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# Hypertensive Disorders of Pregnancy

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# | Speaker Disclosures

## Hypertensive Disorders of Pregnancy

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- This program may contain the mention of drugs or brands presented in a case study or comparative format using evidence-based research. Such examples are intended for educational and informational purposes and should not be perceived as an endorsement of any particular supplier, brand or drug.

# | Learning Objectives

## Hypertensive Disorders of Pregnancy

- Describe the four types of hypertension that can complicate pregnancy
- Discuss maternal and fetal complications that can result from hypertensive disorders of pregnancy
- Outline treatment strategies for the management of hypertensive emergencies in pregnancy
- Identify the benefits of utilizing an evidence-based care team approach to aid patients with hypertensive disorders

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## Hypertensive Disorders of Pregnancy

Treatment of Hypertensive Emergencies:  
Proper management WILL Prevent Maternal Mortality.

# Maternal Mortality, An American Tragedy

YoLanda Mention of Nesmith, NC at her baby shower in 2015



- Uneventful delivery
- Sent home with **dangerously high** blood pressure
- Returned to ER with severe headache and worsening blood pressure
- Made to wait for hours without treatment
- Suffered stroke
- Mother of three daughters died

Source: Alison Young, USA TODAY July 27 2018

# | Maternal Mortality

## An American Failure

- America is the most dangerous country in the developed world to give birth
- U.S. ranks 65th in the world regarding maternal death rate
- Only developed nation in the world with increasing rate of maternal mortality
- Increased from 14 to 26.4 / 100,000 Births from 1990–2015
- Occurred during a time of unprecedented medical advancement
- Maternal death classified as “Never Event” by CHS OB Collaborative
- Greatest tragedy in modern medicine

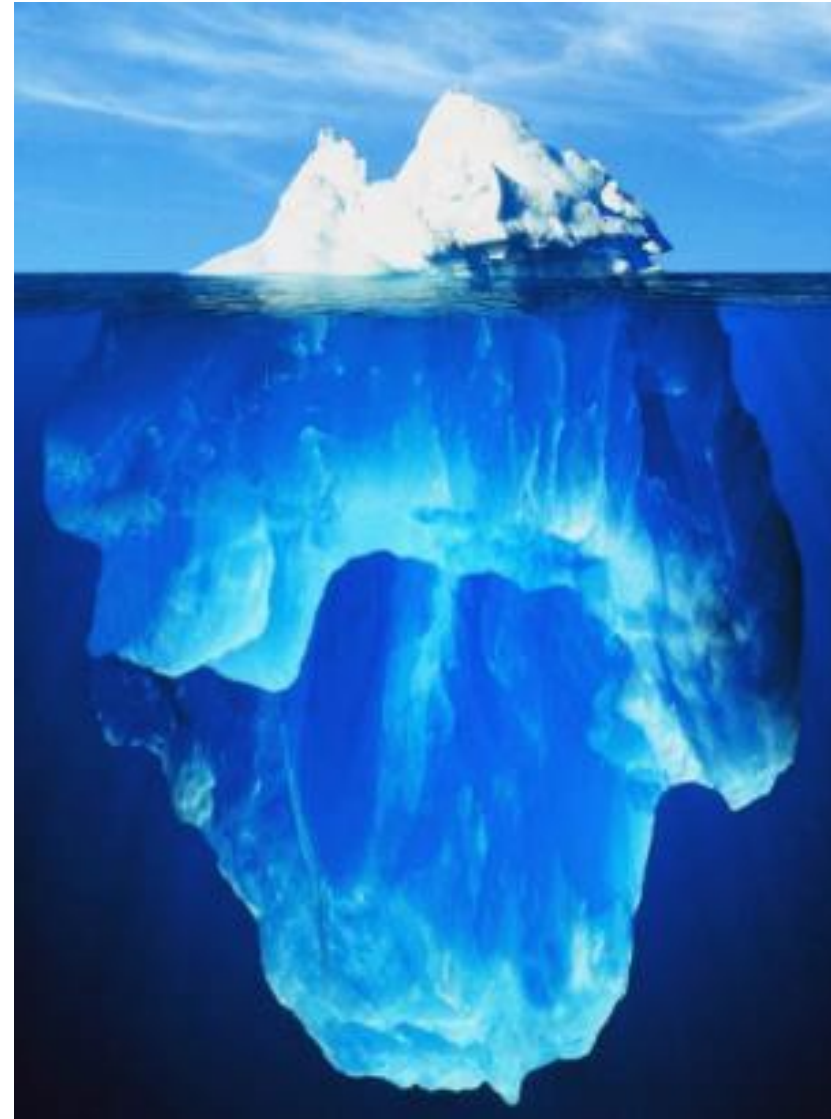
Source: *ACOG Patient Safety and Quality Improvement*. Berg CI et al *Obstet Gynecology* 2012  
WHO, UNICEF, UNFPA, The World Bank and UNDP. *Trends in Maternal Mortality 1990-2013:2014*

## Maternal Morbidity is Extreme

- Shock
- Acute Kidney Injury
- Pulmonary Embolism
- Acute Respiratory Distress Syndrome (ARDS)
- Myocardial Infarction
- Sepsis
- Increased by 45% from 2006 - 2015
- Affects 80,000 mothers per year

Sources: Callaghan, Wm. et al. *Obstet, Gynecology*, 2012.

K Fingar et al *Trans and Disparities in Delivery Hospitalizations Involving Severe Maternal Morbidity, 2006-2015*





# | Maternal Fetal Medicine

- Antenatal Steroids
- Antibiotics for Premature preterm rupture of membranes
- Magnesium for Neuroprotection
- 17 Hydroxyprogesterone for Preterm Birth Prevention
- Fetal Therapy for Twin-Twin Transfusion Syndrome, Neonatal Alloimmune Thrombocytopenia, & Neural Tube Defect
- Head/body cooling for Hypoxic Ischemic Encephalopathy



# Where is the “M” in Maternal-Fetal Medicine?

Source: D’Alton, ME. et al. Where is the “M” in Maternal-Fetal medicine? *Obstet Gynecol.* 2010; 116: 1401-1404

OBSTETRICS

## Putting the “M” back in maternal–fetal medicine

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Although maternal death remains rare in the United States, the rate has not decreased for 3 decades. The rate of severe maternal morbidity, a more prevalent problem, is also rising. Rise in maternal age, in rates of obesity, and in cesarean deliveries as well as more pregnant women with chronic medical conditions all contribute to maternal mortality and morbidity in the United States. We believe it is the responsibility of maternal-fetal medicine (MFM) subspecialists to lead a national effort to decrease maternal mortality and morbidity. In doing so, we hope to reestablish the vital role of MFM subspecialists to take the lead in the performance and coordination of care in complicated obstetrical cases. This article will summarize our initial recommendations to enhance MFM education and training, to establish national standards to improve maternal care and management, and to address critical research gaps in maternal medicine.

**Key words:** maternal-fetal medicine, maternal-fetal medicine education, maternal-fetal medicine research, maternal morbidity, maternal mortality

With a seminal article presented in the *Lancet* less than 25 years ago, Allan Rosenfield and Deborah Maine<sup>1</sup> galvanized the international public health movement to reduce maternal mortality and improve maternal health. Inspired by their message and their leg-

acy, we recently published a call to action for an organized, national approach to decrease maternal mortality and morbidity in the United States.<sup>2</sup>

Although maternal death is rare in the United States, particularly in comparison to the developing world, maternal

mortality has not decreased for 3 decades.<sup>3,4</sup> There continue to be dramatic disparities in health care outcomes—including marked differences in maternal mortality rates—between different socioeconomic and racial groups.<sup>5</sup> Moreover, severe maternal morbidity is a much more prevalent problem than maternal death, affecting tens of thousands of women each year.<sup>6,7</sup>

Maternal mortality and morbidity rates may even be rising due to a number of reasons. Delaying childbearing and assisted reproductive technology has allowed more women of advanced maternal age to conceive. Obesity has also become a national epidemic and is responsible for increasing rates of hypertension, diabetes, and other chronic diseases affecting pregnancy.<sup>8</sup> The rising cesarean delivery rate has increased the incidence of placenta accreta, a diagnosis associated with a high risk of postpartum

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Dr D’Alton delivered the keynote address, “Putting the ‘M’ Back in Maternal-Fetal Medicine,” at the 2012 annual meeting of the American Gynecological and Obstetrical Society. Her address had the same title and content as this manuscript. Dr Spong, as a federal employee, cannot assign copyright. Dr Gilstrap is the executive director of the American Board of Obstetrician Gynecologists, which accredits the maternal-fetal medicine fellowships. No other author reports a conflict of interest.

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# Hypertensive Disorders of Pregnancy

## National Focus

### R<sup>3</sup> Report | Requirement, Rationale, Reference

A complimentary publication of The Joint Commission

Issue 24, August 21, 2019

Published for Joint Commission-accredited organizations and interested health care professionals, *R<sup>3</sup> Report* provides the rationale and references that The Joint Commission employs in the development of new requirements. While the standards manuals also may provide a rationale, *R<sup>3</sup> Report* goes into more depth, providing a rationale statement for each element of performance (EP). The references provide the evidence that supports the requirement. *R<sup>3</sup> Report* may be reproduced if credited to The Joint Commission. Sign up for [email delivery](#).

#### Provision of Care, Treatment, and Services standards for maternal safety

Effective July 1, 2020, 13 new elements of performance (EPs) will be applicable to Joint Commission-accredited hospitals. These new requirements are within the Provision of Care, Treatment, and Services (PC) chapter at PC.06.01.01 and PC.06.01.03 and are designed to improve the quality and safety of care provided to women during all stages of pregnancy and postpartum. The United States ranks 65<sup>th</sup> among industrialized nations in terms of maternal death.<sup>1</sup> Because of worsening maternal morbidity and mortality, The Joint Commission evaluated expert literature to determine what areas held the most potential impact. The literature review revealed that prevention, early recognition, and timely treatment for maternal hemorrhage and severe hypertension/preeclampsia had the highest impact in states working on decreasing maternal complications. This approach was supported by a technical advisory panel assembled by The Joint Commission, resulting in the development of EPs that focus on these complications.

#### Engagement with stakeholders, customers, and experts

In addition to an extensive literature review and public field review, The Joint Commission obtained expert guidance from the following groups:

- [Technical Advisory Panel](#) (TAP) of subject matter experts from various health care and academic organizations and professional associations from the maternal health field.
- [Standards Review Panel](#) (SRP) comprised of clinicians and administrators who provided a “boots on the ground” point of view and insights into the practical application of the proposed standards.

The prepublication version of the maternal safety standards will be available online until June 30, 2020. After July 1, 2020, please access the new requirements in the E-dition or standards manual.

1. Centers for Disease Control and Prevention. Reproductive Health. [Pregnancy Mortality Surveillance System webpage](#). Page last reviewed: June 4, 2019. Accessed Aug. 20, 2019.

#### Standard PC.06.01.03: Reduce the likelihood of harm related to maternal severe hypertension/preeclampsia.

Requirement	EP 1: Develop written evidence-based procedures for measuring and remeasuring blood pressure. These procedures include criteria that identify patients with severely elevated blood pressure.
Rationale	Procedures should address appropriate blood pressure measurement, including cuff size, proper patient positioning, and frequency of measurement. Inaccurate measurement can lead to a mother not receiving proper treatment and being discharged with elevated blood pressure. Untreated hypertension can lead to morbidities or even death. Criteria for what constitutes a severely elevated blood pressure should be established by the organization utilizing current recommendations from national organizations.
Reference	Nathan H, et al. “Blood Pressure Management in Pregnancy.” <i>Royal College of Obstetricians and Gynaecologists</i> . 2015;17:91-98.
Requirement	EP 2: Develop written evidence-based procedures for managing pregnant and postpartum patients with severe hypertension/preeclampsia that includes the following: <ul style="list-style-type: none"><li>• The use of an evidence-based set of emergency response medications that are stocked and immediately available on the obstetric unit</li><li>• The use of seizure prophylaxis</li><li>• Guidance on when to consult additional experts and consider transfer to a higher level of care</li><li>• Guidance on when to use continuous fetal monitoring</li><li>• Guidance on when to consider emergent delivery</li><li>• Criteria for when a team debrief is required</li></ul> Note: The written procedures should be developed by a multidisciplinary team that includes

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# Hypertensive Disorders of Pregnancy

## National Focus

R<sup>3</sup> Report | Requirement, Rationale, Reference  
 Issue 24, Aug. 21, 2019  
 Page | 5

Provision of Care, Treatment, and Services standards for maternal safety

	<i>representation from obstetrics, emergency department, anesthesiology, nursing, laboratory, and pharmacy.</i>
<b>Rationale</b>	Studies have shown that delays in the diagnosis and treatment of severe hypertension/preeclampsia and receipt of suboptimal treatment of severe hypertension/preeclampsia are linked with adverse maternal outcomes. Having clear procedures in place and educating staff around these procedures should decrease failures to recognize and treat severe hypertension/preeclampsia.
<b>Reference</b>	American College of Obstetricians and Gynecologists. "Emergent Therapy for Acute-Onset, Severe Hypertension During Pregnancy and the Postpartum Period. ACOG Committee Opinion No. 767." <i>Obstetrics &amp; Gynecology</i> . 2019;133:e174-180.  American College of Obstetricians and Gynecologists. "Task Force on Hypertension in Pregnancy. Hypertension in Pregnancy Task Force Report." DOI: <a href="https://doi.org/10.1097/01.AOG.0000437382.03963.88">10.1097/01.AOG.0000437382.03963.88</a>  Troiano NH and Witcher PM. "Maternal Morbidity in the United States: Classification on Causes, Preventability and Critical Care Obstetric Implications." <i>Journal of Perinatology &amp; Neonatal Nursing</i> . 2018;32(3):222-231.
<b>Requirement</b>	EP 3: Provide role-specific education to all staff and providers who treat pregnant/postpartum patients about the hospital's evidence-based severe hypertension/preeclampsia procedure. At a minimum, education occurs at orientation, whenever changes to the procedure occur, or every two years. <i>Note: The emergency department is often where patients with symptoms or signs of severe hypertension present for care after delivery. For this reason, education should be provided to staff and providers in emergency departments regardless of the hospital's ability to provide labor and delivery services.</i>
<b>Rationale</b>	Decreasing the blood pressure through rapid recognition and treatment has been shown to decrease maternal morbidity and mortality. It is imperative to provide education for staff and providers on how to measure accurate blood pressures, recognize severe hypertension/preeclampsia, and provide evidence-based treatments to lower blood pressure in a safe and timely manner. Although not required, <i>in situ</i> simulations that allow staff to practice organizational procedures in actual clinical settings are encouraged.
<b>Reference</b>	American College of Obstetricians and Gynecologists. "Task Force on Hypertension in Pregnancy. Hypertension in Pregnancy Task Force Report." DOI: <a href="https://doi.org/10.1097/01.AOG.0000437382.03963.88">10.1097/01.AOG.0000437382.03963.88</a>  Druzin JL, et al. Preeclampsia Toolkit – "Improving Health Care Response to Preeclampsia: A California Toolkit to Transform Maternity Care (2014)." Developed under contract #11-10006 with the California Department of Public Health; Maternal, Child and Adolescent Health Division. Published by the California Maternal Quality Care Collaborative. 2013.
<b>Requirement</b>	EP 4: Conduct drills at least annually to determine system issues as part of ongoing quality improvement efforts. Severe hypertension/preeclampsia drills include a team debrief.
<b>Rationale</b>	Multidisciplinary drills give an organization the opportunity to practice skills and identify system issues in a controlled environment. It is crucial to have members from as many disciplines as possible available during drills to truly be able to test each level of the emergency and identify areas of improvement. Organizations should assess their level of proficiency to determine the frequency drills should be performed; organizations that have reached a high level of mastery may need less frequent drills.
<b>Reference</b>	American College of Obstetricians and Gynecologists. "Preparing for Clinical Emergencies in Obstetrics and Gynecology." ACOG Committee Opinion No. 590. <i>Obstetrics &amp; Gynecology</i> . 2014;123:722-725.  Kyrabina E, et al. "What is the Value of Health Emergency Preparedness Exercises? A Scoping Review Study." <i>International Journal of Disaster Risk Reduction</i> . 2017;21:274-283.  Lee A, et al. "Intrapartum Maternal Cardiac Arrest: A Simulation for Multidisciplinary

# Hypertensive Disorders of Pregnancy

## National Focus

**R' Report** | Requirement, Rationale, Reference  
 Issue 24, Aug. 21, 2019  
 Page | 6

Provision of Care, Treatment, and Services standards for maternal safety

	Providers." MedEdPORTAL. 2018;14:1-8.
<b>Requirement</b>	EP 5: Review severe hypertension/preeclampsia cases that meet criteria established by the hospital to evaluate the effectiveness of the care, treatment, and services provided to the patient during the event.
<b>Rationale</b>	Continuous feedback loops are imperative for organizations to find errors and improve skills to ensure that patients are receiving the highest level of care. Root cause analysis, apparent-cause analysis, or similar tools to review the care in a rigorous, psychologically safe environment is critical to identify successes and opportunities for improvement in a way that creates a culture of safety and empowers staff to design safe and effective procedures and processes.
<b>Reference</b>	Callaghan WM, et al. "Facility-Based Identification of Women with Severe Maternal Morbidity: It is Time to Start." <i>Obstetrics &amp; Gynecology</i> . 2014;123:978-981.  Kilpatrick SJ, et al. "Standardized Severe Maternal Morbidity Review: Rationale and Process." <i>Obstetrics &amp; Gynecology</i> . 2014;124:361-366.
<b>Requirement</b>	EP 6: Provide printed education to patients (and their families including the designated support person whenever possible). At a minimum, education includes: <ul style="list-style-type: none"> <li>• Signs and symptoms of severe hypertension/preeclampsia during hospitalization that alert the patient to seek immediate care</li> <li>• Signs and symptoms of severe hypertension/preeclampsia after discharge that alert the patient to seek immediate care</li> <li>• When to schedule a post-discharge follow-up appointment</li> </ul>
<b>Rationale</b>	Maternal mortality reviews have shown that some patients with severe hypertension/preeclampsia die after discharge because they were unaware of which symptoms to watch for and when to seek care urgently. Women should understand their severe hypertension/preeclampsia diagnosis and inform healthcare providers of their pregnancy history when they seek care after discharge to ensure correct diagnosis and treatment.
<b>Reference</b>	Brousseau CE, et al. "Emergency Department Visits for Postpartum Hypertension." <i>Hypertension in Pregnancy</i> . 2017;36(2):212-216.  American College of Obstetricians and Gynecologists. "Optimizing Postpartum Care." ACOG Committee Opinion No. 736. <i>Obstetrics &amp; Gynecology</i> . 2018;131:e140-e150.  Suplee PD, et al. "Discharge Education on Maternal Morbidity and Mortality Provided by Nurses to Women in the Postpartum Period." <i>Journal of Obstetric, Gynecologic and Neonatal Nursing</i> . 2016;45:8994-904.  Suplee PD, et al. "Improving Postpartum Education About Warning Signs of Maternal Morbidity and Mortality." <i>Journal of Obstetric, Gynecologic and Neonatal Nursing</i> . 2016;20:552-567.

Not a complete literature review.

# An American Tragedy

50% of Maternal Deaths are  
Preventable

Regarding **deaths** associated with  
**hypertension: 50%–60% of patients had a  
significant chance of a different outcome if  
managed more effectively.**

Source: D'Alton ME, Main EK, Menard MK, Levy BS. The national partnership for maternal safety. *Obstet Gynecol* 2014;123:973–7

# | Maternal Mortality

Three Significant Etiologies/Three Opportunities/Three High Value Targets

- Hemorrhage
- Hypertension / Preeclampsia / Eclampsia
- Thromboembolism

Source: D'Alton ME, Main EK, Menard MK, Levy BS. The national partnership for maternal safety. *Obstet Gynecol* 2014;123:973–7

# | Healthcare is a Team Sport

## HealthTrust Team Members

- Nursing
- Pharmacy
- Laboratory Medicine
- Physicians
- Administrators



## | Healthcare is a Team Sport

Maternal mortality and morbidity crisis cannot be fixed by obstetricians alone.

***Need your help in your sphere of influence.***

# Hypertensive Disorders of Pregnancy

## Chronic Hypertension

- Blood pressure is  $\geq 140/90$  prior to pregnancy or prior to 20 weeks gestation
- Definition of hypertension may be in flux per American College of Cardiology and American Heart Association
- Elevated blood pressure  $\geq 12$  weeks post partum

Sources: *Working group report on high blood pressure in pregnancy* NIH 2000. ACOG Task Force 2013

# Hypertensive Disorders of Pregnancy

## Preeclampsia

- New onset of hypertension (HTN) blood pressure is  $\geq 140/90$
- Proteinuria 300 mg or more per 24 hr. urine collection
- Or, HTN and significant end-organ disease with or without proteinuria after 20 weeks gestation in a previously normotensive patient.

### **Risk Factors for Preeclampsia**

Nulliparity  
Multifetal gestations  
Preeclampsia in a previous pregnancy  
Chronic hypertension  
Pregestational diabetes  
Gestational diabetes  
Thrombophilia  
Systemic lupus erythematosus  
Prepregnancy body mass index greater than 30  
Antiphospholipid antibody syndrome  
Maternal age 35 years or older  
Kidney disease  
Assisted reproductive technology  
Obstructive sleep apnea

# Hypertensive Disorders of Pregnancy

## Eclampsia

- The development of eclampsia can lead to the evolution of grand mal seizures in the absence of other pathologic neurologic process associated with seizures.

Sources: *Working group report on high blood pressure in pregnancy* NIH 2000.  
ACOG Task Force 2013

# Hypertensive Disorders of Pregnancy

## Preeclampsia (With or Without Severe Features)

### Severe Features:

- Systolic BP  $\geq$  160 or Diastolic BP  $\geq$  110
- Platelets  $<$  100,000 per mm<sup>3</sup>
- Abnormal liver function test ALT/AST  $\geq$  2X normal
- Renal insufficiency (creatinine level  $\geq$  1.2 or doubling of base line)
- Pulmonary edema
- New onset of cerebral or visual changes
- Right upper quadrant, epigastric pain

Source: *Working group report on high blood pressure in pregnancy* NIH 2000 / ACOG Task Force 2013

# Hypertensive Disorders of Pregnancy

## Chronic Hypertension with Superimposed Preeclampsia

### **Diagnosis can be challenging.**

- New onset proteinuria
- End-organ dysfunction status post 20 weeks gestation
- One or both could occur

### **Example:**

- New onset proteinuria or sudden increase protein
- Sudden increase BP formally controlled on medication
- Platelets < 100,000 per mm<sup>3</sup>
- Increased liver function tests (ALT/AST)
- Central Nervous System changes

❖ **RULE OUT THE WORST FIRST.** *Practitioners should think superimposed preeclampsia first, not simply an exacerbation of chronic hypertension.*

Source: Working group report on high blood pressure in pregnancy NIH 2000 / ACOG Task Force 2013

❖ *Clinical Pearl*

# Hypertensive Disorders of Pregnancy

## Gestational Hypertension

- Hypertension without proteinuria or other signs or symptoms of preeclampsia or associated end-organ dysfunction
  - May evolve into preeclampsia
  - May become severe and life threatening
  - Some experts believe that gestational hypertension and preeclampsia are part of the same spectrum of pathophysiology

Source: *Working group report on high blood pressure in pregnancy* NIH 2000 / ACOG Task Force 2013



# Hypertensive Disorders of Pregnancy

## Why Is It important

- Hypertensive disorder of pregnancy is a significant cause of maternal morbidity and mortality worldwide
- Greater than 80,000 maternal deaths annually
- 1 preeclamptic death every 7 minutes
- #3 cause of fetal mortality largely because of iatrogenic prematurity
- Accounts for greater than 5% of all United States fetal deaths over 20 weeks

Source: *Ananth, C.V. and Smulian, J.C. (2018). Epidemiology of Critical Illness in Pregnancy. In Critical Care Obstetrics*

# | Hypertensive Disorders of Pregnancy

## Maternal Mortality Reviews

- Failure by healthcare providers to realize that preeclampsia is **MULTISYSTEMIC IN NATURE**.
  - This leads to a late or missed diagnosis.
- Failure to recognize that preeclampsia is **ALWAYS PROGRESSIVE**.
  - Rate of progression varies.
  - Providers must keep tempo with disease progression.
  - (Don't let it get ahead of you)
  - The only cure is delivery.
- May worsen post partum (**be vigilant**).

# | Hypertensive Disorders of Pregnancy

## Maternal Mortality Reviews

Nearly 50% of preeclamptic / eclamptic deaths were determined to have a strong or good chance to improve patient outcomes.

Maternal death **CAN** be prevented if health care teams are vigilant to ensure an accurate diagnosis and rapid treatment of hypertensive emergencies/eclampsia.

# Hypertensive Disorders of Pregnancy – Types of Hypertension

CHRONIC HYPERTENSION	<ul style="list-style-type: none"> <li>○ SBP <math>\geq</math> 140 or DBP <math>\geq</math> 90</li> <li>○ Pre-pregnancy or <math>&lt;</math> 20 weeks</li> </ul>
GESTATIONAL HYPERTENSION	<ul style="list-style-type: none"> <li>○ SBP <math>\geq</math>140 or DBP <math>\geq</math> 90</li> <li>○ <math>&gt;</math> 20 weeks</li> <li>○ Absence of Proteinuria or systemic signs/symptoms</li> </ul>
PREECLAMPSIA - ECLAMPSIA	<ul style="list-style-type: none"> <li>○ SBP <math>\geq</math> 140 or DBP <math>\geq</math> 90</li> <li>○ Proteinuria with our without signs/symptoms</li> <li>○ Presentation of signs symptoms/lab abnormalities but no proteinuria</li> </ul> <p><i>*Proteinuria not required for diagnosis eclampsia seizure in setting of preeclampsia</i></p>
CHRONIC HYPERTENSION + SUPERIMPOSED PREECLAMPSIA	
PREECLAMPSIA WITH SEVERE FEATURES	<ul style="list-style-type: none"> <li>○ Two severe BP values (SBP <math>\geq</math> 160 or DBP <math>\geq</math> 110) obtained 15-60 minutes apart</li> <li>○ Persistent oliguria <math>&lt;</math>500ml/24 hours</li> <li>○ Progressive renal insufficiency</li> <li>○ Unremitting headache/visual disturbances</li> <li>○ Pulmonary edema</li> <li>○ Epigastric/RUQ pain</li> <li>○ LFTs <math>&gt;</math> 2x normal</li> <li>○ Platelets <math>&lt;</math> 100K</li> <li>○ HELLP syndrome</li> </ul> <p><i>*5 gr of proteinuria no longer criteria for severe preeclampsia</i></p>

# Hypertensive Disorders of Pregnancy

Accurate Diagnosis is Key

## Blood Pressure Evaluation

- Patient should be sitting upright, legs uncrossed, back and arms supported, and rested for 5 minutes
- Use correct cuff size
- The middle of the cuff should be on the upper arm at the level of the heart's atrium
- No recent tobacco or caffeine use
- Repeat in 5 minutes if elevated
- Left lateral position falsely lowers blood pressure – **do not rely on this BP!**

# | Hypertensive Disorders of Pregnancy

Spectrum Pathophysiology is Large & Complex

- Can affect many organ systems
- Caregivers need high index of suspicion
- This condition is often rapidly progressive and fulminant

# Hypertensive Disorders of Pregnancy

## Preeclampsia

### Cardiovascular Manifestations

- Vascular constriction due to increased vascular reactivity
- Hemoconcentration (vascular tank not full); increased concentration of cells and blood components resulting from loss of fluid to the extravascular space
- Resultantly, mothers don't tolerate hemorrhage well

Sources: *Foley et al Obstetric Intensive Care Manual 2004*



# Hypertensive Disorders of Pregnancy

## Preeclampsia

### Hematologic Manifestations

- Hemoconcentration – Fluid transverse into third space because of damage to endothelium of blood vessels
- Leads to the telltale signs of edema, primarily the hands and face
- Thrombocytopenia (Platelets < 100,000 per mm<sup>3</sup>)
- Hemolysis of red blood cells leads to
  - Increased lactic acid dehydrogenase (LDH)
  - Elevated bilirubin
  - Schistocytes (fragmented part of a red blood cell) on peripheral smear
  - May lead to anemia (vs. Hemoconcentration)
- Severe disease may be associated with Disseminated Intravascular Coagulation (DIC)
- Part of the death quadriad: Hypothermia, Acidemia, DIC & Electrolyte aberration

# Hypertensive Disorders of Pregnancy

## Preeclampsia

### Renal Manifestations

- Vasoconstriction leads to poor perfusion of kidneys, resulting in a decreased glomerular filtration rate (GFR).
- GFR normally increases up to 50% in pregnancy
- Creatinine level rarely greater than 0.8 mg/dL (Red Flag)
- Creatinine level  $\geq 1.2$  mg/dL = severe disease
- Pathology leads to oliguria ( $< 500$  cc /24<sup>0</sup> or  $< 30$ cc per hour for 2 consecutive hours)
- Potential acute kidney injury

Sources: *Foley, et al. Obstetric Intensive Care Manual 2004*

# Hypertensive Disorders of Pregnancy

## Preeclampsia

### Hepatic Manifestations

- Damage to hepatocytes leads to the release of ALT/AST
- Severe disease can lead to subcapsular hematoma (associated with epigastric RUQ pain)
  - **Don't miss this complaint!**
- Liver rupture leads to hemorrhagic shock with predisposition to multisystem organ failure and very high mortality rate

# Hypertensive Disorders of Pregnancy

## Preeclampsia

### Central Nervous System Manifestations

- Severe unrelenting headache is a harbinger of bad things to come
  - Any headache warrants further investigation!
- Eclamptic seizures
  - major cause of maternal mortality worldwide
  - may be attributed to hypertensive encephalopathy or ischemia from vasoconstriction (possibly from cerebral edema)

# Hypertensive Disorders of Pregnancy

## Preeclampsia

### Central Nervous System Manifestations

- Hemorrhagic stroke (thrombotic stroke less likely)
  - Major cause of maternal death in the United States
  - Largely preventable with timely antihypertensive therapy and magnesium sulfate
- UK initiative demonstrated significant decrease in maternal morbidity and mortality

# Hypertensive Disorders of Pregnancy

## Preeclampsia

### Seizure Prevention/Treatment

- Magnesium sulfate is the drug of choice.
- If magnesium sulfate is contraindicated (myasthenia gravis, hypocalcemia, moderate to severe renal failure, cardiac ischemia, heart block, myocarditis) or recalcitrant seizures, caregivers should consider:
  - Lorazepam (Ativan)
  - Diazepam (Valium)
  - Levetiracetam (Keppra)
  - Neuromuscular blockade and intubation

# Hypertensive Disorders of Pregnancy

## Preeclampsia

### Central Nervous System Manifestations

- Be aware of the warning signs/symptoms
  - Headache
  - Scotomata
  - Photopsia (flashes of light)
  - Blurred vision
  - Change in mental status
  - Transient loss of vision (Amaurosis)
- Headache (80%) & visual changes (45%) are the most common prodromal neurologic symptoms associated with eclampsia, regardless of the degree of hypertension both antepartum and postpartum.

# Hypertensive Disorders of Pregnancy

## Preeclampsia

### **Pulmonary Manifestations**

- Pulmonary edema/congestive heart failure/cyanosis
- Acute respiratory failure
- Acute respiratory distress syndrome (ARDS)



# Hypertensive Disorders of Pregnancy

## Preeclampsia

### **HELLP Syndrome**

- Pathophysiology is in a class of its own
- Often progressive and fulminant if not diagnosed and treated in a timely fashion
- Risk of maternal death is 1%

### **H** – Hemolysis

LDH  $\geq$  600 U/L bilirubin  $\geq$  1.2 mg/dl

### **EL** – Elevated liver enzymes

ALT AST  $>$  2X normal LDH 600 U/L

### **LP** – Low platelets

Platelets  $<$  100,000 per mm<sup>3</sup>

\*Presentation may be atypical (e.g. low platelets with mild elevation LFTs).

# Hypertensive Disorders of Pregnancy

## Preeclampsia

### **HELLP Syndrome**

Often associated with severe pathology and extreme maternal morbidity.

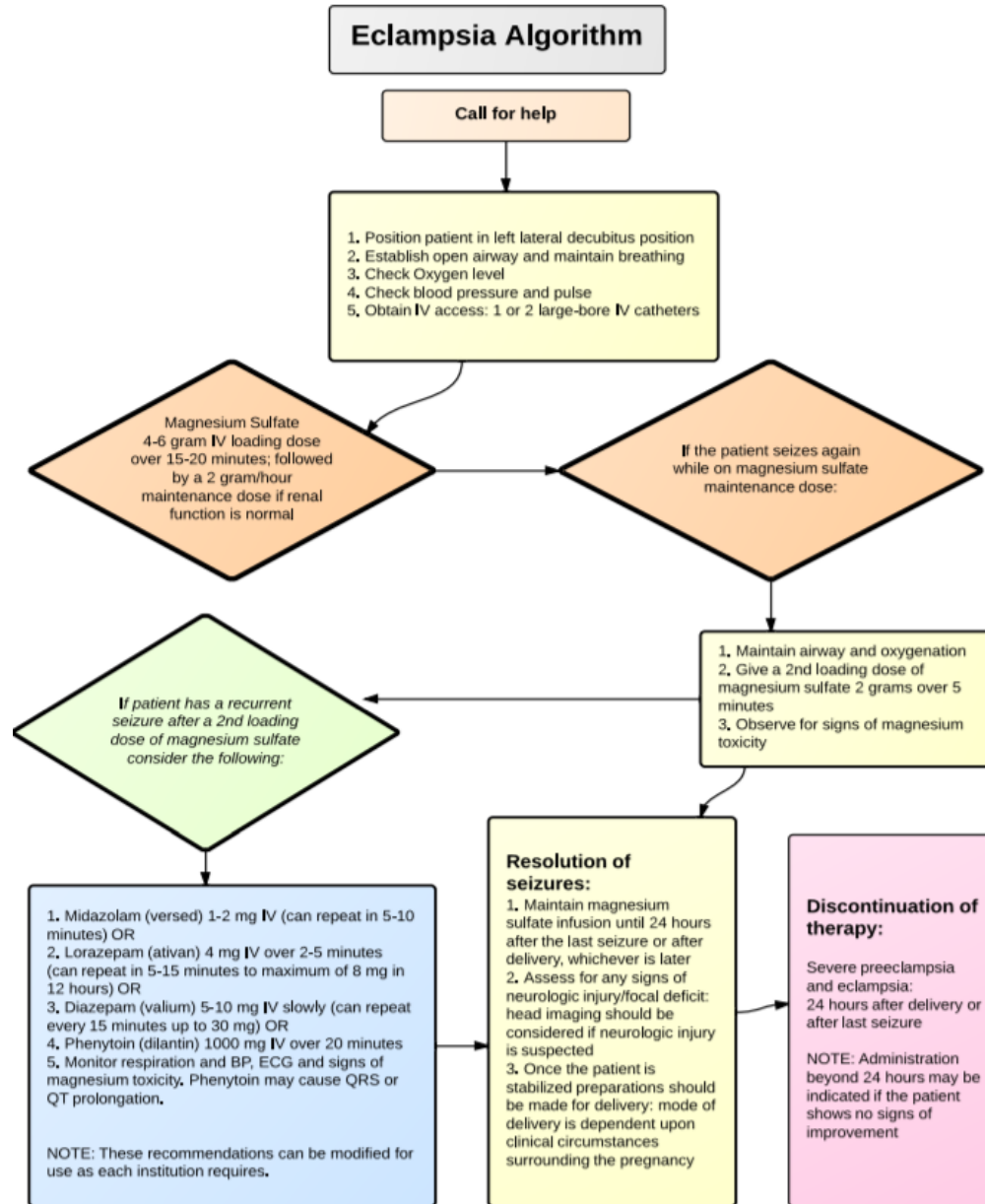
- Disseminated Intravascular Coagulation (DIC) - 15-30 %
- Pulmonary edema - 8%
- Acute kidney injury- 3%
- Stroke - 1%
- Acute respiratory distress syndrome (ARDS) - 1%
- Subcapsular liver hematoma or liver rupture

# Hypertensive Disorders of Pregnancy

## Focus on Eclampsia

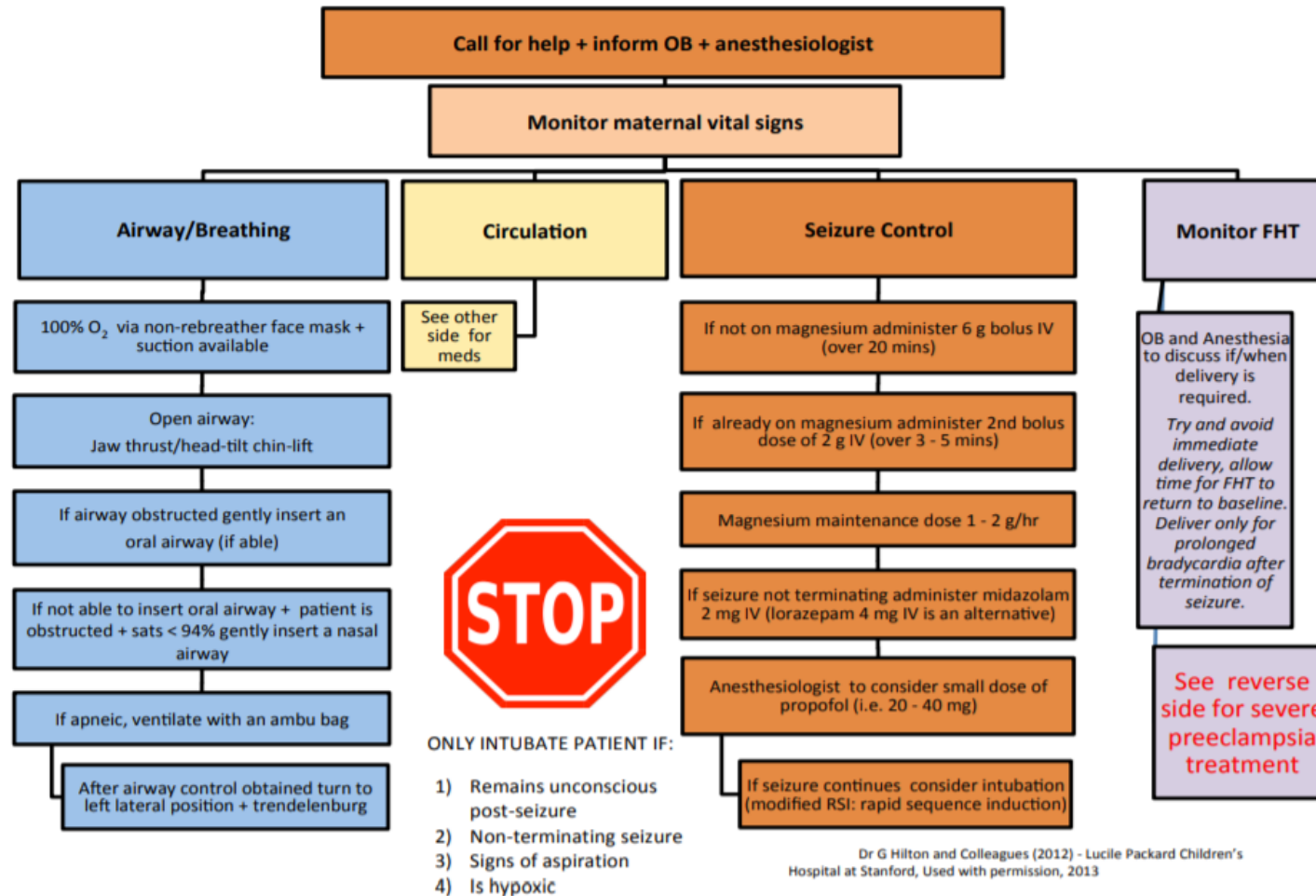
### **Eclampsia**

- Rate is 0.05 – 0.1%
- Major cause of maternal and perinatal morbidity and mortality
- Can occur:
  - Antepartum 50%
  - Intrapartum 25%
  - Postpartum 25%



APPENDIX A: SAMPLE MANAGEMENT OF ECLAMPSIA ALGORITHM

Management of Eclampsia



# Hypertensive Disorders of Pregnancy

## What Constitutes a Hypertensive Emergency in Pregnancy?

- Persistent, severe HTN that can occur antepartum, intrapartum or post partum.
- Defined: 2 severe blood pressure readings SBP  $\geq$  160 OR DBP  $\geq$  110 taken 15 minutes apart.
- Severe values need not be consecutive.

**(Only need to have one critical blood pressure reading to have a stroke)**

\*Controlling blood pressure is optimal intervention to prevent maternal death due to stroke in patient with preeclampsia/eclampsia.

# Hypertensive Disorders of Pregnancy

When to Treat:

- SBP  $\geq$  160 **OR** DBP  $\geq$  110
- If persistent for 5-15 minutes or more, begin treatment ASAP
  - *The goal is for initiation of treatment within 15 minutes (ACOG within 60 minutes)*
- Rapid treatment is emerging as an important quality metric in obstetrics
- Goal is not normotension. May lead to placental hypoperfusion with resultant fetal distress
- Goal is 140 - 150 / 90 - 100 mm Hg



# FIRST LINE THERAPIES

- Intravenous labetalol
- Intravenous hydralazine
- Oral nifedipine

(More rapid and effective than Labetalol)

## **Magnesium sulfate not recommended as antihypertensive agent**

- Should be used for: seizure prophylaxis and controlling seizures in eclampsia
- IV bolus of 4-6 grams in 100 ml over 20 minutes, followed by IV infusion of 1-2 grams per hour. Continue for 24 hours postpartum
- If no IV access, 10 grams of 50% solution IM (5 g in each buttock)
- Contraindications: pulmonary edema, renal failure, myasthenia gravis

## **Anticonvulsants (for recurrent seizures or when magnesium is C/I):**

- Lorazepam: 2-4 mg IV x 1, may repeat x 1 after 10-15 min
- Diazepam: 5-10 mg IV every 5-10 min to max dose 30 mg
- Phenytoin: 15-20 mg/kg IV x 1, may repeat 10 mg/kg IV after 20 min if no response. Avoid with hypotension, may cause cardiac arrhythmias.
- Keppra: 500 mg IV or orally, may repeat in 12 hours. Dose adjustment needed if renal impairment.

*\*There may be adverse effects and additional contraindications. Clinical judgement should prevail*



# Hypertensive Emergency Checklist

## HYPERTENSIVE EMERGENCY:

- Two severe BP values ( $\geq 160/110$ ) taken 15-60 minutes apart. Values do not need to be consecutive.
- May treat within 15 minutes if clinically indicated

- Call for Assistance
- Designate:
  - Team leader
  - Checklist reader/recorder
  - Primary RN
- Ensure side rails up
- Ensure medications appropriate given patient history
- Administer seizure prophylaxis (magnesium sulfate first line agent, unless contraindicated)
- Antihypertensive therapy within 1 hour for persistent severe range BP
- Place IV; Draw preeclampsia labs
- Antenatal corticosteroids (if <34 weeks of gestation)
- Re-address VTE prophylaxis requirement
- Place indwelling urinary catheter
- Brain imaging if unremitting headache or neurological symptoms
- Debrief patient, family, and obstetric team

<sup>†</sup> "Active asthma" is defined as:

- (A) symptoms at least once a week, or
- (B) use of an inhaler, corticosteroids for asthma during the pregnancy, or
- (C) any history of intubation or hospitalization for asthma.

REVISED JULY 2017

## 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  $\geq 160$  or DBP  $\geq 110$

(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 first line agents unsuccessful, emergency consult with specialist (MFM, Internal medicine, OB anesthesiology, critical care) is recommended

## ANTICONVULSANT MEDICATIONS

For recurrent seizures or when magnesium sulfate contraindicated

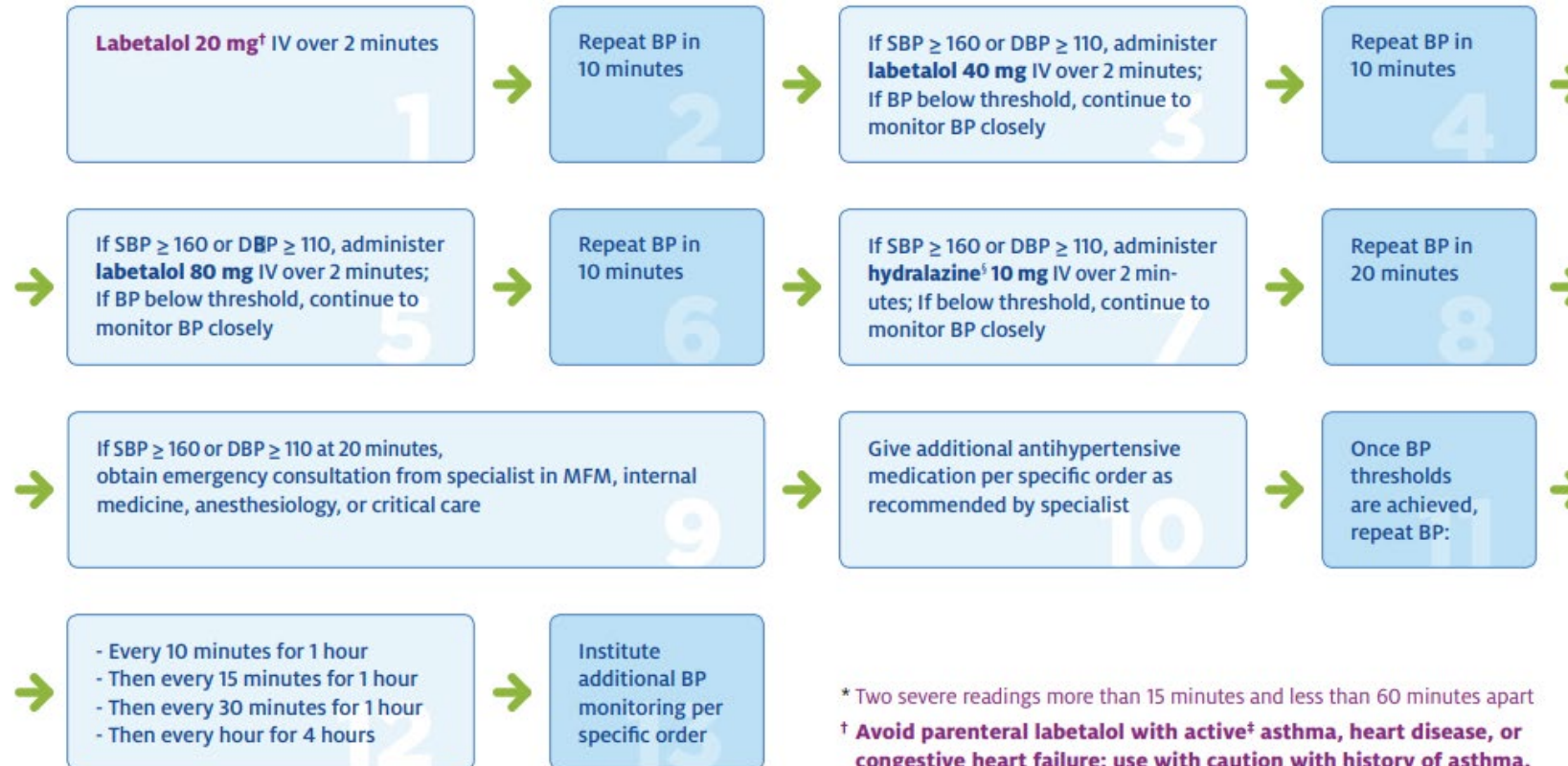
- Lorazepam (Ativan):** 2-4 mg IV x 1, may repeat once after 10-15 min
- Diazepam (Vallium):** 5-10 mg IV q 5-10 min to maximum dose 30 mg

Checklists help in multi-step process where the omission of any step can lead to patient harm.

# Labetalol Algorithm

## EXAMPLE

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



- 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 220 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<sup>‡</sup> 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.

# Hydralazine Algorithm

## EXAMPLE

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



- 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.

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

† **Avoid parenteral labetalol with active<sup>‡</sup> 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.

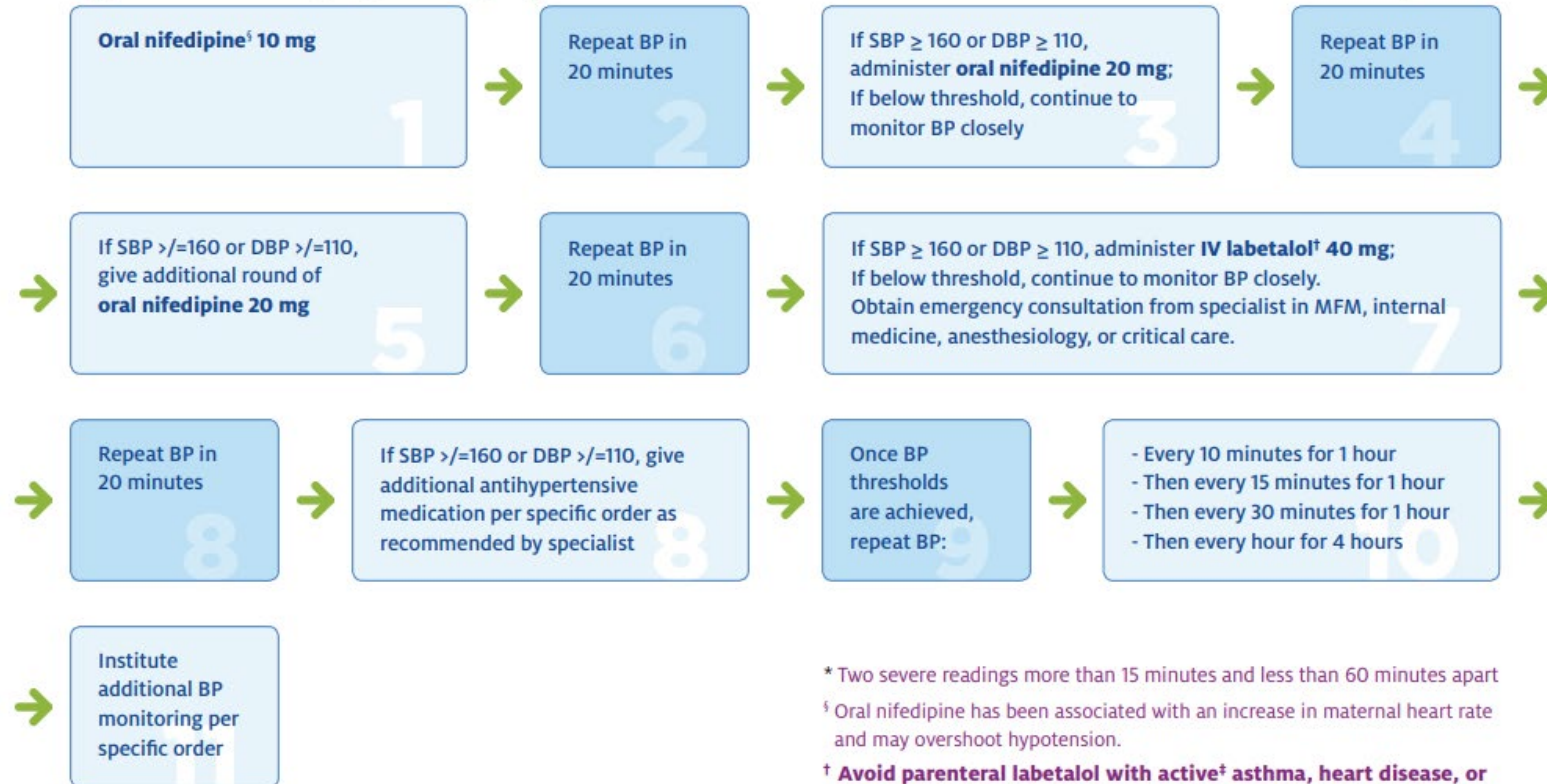
§ Hydralazine may increase risk of maternal hypotension.



# Oral Nifedipine Algorithm

## EXAMPLE

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



- Notify provider after one severe BP value is obtained
- Institute fetal surveillance if viable
- Capsules should be administered orally and not punctured or otherwise administered sublingually
- There may be adverse effects and contraindications. Clinical judgement should prevail.

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

§ Oral nifedipine has been associated with an increase in maternal heart rate and may overshoot hypotension.

† **Avoid parenteral labetalol with active<sup>‡</sup> 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.



*Oral Nifedipine superior to oral Labetalol because of more rapid onset of actions*

# 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 decubitus 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

<sup>†</sup> "Active asthma" is defined as:

- (A) symptoms at least once a week, or
- (B) use of an inhaler, corticosteroids for asthma during the pregnancy, or
- (C) any history of intubation or hospitalization for asthma.

REVISED JULY 2017



## 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  $\geq$  160 or DBP  $\geq$  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 (Vallium):** 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

Checklists help in multi-step process where the omission of any step can lead to patient harm.

# | Hypertensive Disorders of Pregnancy

Don't be Afraid to Call for Help - "Circle the Wagons"

- Critical Care
- Internal Medicine
- Anesthesia
- Emergency Medicine
- Maternal Fetal Medicine

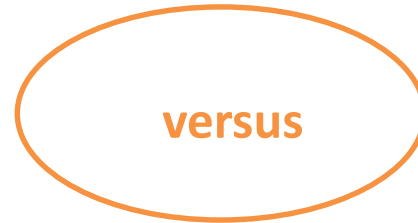
## Mentor's Pearl

*Being an obstetrician is much like serving two masters simultaneously whose goals are diametrically opposed to each other.*

# Hypertensive Disorders of Pregnancy

## Mother

- Severe Morbidity or Mortality



## Baby

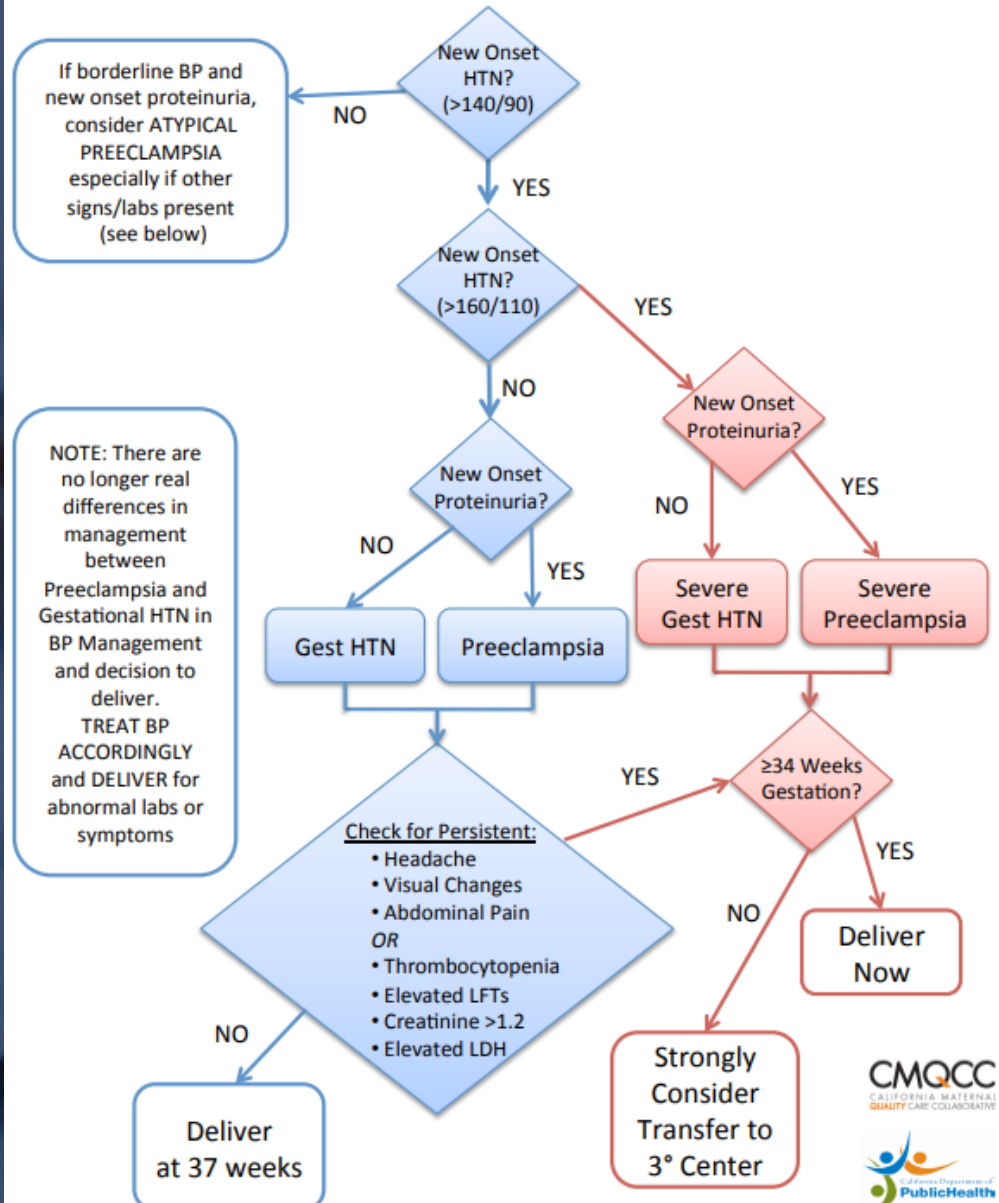
- Iatrogenic Prematurity with Resultant Morbidity & Mortality

❖ *Benefit to baby must outweigh the risk to mother.*



# SUSPECTED PREECLAMPSIA ALGORITHM

## Suspected Preeclampsia Flowchart Diagnosis and Management



NOTE: There are no longer real differences in management between Preeclampsia and Gestational HTN in BP Management and decision to deliver. TREAT BP ACCORDINGLY and DELIVER for abnormal labs or symptoms



# Hypertensive Disorders of Pregnancy

## Maternal

- Uncontrolled severe-range blood pressures (persistent systolic blood pressure 160 mm Hg or more or diastolic blood pressure 110mm Hg or more, not responsible to antihypertensive medication)
- Persistent headaches, refractory to treatment
- Epigastric pain or right upper pain unresponsive to repeat analgesics
- Visual disturbances, motor deficit or altered sensorium
- Stroke
- Myocardial infarction
- HELLP syndrome
- New or worsening renal dysfunction (serum creatinine greater than 1.1 mg/dL or twice baseline)
- Pulmonary edema
- Eclampsia
- Suspected acute placental abruption or vaginal bleeding in the absence of placenta previa

## Fetal

- Abnormal fetal testing
- Fetal death
- Fetus without expectation for survival at the time of maternal diagnosis (e.g. extreme prematurity)
- Persistent, reversed end-diastolic flow in the umbilical artery

Abbreviation: HELLP, hemolysis, elevated liver enzymes and low platelet count

*\*In some cases, a course of antenatal steroids can be considered depending on gestational age and maternal severity of illness.*

**\* Neonates requiring imminent delivery may benefit from exposure to first dose of betamethasone.**

Sources :ACOG Practice Bulletin Number 202, January 2019. Balogun OA, Sibai BM. Counseling, management and outcome in women with severe preeclampsia at 23–28 weeks' gestation. *Clin Obstet Gynecol* 2017; 60: 183-9

## Recommendations for the Timing of Delivery When Conditions Complicate Pregnancy

Maternal Conditions – Hypertensive Disorders of Pregnancy	General Timing	Suggested Specific Timing
Chronic hypertension: isolated, uncomplicated, controlled, not requiring medications	Early term/full term	38 $\frac{0}{7}$ to 39 $\frac{6}{7}$ weeks of gestation
Chronic hypertension: isolated, uncomplicated, controlled, on medications	Early term/full term	37 $\frac{1}{7}$ to 39 $\frac{6}{7}$ weeks of gestation
Chronic hypertension: difficult to control (requiring frequent medication adjustments)	Late preterm/early term	36 $\frac{0}{7}$ to 37 $\frac{6}{7}$ weeks of gestation
Gestational Hypertension, without severe-range blood pressure	Early term	37 $\frac{0}{7}$ weeks or at diagnosis if diagnosed later
Gestational Hypertension with severe-range blood pressures	Late preterm	34 $\frac{0}{7}$ weeks or at diagnosis if diagnosed later
Preeclampsia without severe features	Early term	37 $\frac{0}{7}$ weeks or at diagnosis if diagnosed later
Preeclampsia with severe features, stable maternal & fetal conditions, after fetal viability (includes superimposed)	Late preterm	34 $\frac{0}{7}$ weeks or at diagnosis if diagnosed later
Preeclampsia with severe features, unstable or complicated, after fetal viability (includes superimposed and HELLP)	Soon after maternal stabilization	Soon after maternal stabilization
Preeclampsia with severe features, before viability	Soon after maternal stabilization	Soon after maternal stabilization

# COMPLICATIONS & ESCALATION PROCESS

## **MATERNAL** (pregnant or postpartum)

- CNS (seizure, unremitting headache, visual disturbance)
- Pulmonary edema or cyanosis
- Epigastric or right upper quadrant pain
- Impaired liver function
- Thrombocytopenia
- Hemolysis
- Coagulopathy
- Oliguria \**<30 ml/hr for 2 consecutive hours*

## **FETAL**

- Abnormal fetal tracing
- IUGR

→ **Prompt evaluation and communication:** If undelivered, plan for delivery

# MONITORING CHANGE OF STATUS

*Once patient is stabilized, consider:*

## SEIZURE PROPHYLAXIS

- Magnesium sulfate (if not already initiated)

## TIMING & ROUTE OF DELIVERY

- **Eclampsia** → Delivery after stabilization
- **HELLP/Severe preeclampsia/Chronic hypertension + superimposed preeclampsia** → Vaginal delivery, if attainable in reasonable amount of time
- **≥ 34 weeks** → Deliver

## MATERNAL BP

- Continue control with oral agents
- Target range of 140-150/90-100

## IF PRETERM (<34 WKS) & EXPECTANT MGMT PLANNED

- Antenatal corticosteroids
- Subsequent pharmacotherapy
- **HELLP (Gestational age of fetal viability to 33 6/7 wks)**
  - ✓ Delay delivery for 24-48 hours if maternal and fetal condition remains stable
- ✓ Contraindications to delay in delivery for fetal benefit of corticosteroids:
  - Uncontrolled hypertension
  - Eclampsia
  - Pulmonary edema
  - Suspected abruption placenta
  - Disseminated intravascular coagulation,
  - Nonreassuring fetal status
  - Intrauterine fetal demise



# POSTPARTUM SURVEILLANCE

Necessary to prevent additional morbidity as preeclampsia/eclampsia can develop postpartum

## INPATIENT

- Measure BP every 4 hours after delivery until stable
- Do not use NSAIDs for women with elevated BP (*current controversy*)
- Do not discharge patient until BP is well controlled for at least 24 hours

## OUTPATIENT

- For pts with preeclampsia, visiting nurse evaluation recommended:
  - ✓ Within 3-5 days
  - ✓ Again in 7-10 days after delivery (earlier if persistent symptoms)

\* Preeclampsia/eclampsia can occur 4-6 weeks.  
*California Maternal Quality Care Collaborative*

## ANTIHYPERTENSIVE THERAPY

- Recommended for persistent postpartum HTN: SBP  $\geq$  150 or DBP  $\geq$  100 on at least two occasions at least 4 hours apart
- Persistent SBP  $\geq$  160 or DBP  $\geq$  110 should be treated within 1 hour

Safe Motherhood Initiative



# Postpartum Preeclampsia Checklist

EMERGENCY DEPARTMENT

## TRIAGE PATIENTS LESS THAN 6 WEEKS POSTPARTUM AS FOLLOWS:

- Core evaluation and assessment
- If BP  $\geq$  160/110 or 140/90 with:
  - Unremitting headaches
  - Visual disturbance
  - Epigastric pain
- Begin stabilization
- Call for Obstetric consult immediately
- OBS contact documented
- Call MFM/MICU consult immediately for refractory blood pressure
- Labs should include:
  - CBC
  - PT
  - PTT
  - Fibrinogen
  - CMP
  - Uric Acid
  - Hepatic function panel
  - Type and Screen
- Initiate Intravenous Access
- Assess neurologic status
  - LOC/arousal/orientation/behavior
  - Deep tendon reflexes
  - Speech
- Assess vital signs including oxygen saturation
- Assess complaints and report; unremitting headaches, epigastric pain, visual disturbances, speech difficulties, lateralizing neuro signs
- Place Foley catheter
- Strict I&O report output less than 30 ml/hr for 2 hours
- Plan brain imaging studies if:
  - Unremitting headache
  - Focal signs and symptoms
  - Uncontrolled high blood pressure
  - Lethargy
  - Confusion
  - Seizures
  - Abnormal neurologic examination

## INITIAL MEDICATIONS

- Load 4-6 grams 10% magnesium sulfate in 100 ml solution IV over 20 minutes
- Magnesium sulfate on infusion pump
- Magnesium sulfate and pump labeled
- Magnesium sulfate 10 grams of 50% solution IM (5 grams in each buttock) if no IV access
- Magnesium sulfate maintenance 1-2 grams/hour continuous infusion

**Contraindications:** pulmonary edema, renal failure, myasthenia gravis

If magnesium sulfate is contraindicated  
Keppra 500 mg PO or IV every 12 hours

## ANTIHYPERTENSIVE MEDICATIONS

- **Labetalol** (20, 40, 80, 80 mg IV\* over 2 minutes, escalating doses, repeat every 10 minutes or 200 mg orally if no IV access); avoid in asthma or heart failure, can cause neonatal bradycardia
- **Hydralazine** (5-10 mg IV\* over 2 minutes, repeat in 20 minutes until target blood pressure is reached)
- Repeat blood pressure every 10 minutes during administration

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

Checklists help in multi-step process where the omission of any step can lead to patient harm.

# DISCHARGE PLANNING

## All patients receive information on preeclampsia:

- ✓ Signs and symptoms
- ✓ Importance of reporting information to health care provider as soon as possible
- ✓ Culturally-competent, patient-friendly language

## All new nursing and physician staff receive information on hypertension in pregnancy and postpartum

### FOR PATIENTS WITH PREECLAMPSIA

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- ✓ BP check recommended 72 hours after delivery
- ✓ Outpatient surveillance (visiting nurse evaluation) recommended:
  - Within 3-5 days
  - Again in 7-10 days after delivery (earlier if persistent symptoms)



# Preventive Strategies for Reducing the Risk of Hypertensive Disorders of Pregnancy/Aspirin Therapy

Level of Risk	Risk Factors	Recommendation
High <sup>†</sup>	<ul style="list-style-type: none"> <li>• History of preeclampsia, especially when accompanied by an adverse outcome</li> <li>• Multifetal gestation</li> <li>• Chronic hypertension</li> <li>• Type 1 or 2 diabetes</li> <li>• Renal disease</li> <li>• Autoimmune disease (ie, systemic lupus erythematosus, the antiphospholipid syndrome)</li> </ul>	Recommend low-dose aspirin if the patient has one or more of these high-risk factors
Moderate <sup>‡</sup>	<ul style="list-style-type: none"> <li>• Nulliparity</li> <li>• Obesity (body mass index greater than 30)</li> <li>• Family history of preeclampsia (mother or sister)</li> <li>• Sociodemographic characteristics (African American race, low socioeconomic status)</li> <li>• Age 35 years or older</li> <li>• Personal history factors (eg, low birth weight or small for gestational age, previous adverse pregnancy outcome, more than 10-year pregnancy interval)</li> </ul>	Consider low-dose aspirin if the patient has more than one of these moderate-risk factors <sup>§</sup>
Low	<ul style="list-style-type: none"> <li>• Previous uncomplicated full-term delivery</li> </ul>	Do not recommend low-dose aspirin

\* Based on good and consistent scientific evidence (Level A)

Sources: ACOG Practice Bulletin No. 202: Gestational Hypertension and Preeclampsia. *Obstetrics & Gynecology*133(1):e1-e25, January 2019.

## READINESS

### Every Unit

- Standards for early warning signs, diagnostic criteria, monitoring and treatment of severe preeclampsia/eclampsia (include order sets and algorithms)
- Unit education on protocols, unit-based drills (with post-drill debriefs)
- Process for timely triage and evaluation of pregnant and postpartum women with hypertension including ED and outpatient areas
- Rapid access to medications used for severe hypertension/eclampsia: Medications should be stocked and immediately available on L&D and in other areas where patients may be treated. Include brief guide for administration and dosage.
- System plan for escalation, obtaining appropriate consultation, and maternal transport, as needed

## RECOGNITION & PREVENTION

### Every Patient

- Standard protocol for measurement and assessment of BP and urine protein for all pregnant and postpartum women
- Standard response to maternal early warning signs including listening to and investigating patient symptoms and assessment of labs (e.g. CBC with platelets, AST and ALT)
- Facility-wide standards for educating prenatal and postpartum women on signs and symptoms of hypertension and preeclampsia

# Hypertension

## RESPONSE

Every case of severe hypertension/preeclampsia

- Facility-wide standard protocols with checklists and escalation policies for management and treatment of:
  - Severe hypertension
  - Eclampsia, seizure prophylaxis, and magnesium over-dosage
  - Postpartum presentation of severe hypertension/preeclampsia
- Minimum requirements for protocol:
  - Notification of physician or primary care provider if systolic BP  $\geq$  160 or diastolic BP  $\geq$  110 for two measurements within 15 minutes
  - After the second elevated reading, treatment should be initiated ASAP (preferably within 60 minutes of verification)
  - Includes onset and duration of magnesium sulfate therapy
  - Includes escalation measures for those unresponsive to standard treatment
  - Describes manner and verification of follow-up within 7 to 14 days postpartum
  - Describe postpartum patient education for women with preeclampsia
- Support plan for patients, families, and staff for ICU admissions and serious complications of severe hypertension

## REPORTING/SYSTEMS LEARNING

Every unit

- Establish a culture of huddles for high risk patients and post-event debriefs to identify successes and opportunities
- Multidisciplinary review of all severe hypertension/eclampsia cases admitted to ICU for systems issues
- Monitor outcomes and process metrics

*Note: "Facility-wide" indicates all areas where pregnant or postpartum women receive care. (E.g. L&D, postpartum critical care, emergency department, and others depending on the facility).*

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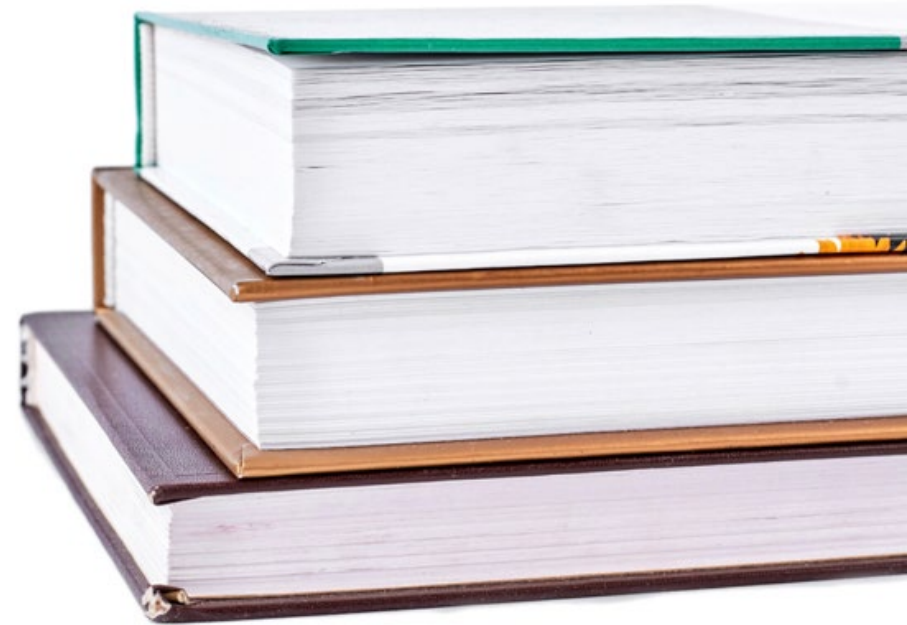
Standardization of health care processes and reduced variation has been shown to improve outcomes and quality of care. The Council on Patient Safety in Women's Health Care disseminates patient safety bundles to help facilitate the standardization process. This bundle reflects emerging clinical, scientific, and patient safety advances as of the date issued and is subject to change. The information should not be construed as dictating an exclusive course of treatment or procedure to be followed. Although the components of a particular bundle may be adapted to local resources, standardization within an institution is strongly encouraged.

The Council on Patient Safety in Women's Health Care is a broad consortium of organizations across the spectrum of women's health for the promotion of safe health care for every woman.

## Assessment Question 1

Which type of hypertensive disorder can complicate pregnancy and features a new onset of hypertension with blood pressure 140/90 or greater and proteinuria of 300mg or more in a 24 hour urine collection?

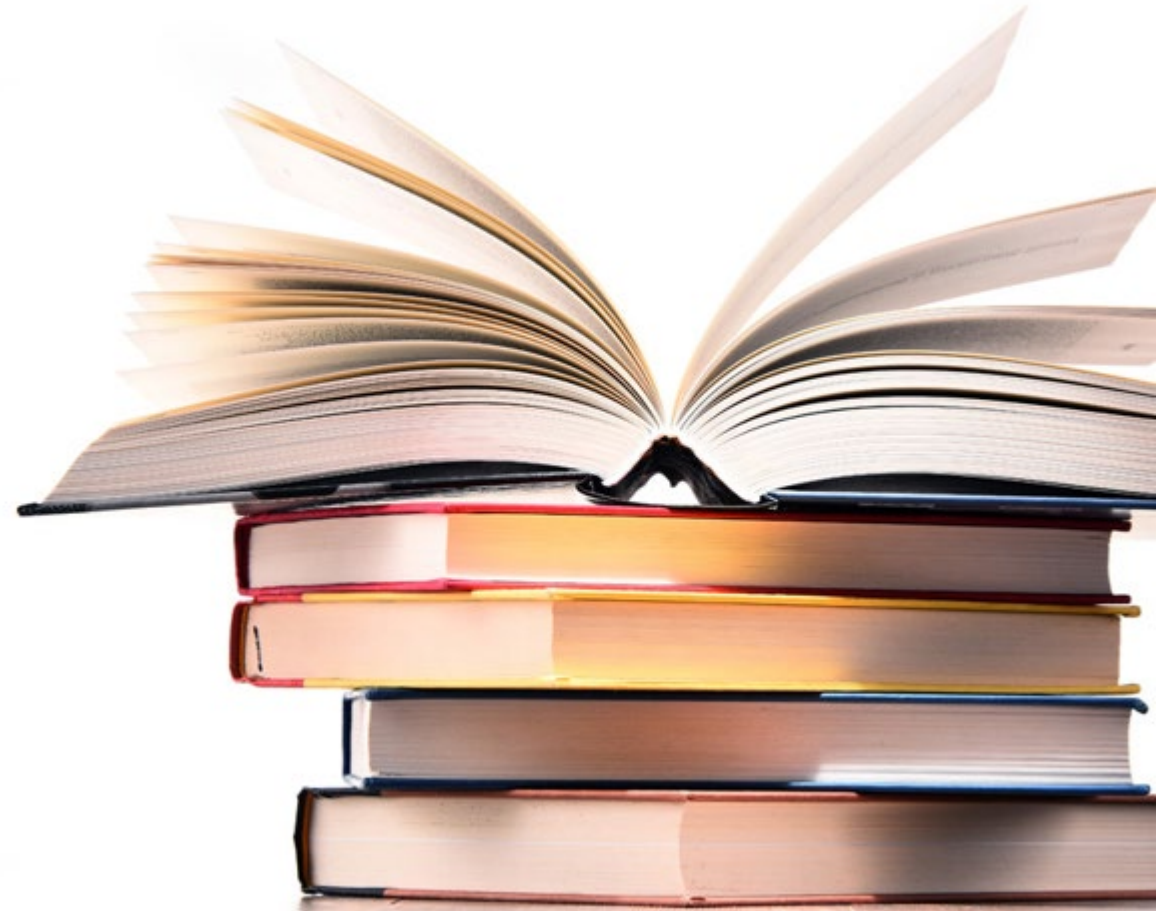
- a. Chronic hypertension
- b. Gestational hypertension
- c. Preeclampsia
- d. Malignant hypertension



## Assessment Question 1 Correct Response

Which type of hypertensive disorder can complicate pregnancy and features a new onset of hypertension with blood pressure 140/90 or greater and proteinuria of 300mg or more in a 24 hour urine collection?

- a. Chronic hypertension
- b. Gestational hypertension
- c. Preeclampsia**
- d. Malignant hypertension

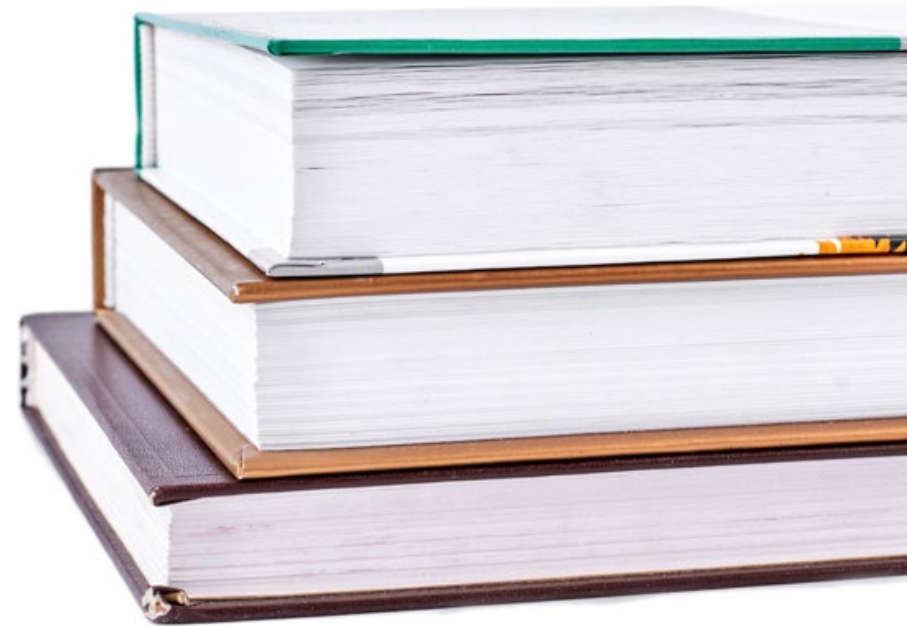




## Assessment Question 2

Maternal and fetal complications that can result from hypertensive disorders of pregnancy include which of the following?

- a. Intrauterine growth restriction (IUGR)
- b. Eclamptic seizures
- c. Hemorrhagic stroke
- d. All of the above



## Assessment Question 2 Correct Response

Maternal and fetal complications that can result from hypertensive disorders of pregnancy include which of the following?

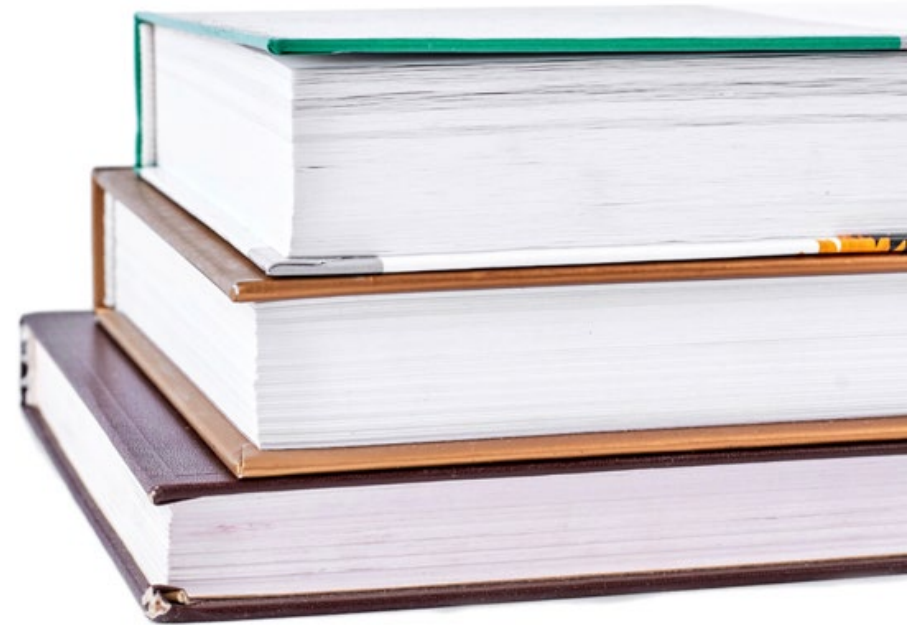
- a. Intrauterine growth restriction (IUGR)
- b. Eclamptic seizures
- c. Hemorrhagic stroke
- d. All of the above**



## Assessment Question 3

Which of the following is a first line treatment strategy in the management of hypertensive emergencies in pregnancy?

- a. Oral labetalol
- b. Oral hydralazine
- c. Oral nifedipine
- d. Magnesium sulfate





## Assessment Question 3 Correct Response

Which of the following is a first line treatment strategy in the management of hypertensive emergencies in pregnancy?

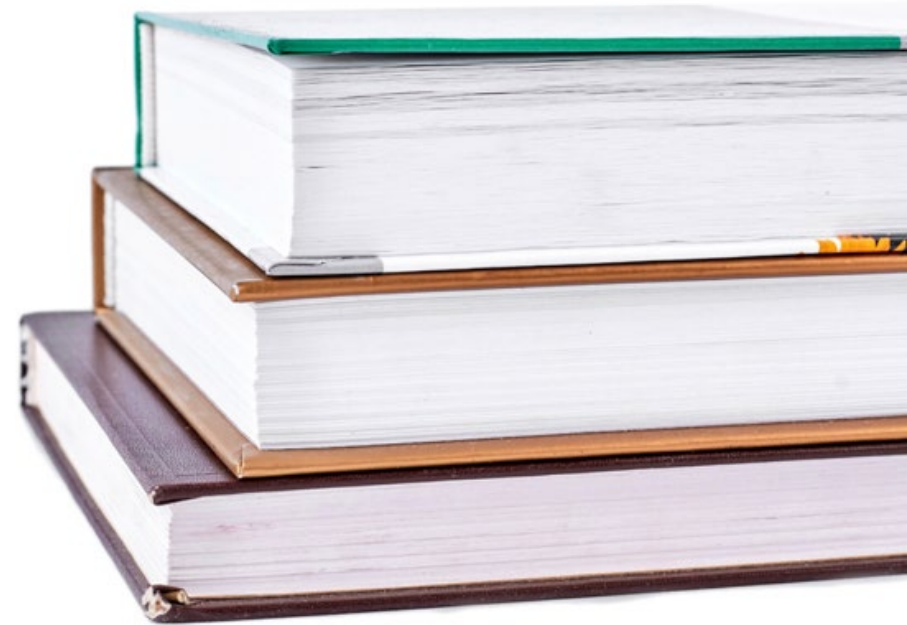
- a. Oral labetalol
- b. Oral hydralazine
- c. Oral nifedipine**
- d. Magnesium sulfate



## Assessment Question 4

How does an evidence-based care team approach improve outcomes in patients with hypertensive disorders of pregnancy?

- a. Timely, accurate diagnosis
- b. Minimize delays in critical processes
- c. Enhance communication between team members
- d. All of the above



## Assessment Question 4 Correct Response

How does an evidence-based care team approach improve outcomes in patients with hypertensive disorders of pregnancy?

- a. Timely, accurate diagnosis
- b. Minimize delays in critical processes
- c. Enhance communication between team members
- d. All of the above**



# Hypertensive Disorders of Pregnancy

## Maternal Mortality – An American Failure

### Conclusion:

- Severe uncontrolled hypertension is deadly.
- Eclampsia is deadly.
- Diagnose quickly and accurately.
- Clinical deterioration can be rapid and fulminate.
- Timely, accurate diagnosis and rapid treatment will save lives.
- Be vigilant for complications.
- Healthcare is a TEAM sport.
- Get the word out!



**It is incumbent on all healthcare professionals to take the responsibility to begin adopting new approaches, new tools and new thinking to reverse the rates of maternal mortality and morbidity in the U.S.**

Source: *Foley et al Obstetric Intensive Care Manual 2004*

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...Thank you...

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