Antihypertensives for BP > 160/110

Immediate delivery after stabilization

- Eclampsia
- Pulmonary edema
- DIC
- Uncontrollable severe hypertension
- Abnormal fetal test results
- Placental abruption
- Fetal demise
- Previabe

Delivery after corticosteroids

- Corticosteroids administered and delivery deferred for 48 hours if maternal and fetal conditions remain stable at or less than 33 6/7 weeks with any of the following
- Persistent symptoms
- HELLP or partial HELLP
 - Platelet $<100,000$, AST/ALT $> 2\times$ ULN
- EFW $< 5\%$
- AFI $< 5\text{cm}$
- REDF on umbilical artery Doppler
- Labor or PPRROM
- Renal dysfunction

Expectant management till 34 0/7wks

- Inpatient only (facilities with adequate maternal and NICU resources)
- Stop magnesium sulfate
- NST daily, growth ultrasound every 3-4 weeks
- Symptoms should be assessed at least every 8h
- Vital signs and I/O at least every 8h
- CBC, AST/ALT, Cr should be done daily and may be spaced out to every other day if the patient remains asymptomatic
- Oral antihypertensive therapy for BP > 160/110

Management of severe preeclampsia

- For women with diagnosis after 34 0/7 weeks, delivery soon after maternal stabilization is recommended
- The mode of delivery need not be CD, but should be determined by fetal gestational age, presentation, cervical status, and maternal and fetal conditions
 - CD rate with IOL
 - 93-97% at less than 28 weeks
 - 53-65% at 28 – 32 weeks
 - 31-38% at 32 – 34 weeks
- ACOG says before 30 weeks with an unfavorable cervix can proceed to CD

Treatment of severe hypertension

- For women with severe hypertension (sustained SBP ≥ 160 or DBP ≥ 110) the uses of antihypertensive therapy is recommended
- Target BP is 130-150/80-90
- Over treatment of initial BP can cause fetal distress
- Persistent severe hypertension is associated with
 - Maternal stroke
 - Eclampsia
 - Myocardial ischemia
 - Liver complications

Drugs for urgent lowering of BP

- Labetalol: 10-20mg IV, then 20-80mg q20-30min (max 300mg)
 - Onset: 1-2 min lasts for 6-16hrs
 - Considered first line
 - Tachycardia less common
 - Contraindicated in asthma and heart disease
- Hydralazine: 5mg IV, then 5-10mg q20-40min
 - Onset: 10-20min lasts for 3-8hrs
 - Frequent dosing associated with hypotension, HA, and fetal distress
- Nifedipine 10-20mg PO, repeat in 30min then 10-20mg q2-6h
 - Onset: 5-10 min lasts for 4-8hrs
 - May cause reflex tachycardia and headaches

Eclampsia

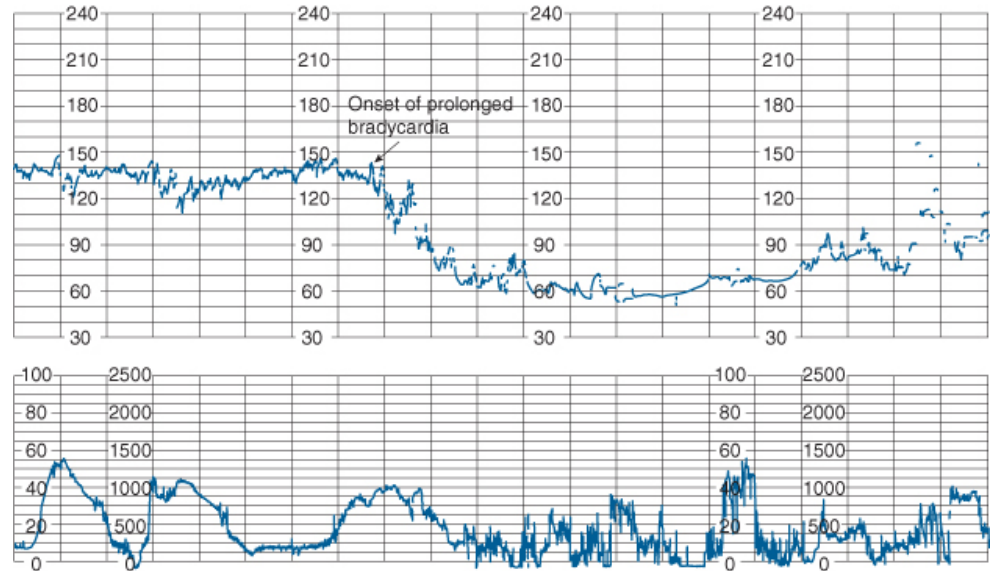
- New onset gran mal seizure in a woman with preeclampsia
- Elevated BP and proteinuria not always present
- Symptoms can be helpful
 - Persistent occipital or frontal headache
 - Blurred vision, photophobia
 - Epigastric or RUQ pain
 - Altered mental status

Eclamptic seizures

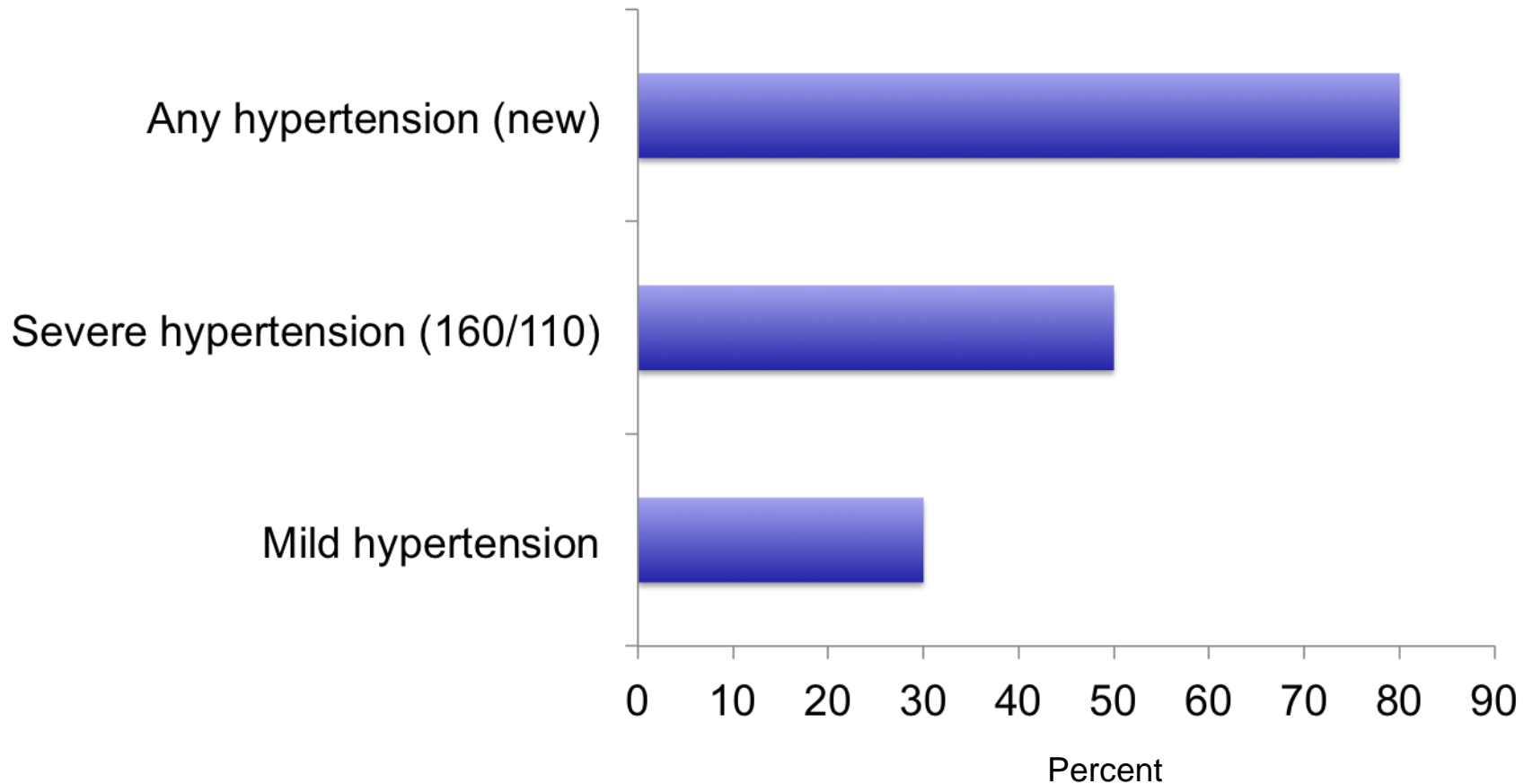
- Brief (10-60 seconds) in duration
- Variable neurologic changes (transient)
 - Focal deficits
 - Cortical blindness (10%, usual resolves)
 - Coma (very rare)
- Temporary cessation of breathing followed by tachypnea
- Fetal bradycardia (3-5 minutes)

Fetus

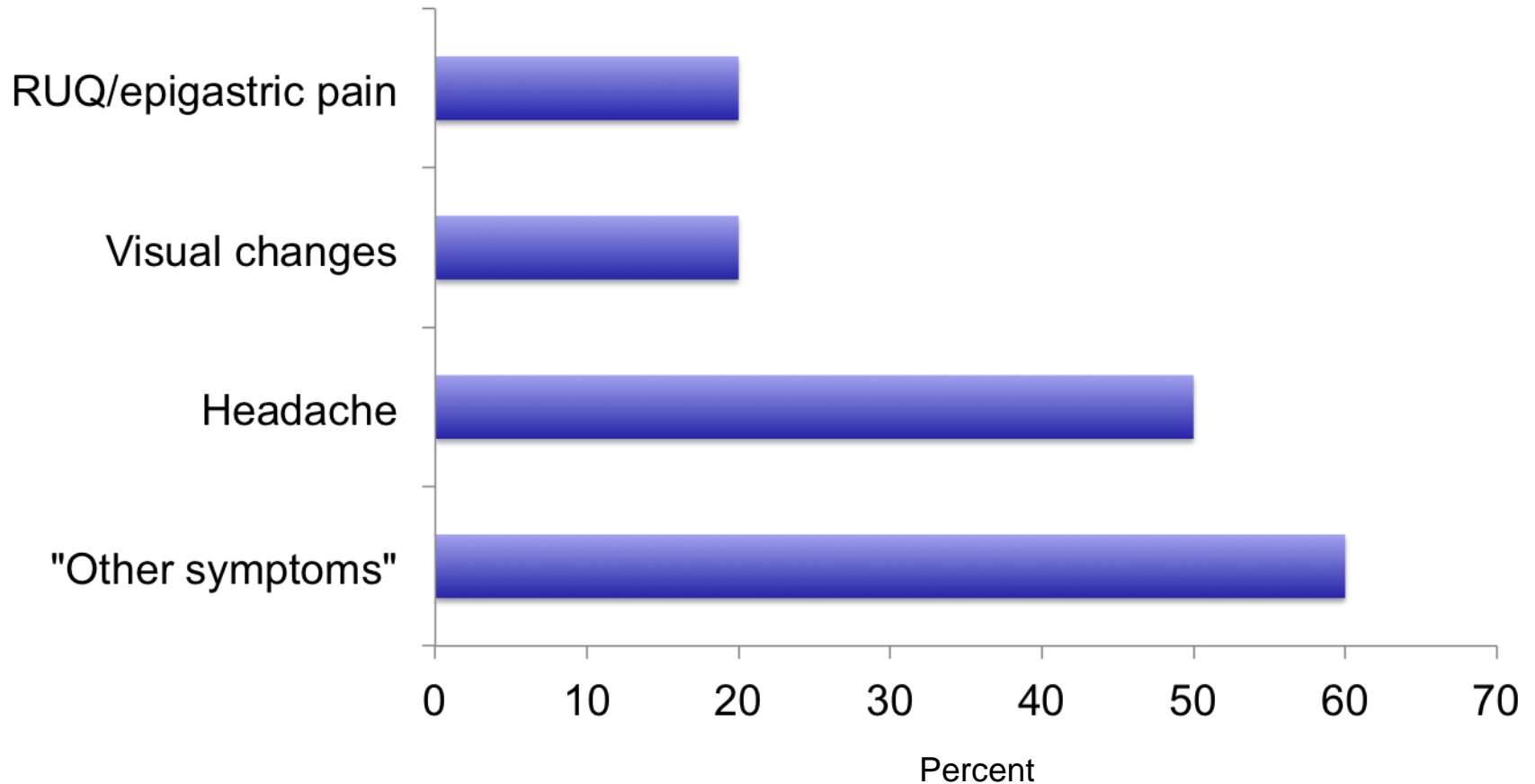
- During acute event fetal monitoring is not helpful
 - Fetal bradycardia is common
- Before assessing and considering intervention for the fetal status it is imperative to assess, stabilize and optimize the maternal condition



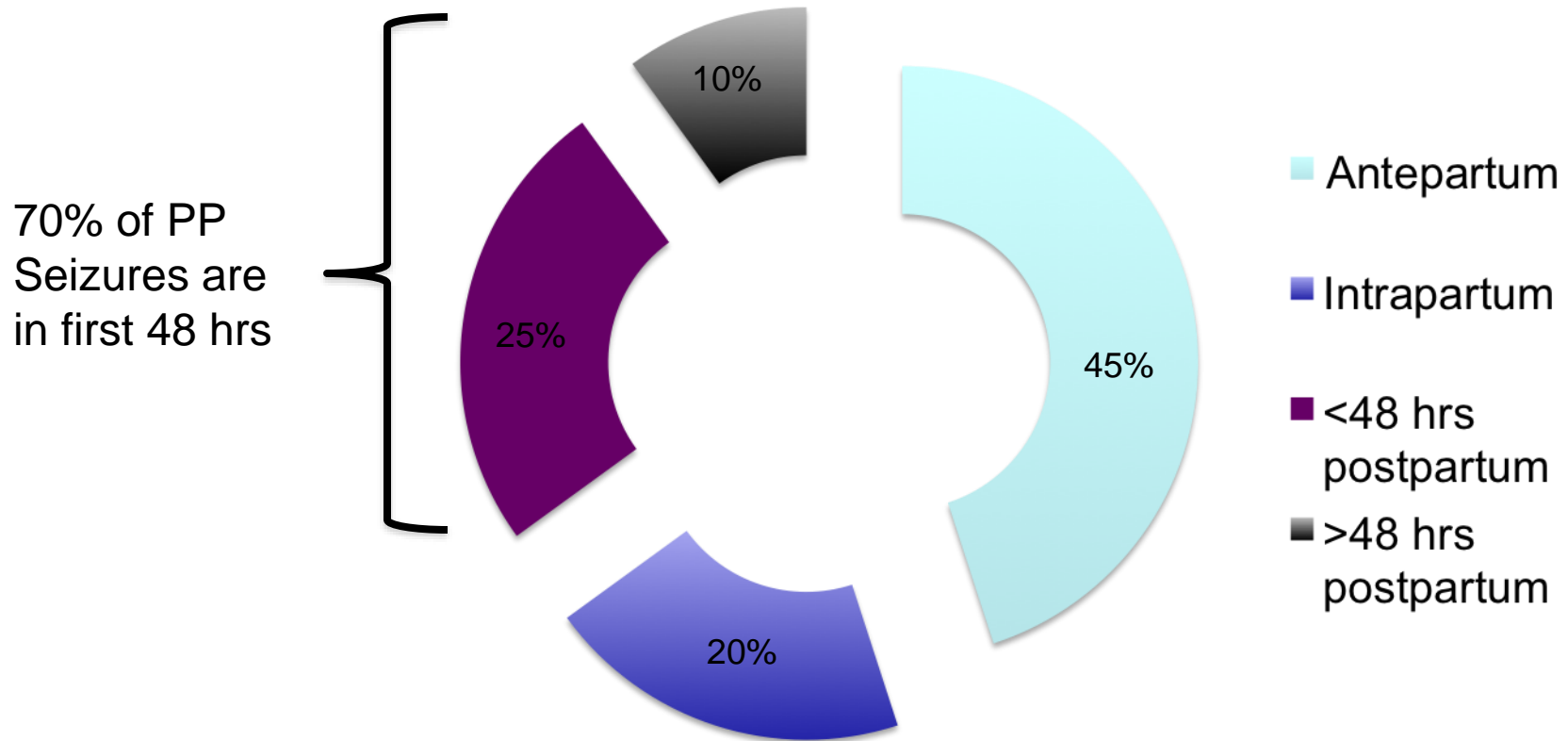
Eclampsia and BP



Associated symptoms



Timing of seizure



Management of eclampsia

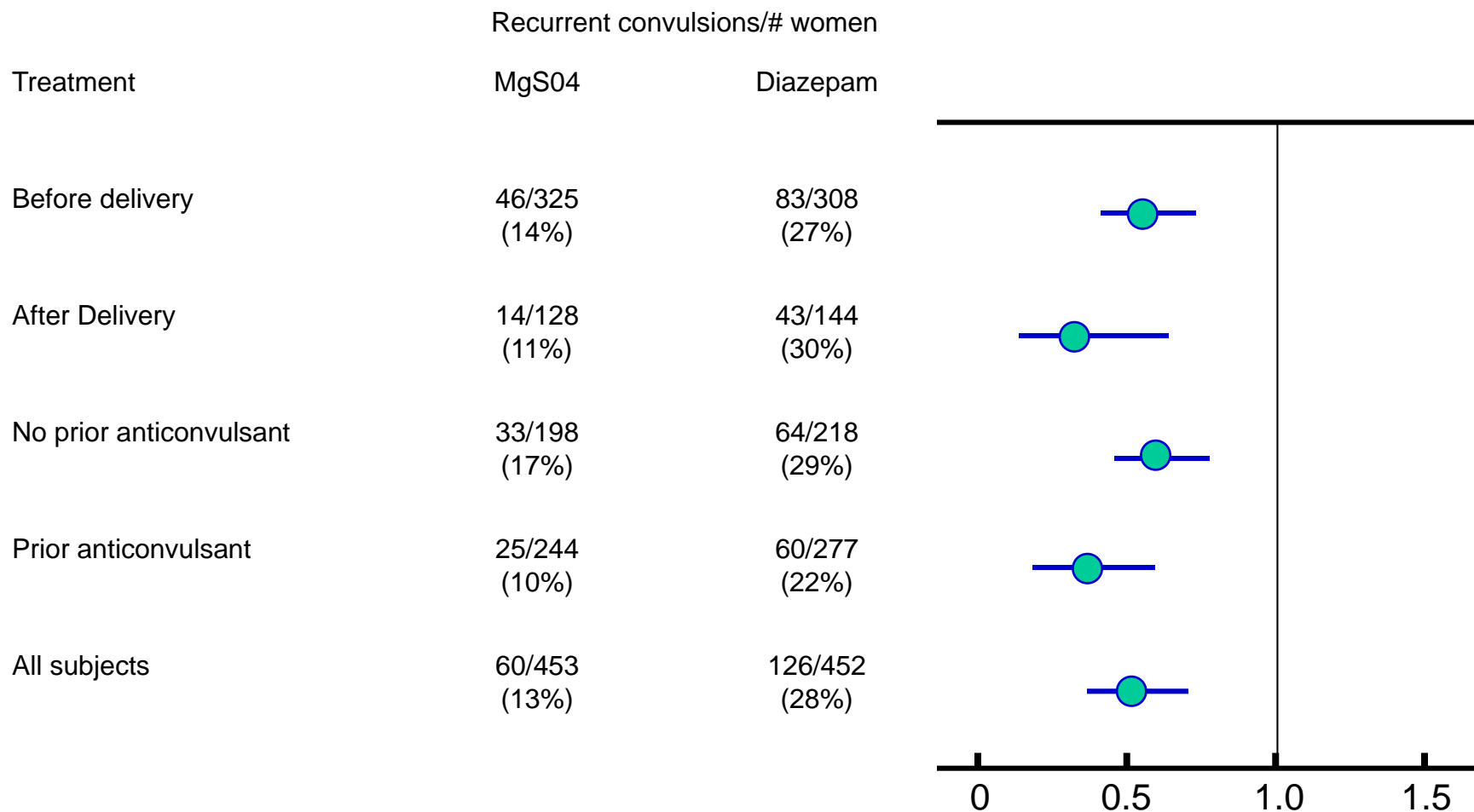
- General approach to seizing obstetric patient
 - Maintain airway
 - Prevent next seizure
 - Control blood pressure (Goal < 160/105)
- Assume diagnosis of eclampsia until proven otherwise
- Optimize patient (LL displacement, IV access)
- Secondary assessment including laboratory data
- Delivery planning

Which anticonvulsant for women with eclampsia? Evidence from the Collaborative Eclampsia Trial

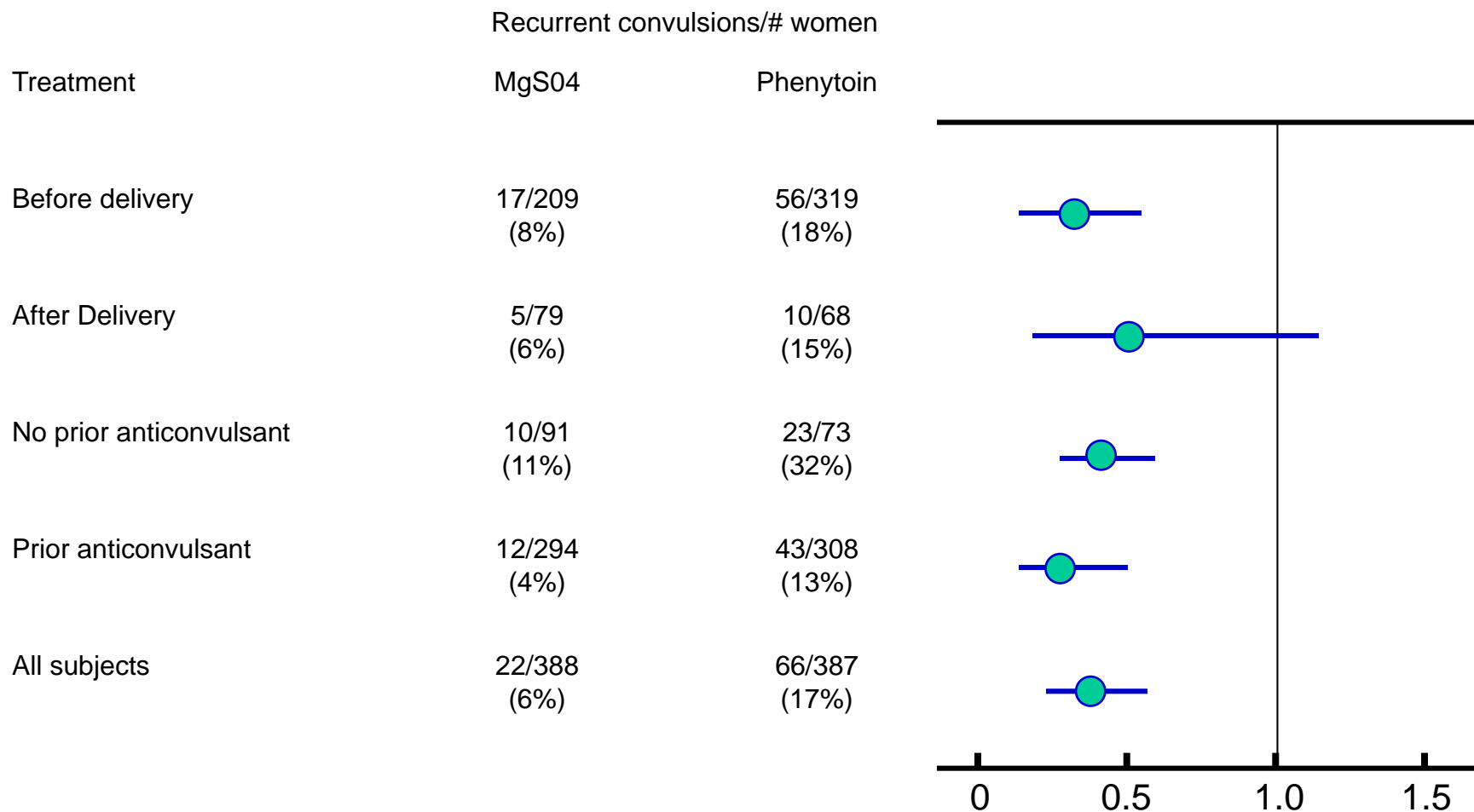
*The Eclampsia Trial Collaborative Group**

- 1680 women with eclampsia randomized to
 - MgSO₄ (n=453) vs Diazepam (n=453)
 - MgSO₄ (n=388) vs. Phenytoin (n=387)

Results



Results



Magnesium sulfate

- Used as both prophylaxis and treatment for eclampsia
 - All women with severe preeclampsia should receive magnesium
- Continuous infusion
 - 6 gram loading dose diluted in 100cc of IVF over 15-20 minutes
 - 2g/hr thereafter until 24 hours post partum
 - May consider Mg levels every 4-6 hours (4-6 mEq/L)
- Intramuscular
 - 10 grams of 50% MgSO₄ solution injected as divided dose into each buttock

MgSO4 levels

- >25 mEq/L Arrest
- 15 mEq/L Respiratory paralysis
- 10 mEq/L Loss of DTR
- 5-10 mEq/L EKG changes
- 4-6 mEq/L Seizure prophylaxis

“Mag check” →

- ✓ Ask about lethargy, SOB
- ✓ Check O2 sats, UOP, DTR

HELLP Syndrome

- Hemolysis
 - LDH, peripheral smear, haptoglobin
- Elevated Liver enzymes
 - AST/ALT > 2x ULN
- Low Platelets
 - Plate count < 100,000

HELLP Syndrome

- Can occur antepartum or postpartum
- Frequently present with normal BP and RUQ/MEG pain and N/V as main symptoms
- If <33 6/7wks it is suggested that delivery be delayed for 24-48h if maternal and fetal condition remain stable to allow for corticosteroids
- For women at 34 0/7 weeks or more delivery soon after maternal initial stabilization

CHTN with superimposed preeclampsia

- Superimposed preeclampsia develops in 13-40%
- Superimposed preeclampsia likely when:
 - A sudden increase in BP that was previously well controlled
 - New onset proteinuria or a sudden increase in proteinuria
- Stratified into 2 groups
 - Superimposed preeclampsia
 - Superimposed preeclampsia with severe features

CHTN with superimposed preeclampsia

- For women without severe features and stable maternal and fetal condition expectant management until 37 0/7 weeks
- Paucity of data on outpt management
 - Home BP monitoring daily
 - Physician visits 1-2x/wk
 - Weekly laboratory testing
 - Fetal surveillance

Superimposed preeclampsia with severe features

- Superimposed preeclampsia with severe features:
 - Severe hypertension despite escalation of antihypertensive therapy
 - Persistent cerebral or visual disturbances or RUQ pain
 - AST/ ALT > 2x/ULN
 - Platelets < 100,00
 - Pulmonary edema
 - Creatinine level above 1.1mg/d or doubling
- When severe features are present, magnesium sulfate is recommended during the intrapartum-postpartum period
- Expectant management beyond 34 0/7 weeks is not recommended

Postpartum Management

- In women with the diagnosis of

- Preeclampsia
- Gestational hypertension
- Superimposed preeclampsia

it is suggested that BP be monitored in the hospital for at least 72h postpartum and again 7-10 days after delivery

- BP usually decreases within 48h after delivery, but increases again 3-6 days postpartum
- For women with persistent SBP ≥ 150 or DBP ≥ 100 on at least 2 occasions that are 4-6h apart, antihypertensive therapy is suggested
- Persistent SBP ≥ 160 or DBP ≥ 110 should be treated within 1 hour

Postpartum Hypertension

- BP remains labile for months postpartum, usually normalizing by the end of the first year
- For women who present after delivery with:
 - New-onset hypertension associated with HA or visual changes
 - Preeclampsia with severe hypertension

The parental administration of magnesium sulfate is recommended for at least 24h

Postpartum management

- Education of patients on symptoms
- Education of health professional that preeclampsia can occur up to 4 weeks postpartum
- Contribution of NSAIDs to increase BP, consider replacing in women with hypertension that persists for more than 1 day postpartum

Management of women with prior preeclampsia

- Preconception (can be done at 6wk PP visit)
 - Weight loss / Nutrition consult
 - Increased physical activity
 - Optimize control of BP and diabetes
 - Perform baseline metabolic profile and urinalysis
 - Recommend early establishment of prenatal care
- Antepartum
 - Early ultrasound for dating
 - Baseline labs
 - Frequent PNC visits to monitor symptoms, BP, proteinuria
 - Serial ultrasounds for fetal growth

Prevention of preeclampsia

- A meta-analysis of studies investigating the benefit of low dose aspirin (50-150mg) for the prevention of preeclampsia showed a 10% lower incidence of preeclampsia
- A more significant reduction was noted for severe preeclampsia and FGR when aspirin was started before 16 weeks
- ACOG currently recommending ASA 81mg starting at 12 weeks up to 28 weeks, but ideally less than 16 weeks

Prevention of preeclampsia

- Things that don't work
 - Vitamin C and E
 - Calcium
 - Fish oil
 - Bed rest/ Activity restriction
 - Salt restriction

References

- American College of Obstetricians and Gynecologists. Task Force on Hypertension in Pregnancy, author. Hypertension in Pregnancy – Practice Guideline WQ 244