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HYPERTENSION DISORDERS IN PREGNANCY

Mari Charisse Trinidad, MD

OBJECTIVES

- Define hypertension disorders in pregnancy
- Describe current understanding of the pathophysiology of preeclampsia
- List risk factors for preeclampsia
- List possible complications and adverse outcomes from hypertension disorders in pregnancy
- Describe the implications of hypertension disorders in pregnancy on future pregnancies and long term health

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OBJECTIVES

- Describe most current practice and evidence based care in the management of hypertension disorders in pregnancy
  - Antenatal
  - Intrapartum
  - Postpartum

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ECLAMPSIA

- Greek *eclampein*
  - (ec)**εκ**(=forth)+(lampo)**λάμπω**(=to shine)
- **1619**: Word “eclampsia” first appeared in a treatise on gynaecology by Varandaeus based upon the flashing lights/spots before the eyes of pregnant women with preeclampsia
  - Headache accompanied by heaviness and convulsions during pregnancy considered bad (Aphorism XXXI 507, Coan Prognosis. Hippocrates, 400 BCE)
- **1739**: Bossier de Sauvages differentiated eclampsia from epilepsy
- **1797**: Demanet noted a connection between edematous women and eclampsia

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ECLAMPSIA

- **1843**: John Lever discovered albumin in the urine of eclamptic women
- **1843**: Connection between premonitory symptoms (headache, temporary loss of vision, severe pain in the stomach, and edema of the hands, arms, neck, and face) during the later months of pregnancy and the development of puerperal convulsions was also recognized in by Dr. Robert Johns.
- **1897**: Vaquez and Nobecourt were credited with the discovery of eclamptic hypertension

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ECLAMPSIA / PREECLAMPSIA
Historical management

- Charms and amulets
- Warm baths
- Phlebotomy / Blood letting
- Use of opiates
- Warm baths
- Splashing of the face with cold water
- Delivery

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ECLAMPSIA / PREECLAMPSIA

Historical management

- **1906**: Horn first used magnesium sulfate to manage preeclampsia-eclampsia
- **1920s**: Parental use of magnesium sulfate in the treatment of preeclampsia-eclampsia was popularized by Lazard and Dorsett

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HYPERTENSION DISORDERS IN PREGNANCY

PATHOPHYSIOLOGY

PATHOPHYSIOLOGY

- Exact mechanisms underlying preeclampsia are incompletely understood
- Likely genetic and environmental factors
- Poor early placental development and/or co-morbid microvascular circulatory disorders are contributory

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HYPERTENSION DISORDERS IN PREGNANCY

RISK FACTORS

RISK FACTORS

- **Primiparity**
- **Previous pregnancy with preeclampsia**
- **Family history of preeclampsia**
- **Multiple pregnancy**
- **Obesity**
- **Advanced maternal age (older than 40)**
- **Co-morbid medical conditions**
  - Chronic hypertension
  - Chronic renal disease
  - Diabetes mellitus
  - Antiphospholipid antibody syndrome
  - Autoimmune disease (ex., SLE)

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HYPERTENSION DISORDERS IN PREGNANCY

DEFINITIONS

DEFINITIONS

HYPERTENSION DISORDERS IN PREGNANCY

National High Blood Pressure Education program Working Group on high blood pressure in pregnancy, 2000.

Chronic Hypertension (of any cause)
Gestational Hypertension
Preeclampsia - Eclampsia
Chronic hypertension with superimposed preeclampsia

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DEFINITIONS

HYPERTENSION DISORDERS OF PREGNANCY	National High Blood Pressure Education program Working Group on high blood pressure in pregnancy, 2000.
Chronic Hypertension (of any cause)	Hypertension (BP ≥ 140/90 mm Hg) prior to pregnancy or before 20 weeks gestation
Gestational Hypertension	New onset hypertension (BP ≥ 140/90 mm Hg) at or after 20 weeks gestation in a woman with previously normal blood pressures **in the absence of accompanying proteinuria** Hypertension should resolve postpartum, usually within 3 months after birth

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DEFINITIONS

HYPERTENSION DISORDERS OF PREGNANCY	National High Blood Pressure Education program Working Group on high blood pressure in pregnancy, 2000.
Preeclampsia - Eclampsia	New onset hypertension (BP ≥ 140/90 mm Hg) at or after 20 weeks gestation in a woman with previously normal blood pressures **accompanied by new onset proteinuria** **OR** **In the absence of proteinuria** but associated with • **Thrombocytopenia** • **Impaired liver function** • **New renal insufficiency** • **Pulmonary edema** • **New onset cerebral or visual disturbances**

DEFINITIONS

HYPERTENSION DISORDERS OF PREGNANCY	National High Blood Pressure Education program Working Group on high blood pressure in pregnancy, 2000.
Preeclampsia - Eclampsia	**In the absence of proteinuria** but associated with • **Thrombocytopenia** (platelet count less than 100,000/microliter) • **Impaired liver function** (liver transaminases elevated to twice normal) • **New renal insufficiency** (elevated serum creatinine > 1.1 mg/dl or doubling of serum creatinine in the absence of other renal disease • **Pulmonary edema** • **New onset cerebral disturbances**

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DEFINITIONS

HYPERTENSION DISORDERS OF PREGNANCY	National High Blood Pressure Education program Working Group on high blood pressure in pregnancy, 2000.
Preeclampsia - Eclampsia	Eclampsia is the occurrence of seizure in the setting of preeclampsia*
Chronic hypertension with superimposed preeclampsia	New onset of signs and symptoms of preeclampsia in a woman with chronic hypertension

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HYPERTENSION DISORDERS IN PREGNANCY

HYPERTENSION – KEY POINTS

HYPERTENSION - KEY POINTS

Establishing the diagnosis in pregnancy

- Same criteria for diagnosis as in nonpregnant
- New onset persistent elevation of systolic blood pressure (BP) of 140 mm Hg or higher, or a diastolic BP of 90 mm Hg or higher **on two occasions at least 4 hours apart** in a woman with a previously normal blood pressure
- Hypertension greater than or equal to 160 mm Hg systolic, or greater than or equal to 110 mm Hg diastolic
  - Hypertension **confirmed in a short interval (minutes)** to facilitate timely antihypertensive therapy

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HYPERTENSION - KEY POINTS

Establishing the diagnosis in pregnancy

- New onset BP ≥ 140 / 90 mm Hg more than 4 hours apart
- New onset BP ≥ 160 / 110 mm Hg confirmed in a repeat measurement 15 minutes after

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HYPERTENSION - KEY POINTS

Establishing the diagnosis in pregnancy

- **OPTIMAL MEASUREMENT**
  - Patient comfortably seated, legs uncrossed, back and arm supported
    - **OR** in left lateral position if supine
  - Middle of cuff is at the level of the right atrium (midpoint of the sternum)
  - Patient instructed to relax, not talk
  - Ideally, wait 5 minutes before taking first measurement
  - Bladder of cuff encircles ≥80% of arm

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HYPERTENSION DISORDERS IN PREGNANCY

PROTEINURIA – KEY POINTS

PROTENURIA - KEY POINTS

Establishing the diagnosis the preeclampsia

- Greater than or equal to 300 mg per 24 hour urine collection (or this amount extrapolated from a timed collection)

OR

- Protein / creatinine ratio greater than 0.3 (each measured as mg/dl)
- Dipstick reading 1+ (used only if other quantitative not available)

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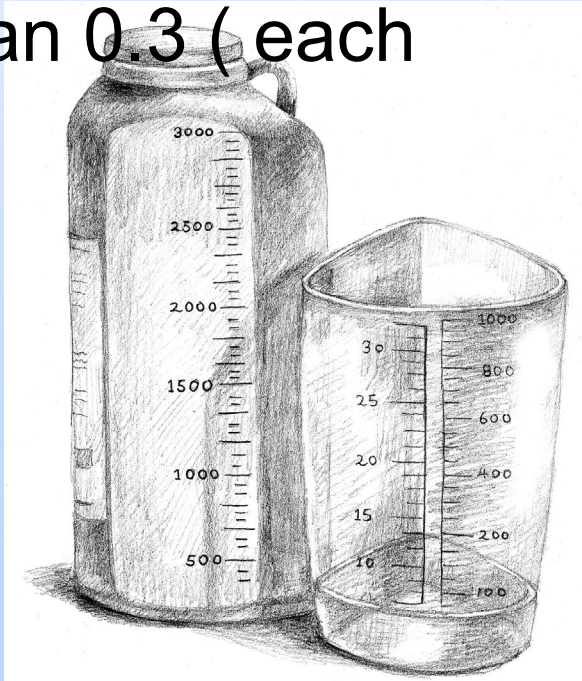

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HYPERTENSION DISORDERS IN PREGNANCY

PREECLAMPSIA WITH SEVERE FEATURES – KEY POINTS

SEVERE FEATURES - KEY POINTS

Establishing the diagnosis of preeclampsia

Severe range hypertension	Systolic blood pressure of 160 mm Hg or greater, or diastolic bood pressure of 110 mm Hg or greater on two occasions at least 4 hours apart while the patient is on bed rest (unless antihypertensive therapy is initiated before this time)

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SEVERE FEATURES - KEY POINTS

Establishing the diagnosis of preeclampsia

IN THE ABSENCE OF PROTEINURIA	
Thrombocytopenia	Platelet count less than 100,000/microliter
Impaired liver function	Abnormally elevation in blood concentration of liver transaminases (elevated to twice normal concentrations) **OR** Severe persistent right upper quadrant or epigastric pain unresponsive to medication, **not accounted for by alternative diagnosis**

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SEVERE FEATURES - KEY POINTS

Establishing the diagnosis of preeclampsia

IN THE ABSENCE OF PROTEINURIA	
New progressive renal insufficiency	Elevated serum creatinine > 1.1 mg/dl **OR** Doubling of serum creatinine in the absence of other renal disease
Pulmonary edema	
New onset cerebral or visual disturbances	

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SEVERE FEATURES - KEY POINTS

CRITERIA NO LONGER USED

- Proteinuria greater than 5 g per 24 hour urine collection
- Presence of fetal growth restriction

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KEY POINTS – DEFINITIONS

RECOMMENDED VERBAGE

- Chronic hypertension
- Gestational hypertension
- Preeclampsia
  - **WITHOUT SEVERE FEATURES**
  - **WITH SEVERE FEATURES**
- Eclampsia
- Chronic hypertension with superimposed preeclampsia

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KEY POINTS – DEFINITIONS

DISCOURAGE USE OF FOLLOWING TERMS

- Toxemia of pregnancy
- Pregnancy induced hypertension or PIH
- Mild preeclampsia

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HYPERTENSION DISORDERS IN PREGNANCY
MANAGEMENT

- **To admit or not to admit?**
- **To deliver or not to deliver?**

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MAIN CONSIDERATIONS

- **MATERNAL STATUS**
  - Maternal risks with prolongation of the pregnancy
- **FETAL STATUS**
  - Fetal benefits with prolongation of the pregnancy
- **GESTATIONAL AGE**
- **INSTITUTIONAL RESOURCES**
  - Medical and allied staff
  - Labor and Delivery capabilities
  - Maternal intensive care resources
  - Neonatal intensive care resources

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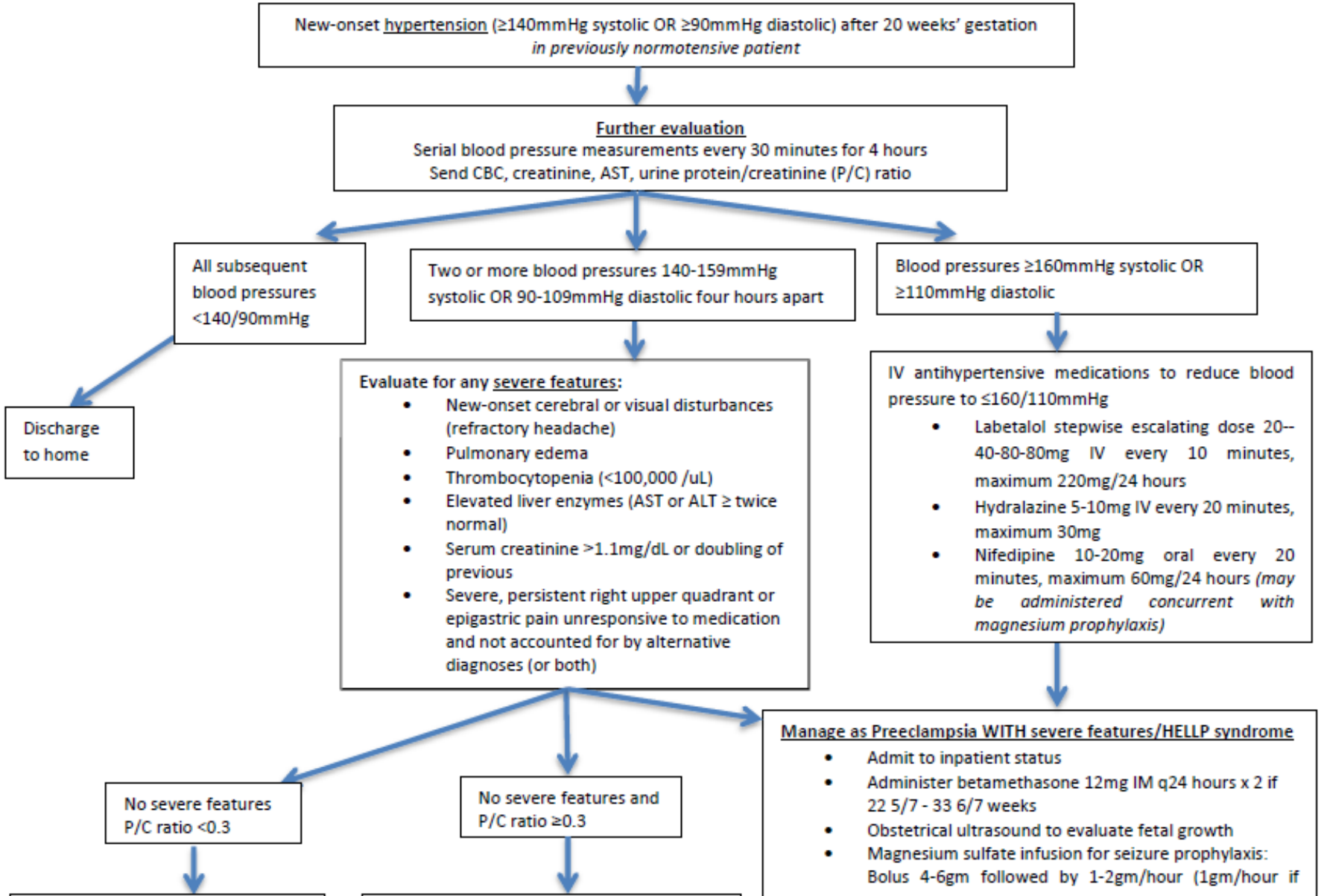
FAMILY BIRTH CENTER

Evaluation of New-Onset Hypertension in Pregnancy



INITIAL EVALUATION
MATERNAL

- **Serial blood pressure evaluation**
- **Complete blood count with platelet count**
- **Serum creatinine**
- **Liver transaminases**
- **Symptoms of severe preeclampsia** (i.e., severe persistent right upper quadrant or epigastric pain unresponsive to medication, not accounted for by alternative diagnosis; new cerebral or visual disturbances)

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INITIAL EVALUATION
FETAL

- Ultrasound evaluation
  - Estimated fetal weight
  - Amniotic fluid index
- Nonstress test (NST)
- Biophysical profile (BPP), if NST nonreactive

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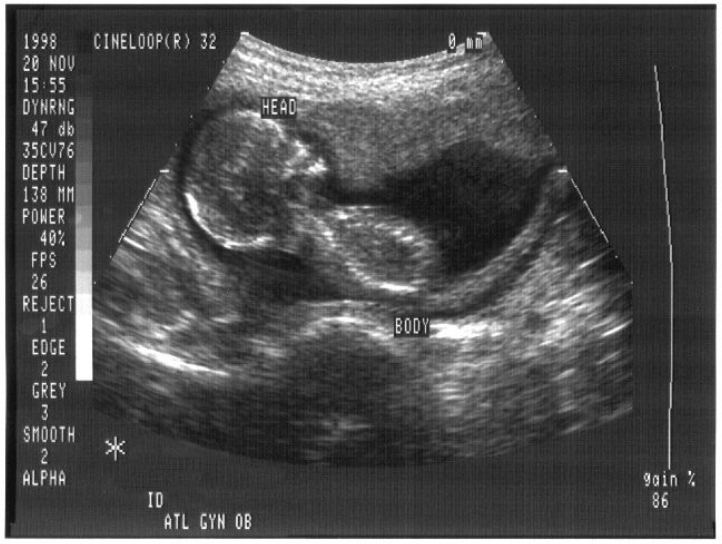

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DELIVERY INDICATIONS

MILD GESTATIONAL HYPERTENSION
PREECLAMPSIA WITHOUT SEVERE FEATURES

Gestational age ≥ 37 0/7 weeks gestation
Suspected placental abruption
Gestational age ≥ 34 0/7 weeks gestation and any of the following:
• **Progressive labor or rupture of membranes** • **Ultrasonographic estimated fetal weight < 5th percentile** • **Oligohydramnios (persistent amniotic fluid index < 5 cm)** • **Persistent BPP ≤ 6/10 (normal BPP 8-10/10)**

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DELIVERY INDICATIONS

PREECLAMPSIA WITH SEVERE FEATURES

IMMEDIATE DELIVERY

Gestational age ≥ 34 0/7 weeks gestation

DELIVERY ONCE MATERNAL CONDITION STABLE

Gestational age ≤ 34 0/7 weeks gestation and any contraindication to continued expectant management:

- **Eclampsia**
- **Pulmonary edema**
- **Disseminated intravascular coagulation**
- **Uncontrollable severe hypertension**
- **Nonviable fetus**
- **Abnormal fetal testing results**
- **Placental abruption**
- **Intrauterine fetal demise**

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DELIVERY INDICATIONS

PREECLAMPSIA WITH SEVERE FEATURES

CORTICOSTEROIDS FOR FETAL LUNG MATURITY AND DELIVERY AFTER 48 HOURS

Gestational age ≤ 34 0/7 weeks gestation and any of the following complications:

- **Persistent symptoms**
- **HELLP or partial HELLP syndrome**
- **Fetal growth restriction (< 5th percentile)**
- **Severe oligohydramnios**
- **Reversed end diastolic flow (umbilical artery Doppler studies)**
- **Labor or premature rupture of membranes**
- **Significant renal dysfunction**

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DELIVERY INDICATIONS

PREECLAMPSIA WITH SEVERE FEATURES

Gestational age ≤ 34 0/7 weeks gestation and stable maternal and fetal status:
CONSIDER EXPECTANT MANAGEMENT ONLY AT FACILITIES WITH ADEQUATE MATERNAL AND NEONATAL INTENSIVE CARE RESOURCES

- **Fetal viability – 33 6/7 weeks gestation**
- **Inpatient management only**
- **Discontinuation of magnesium sulfate**
- **Daily maternal and fetal tests**
- **Vital signs, symptoms and laboratory evaluation**
- **Oral antihypertensive drugs**

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MODE OF DELIVERY

- Considerations in determining mode of delivery
  - Fetal gestational age
  - Fetal presentation
  - Cervical status
  - Maternal and fetal status
- Likelihood of cesarean delivery increases with decreasing gestational age
  - <28 weeks gestation: 93-97%
  - 28-32 weeks: 53-65%
  - 32-34 weeks: 31-38%

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ANESTHETIC CONSIDERATIONS

- **Hypotension with neuroaxial blockade**
  - Spinal > Epidural analgesia
- **Thrombocytopenia and neuroaxial blockade**
  - Concern for epidural hematoma
  - American Society of Anesthesiologists has not recommended a safe limit
  - Health provider judgment following a review of laboratory values
- **Magnesium sulfate and nondepolarizing muscle relaxants during cesarean delivery**
  - **CONTINUE** magnesium sulfate throughout delivery
    Half life 5 hours so minimal effect with discontinuation

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INTRAPARTUM AND DELIVERY CONSIDERATIONS

ANTENATAL CORTICOSTEROIDS

Recommended for patients diagnosed with a hypertension disorder in pregnancy at gestational ages ≤ 34 0/7 weeks

- **Betamethasone 12 mg IM q24 hours x 2 doses**

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INTRAPARTUM AND DELIVERY CONSIDERATIONS

MAGNESIUM SULFATE FOR SEIZURE PROPHYLAXIS

DRUG OF CHOICE for the prevention of eclampsia

Recommended for preeclampsia with severe features (to be discontinued if expectant management)

Intravenous loading dose: 4-6 g

Maintenance dose: 1-2 g/hour

(1gm/hour if renal impairment)

Continue postpartum for 12-24 hours after delivery or 24 hours after an eclamptic seizure, whichever is longer

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MAGNESIUM SULFATE- KEY POINTS

- Monitoring of serum magnesium sulfate levels not clinically indicated
- “Magnesium checks”
  - Respiratory rate
  - Reflexes
  - Urinary output

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ACTION POINTS WITH MAG CHECKS

MAGNESIUM CHECK			
Urine output	< 10 ml / hr	10 – 25 ml / hr	> 25 ml / hr
Reflexes	Depressed		Normal
Respiratory rate	< 16 / min		> 16 / min
ACTION	STOP IV INFUSION OR WITHOLD NEXT IM INJECTION	DECREASE IV MAINTENANCE INFUSION OR NEXT IM DOSE TO HALF	CONTINUE MAINTENANCE INFUSION

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INTRAPARTUM AND DELIVERY CONSIDERATIONS

ANTIHYPERTENSIVE MEDICATIONS

INTRAPARTUM: Recommend intrapartum medical management of persistent severe range hypertension (target ≤160/110mmHg)

LABETALOL: Stepwise escalating doses 20-40-80 mg IV every 10 minutes, then hydralazine 10 mg IV and obtain emergency consultation if BP threshold still exceeded

HYDRALAZINE: 5 or 10 mg IV then 10 mg in 20 minutes (once), then labetalol 40 mg IV and obtain emergency consultation if BP threshold still exceeded

NIFEDIPINE: 10 mg oral then 20 mg every 20 minutes (up to two doses), then labetalol 40 mg IV and obtain emergency consultation if BP threshold still exceeded

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HYPERTENSION URGENCY – KEY POINTS

- If BP ≥ 160/110 mm Hg, recheck BP in a short interval (15 minutes) to facilitate antihypertensive therapy
- If undelivered, institute continuous fetal monitoring

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HYPERTENSION DISORDERS IN PREGNANCY

ECLAMPSIA

INITIAL EVALUATION
MATERNAL

- **Serial blood pressure evaluation**
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- **Serum creatinine**
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- **Symptoms of severe preeclampsia** (i.e., severe persistent right upper quadrant or epigastric pain unresponsive to medication, not accounted for by alternative diagnosis; new cerebral or visual disturbances)

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ECLAMPSIA

- **New seizure in the setting of preeclampsia**
  - **Timing**: Antepartum (40-50%), intrapartum (20-35%), postpartum (10-40%)
  - Hypertension or proteinuria may be absent before eclampsia (15-30%)
  - Priorities: Airway, Breathing, Circulation

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ECLAMPSIA- KEY CONSIDERATIONS

COMMUNICATION	Clearly communicate diagnosis to team members Call for additional assistance • Obstetrics • Nursing • Anesthesiology • Pediatrics
PATIENT POSITIONING	Keep patient in a safe position Left lateral decubitus Keep rails up

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ECLAMPSIA- KEY CONSIDERATIONS

MATERNAL CARE	Provide oxygen by face mask Obtain IV access Treat severe range hypertension (BP≥ 160 mm Hg) with antihypertensive medications
FETAL CARE	Continuous fetal monitoring and toco, expecting decelerations
MAGNESIUM SULFATE FOR PREVENTION OF RECURRENCE	Loading dose 6 g IV **OR** 10 g IM (5 g each buttock)

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HYPERTENSION DISORDERS IN PREGNANCY

FUTURE IMPLICATIONS

FUTURE IMPLICATIONS
MATERNAL HEALTH

Future pregnancies	Risk of recurrence in subsequent pregnancy (10-40%)
Long term health	Increased risk of cardiovascular disease • Hypertension • Ischemic heart disease • Venous thromboembolism Overall mortality after preeclampsia increased

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FUTURE IMPLICATIONS
CHILD HEALTH

Long term health	Low birth weight associated with higher risk of diabetes mellitus and ischemic heart disease in later life Hypertension in later life

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OBJECTIVES

- Define hypertension disorders in pregnancy
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OBJECTIVES

- Describe most current practice and evidence based care in the management of hypertension disorders in pregnancy
  - Antenatal
  - Intrapartum
  - Postpartum

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Questions & Discussion

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