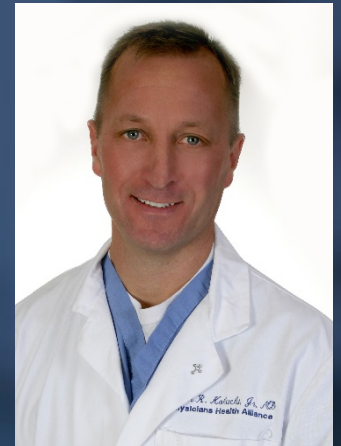




HEALTHTRUST®

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Addressing the Tragedy of Maternal Mortality & Morbidity in America

A presentation for HealthTrust Members by

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Addressing the Tragedy of Maternal Mortality & Morbidity in America: Part 3, Hypertensive Disorders of Pregnancy

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Addressing the Tragedy of Maternal Mortality & Morbidity in America:

Part 3, Hypertensive Disorders of Pregnancy

Learning Objectives

- Describe the four types of hypertension that can complicate pregnancy
- Explain the maternal and fetal complications that can result from hypertensive disorders of pregnancy
- Recall the evaluation, diagnosis and management of hypertensive emergencies in pregnancy
- Identify the benefits of utilizing an evidence-based care team approach to aid patients with hypertensive disorders



Hypertensive Disorders of Pregnancy

Treatment of Hypertensive Emergencies

Proper management WILL Prevent Maternal Mortality.

Maternal Mortality, An American Tragedy

YoLanda Mention of Nesmith, SC,
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 60th 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 Trends 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

Clear Need for Action

Current Commentary

Where Is the “M” in Maternal-Fetal Medicine?

Mary E. D’Alton, MD

In contrast to the generally encouraging trend regarding global maternal mortality, there has been an apparent increase in the maternal mortality ratio in the United States. Although maternal death remains a relatively rare adverse event in this country, programs to reduce maternal mortality also will result in a reduction in maternal morbidity, which is a far more prevalent problem. Progress in the field of maternal-fetal medicine over the past several decades has been largely attributable to improvements in fetal and neonatal medicine. We need to develop an organized, national approach focused on reducing maternal mortality and morbidity. The goal will be to outline a specific plan for clinical, educational, and research initiatives to put the “M” back in maternal-fetal medicine.

(Obstet Gynecol 2010;116:1401-6)

Twenty-five years ago, in a seminal article published in the *Lancet*, Allen Rosenfield and Deborah Maine alerted the public to the tremendous problem of global maternal mortality.¹ Recognizing that maternal-child health care programs in developing countries were doing little to reduce maternal mortality and improve maternal health, this commentary was a call to action for health professionals, policy makers, and politicians to focus on this critical issue. Soon thereafter, the international movement to reduce maternal mortality was launched at the global Safe Motherhood Conference in Nairobi, Kenya. Finally, the international community acknowledged the importance of maternal health in the broader context of women’s rights and equality and committed resources to

decreasing maternal mortality. More recently, reduction in maternal mortality became one of the eight Millennium Development Goals of the United Nations.²

There has been good news this year in the progress toward the Millennium Development Goals of the United Nations, which targets a reduction in the maternal mortality ratio by 75% from 1990 to 2015. In a comprehensive analysis funded by the Bill and Melinda Gates Foundation, estimates of global maternal deaths have declined from 526,300 in 1980 to 342,900 in 2008.³ Maternal mortality is difficult to measure, particularly in developing countries; thus, there are wide uncertainty intervals around these numbers. Nevertheless, these new estimates provide hope that interventions to reduce fertility rates, increase income and education, and expand access to skilled birthing attendants, among other efforts, may be producing the desired results. Because only a minority of countries is currently on track to meet the Millennium Development Goals of the United Nations, it is imperative that the global health community remains fully committed to this goal. At this year’s Women Deliver conference, Melinda Gates pledged \$1.5 billion toward maternal, newborn, and child health in developing countries over the next 5 years, the second largest donation in the foundation’s history. This money not only will enormously help countries with the highest rates of maternal mortality but also it may prompt governments and organizations worldwide to invest more toward maternal health.

In contrast to the generally encouraging trend regarding global maternal mortality, there has been an apparent increase in the maternal mortality ratio in several high-income countries, such as the United States, Canada, Denmark, and Norway.² This is not the first evidence that maternal mortality is increasing in the United States. The National Center for Health Statistics has reported that the maternal mortality ratio increased by 62% between 1990 and 2006, from 8.2 to 13.3 per 100,000.⁴ These increases have been largely attributed to methodological changes in the

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



Sentinel Event Alert

January 26, 2010

Issue 44, January 26, 2010

National Focus

Preventing Maternal Death

The goal of all labor and delivery units is a safe birth for both newborn and mother. A previous *Alert*⁽¹⁾ reviewed the causes of death and injury among newborns with normal birth weight and suggested risk reduction strategies. This Alert addresses the equally tragic loss of mothers. Unfortunately, current trends and evidence suggest that maternal mortality rates may be increasing in the U.S., despite the rarity of the incidence of maternal death – deaths that occur within 42 days of birth or termination of pregnancy. Since 1996, a total of 84 cases of maternal death have been reported to The Joint Commission’s sentinel event database, with the largest numbers of events reported in 2004, 2005 and 2006. According to the National Center for Health Statistics of the Centers for Disease Control and Prevention, in 2006, the national maternal mortality rate was 13.3 deaths per 100,000 live births. ⁽²⁾ “Although the current maternal mortality rate may reflect increased identification of women who died during or shortly after pregnancy ⁽³⁾, there clearly has been no decrease in maternal mortality in recent years, and we are not moving toward the U.S. government’s Healthy People 2010 target of no more than 3.3 maternal deaths per 100,000 live births ⁽⁴⁾,” says William M. Callaghan, M.D., M.P.H., senior scientist, Division of Reproductive Health, Centers for Disease Control and Prevention.

Leading causes and prevention of maternal death

According to a study by the CDC of pregnancy-related mortality in the U.S. between 1991 and 1997, ⁽⁵⁾ the leading causes of maternal death are: hemorrhage, hypertensive disorder, pulmonary embolism, amniotic fluid embolism, infection, and pre-existing chronic conditions (such as cardiovascular disease). The study – conducted with state health departments and the American College of Obstetricians and Gynecologists – also indicated a four-fold increased risk of pregnancy-related death for black women, and increased risks for older women and women with no prenatal care. Whether due to better management, increased awareness or quality improvement, the numbers of deaths related to hemorrhage are declining, while deaths attributable to other medical conditions – including cardiovascular, pulmonary and neurologic problems – have significantly increased. ⁽⁴⁾

Comment on this Alert.

Individual state health departments and researchers nationally are examining the possible role of pre-existing medical conditions in contributing to maternal death. Pre-pregnancy obesity, with its related health implications, is an example. “Obesity is a growing epidemic in this country which impacts all age groups, including women of child-bearing age. Obesity can lead to hypertensive disorders, diabetes, and other medical conditions, and thus can directly and indirectly present significant health risks for pregnant women,” says Janet Hardy, Ph.D., M.Sc., M.P.H., perinatal epidemiologist and assistant professor, Departments of Medicine, Obstetrics/Gynecology and Pediatrics, University of Massachusetts Medical School. “Heightened practitioner awareness and screening of pre-pregnant and pregnant women with pre-existing conditions and associated risk factors should be optimized. Improving access to prenatal care environments where specialized services and support are available for these women should be considered.” It is only by taking a thorough medical and social history that underlying factors can be revealed.

Attempts to identify preventable deaths and understand how to prevent them has yielded varying results; several studies ^(6,7,8) determined that from 28 to 50 percent of maternal deaths were preventable. In 2008, Hospital Corporation of America (HCA) looked at individual causes of maternal deaths among 1.5 million births within 124 hospitals in the previous six years. ⁽⁶⁾ The study concluded that the majority of maternal deaths are not preventable and that while some deaths can be prevented by better individual care, precise figures indicating the frequency of preventable deaths should be examined carefully and with caution. According to the HCA study, the most common preventable errors are:

- Failure to adequately control blood pressure in hypertensive women
- Failure to adequately diagnose and treat pulmonary edema in women with pre-eclampsia
- Failure to pay attention to vital signs following Cesarean section
- Hemorrhage following Cesarean section

“The data showed the individual causes of death to be very heterogeneous and that the only cause of maternal death amendable to nationwide systematic prevention efforts is pulmonary embolism,” says Steven L. Clark, M.D., medical

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.*

Sources: D'Alton, et al. National Partnership for Maternal Safety 2014 and California Maternal Quality Care Collaborative

| Maternal Mortality

Three Significant Etiologies/Three Opportunities/Three High Value Targets

- Hemorrhage
- Hypertension / Preeclampsia / Eclampsia
- Thromboembolism

Source: National Partnership Maternal Safety. ACOG 2014

| Healthcare is a Team Sport

HealthTrust Team Members

- Nursing
- Pharmacy
- Laboratory Medicine
- Physicians
- Administrators

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 ≥ 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 24hr 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

Sources: *Working group report on high blood pressure in pregnancy* NIH 2000.
ACOG Task Force 2013. *ACOG Practice Bulletin Number 202* January 2019

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 ≥ 160 or Diastolic BP ≥ 110
- Platelets $< 100,000$ per mm^3
- Abnormal liver function test ALT/AST $\geq 2X$ normal
- Renal insufficiency (creatinine level ≥ 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 mm³
 - 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 CV, Smulian JC. *Epidemiology of Critical Illness in Pregnancy. Critical Care Obstetrics 2017*

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*).

Source: ACOG Task Force on Hypertension in Pregnancy 2013

❖ *Clinical Pearl*

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.

Sources: ACOG Task Force on Hypertension in Pregnancy 2013

CMQCC
California Maternal
Quality Care Collaborative

TYPES OF HYPERTENSION

CHRONIC HYPERTENSION	<ul style="list-style-type: none"> ○ SBP \geq 140 or DBP \geq 90 ○ Pre-pregnancy or $<$20 weeks
GESTATIONAL HYPERTENSION	<ul style="list-style-type: none"> ○ SBP \geq 140 or DBP \geq 90 ○ $>$ 20 weeks ○ Absence of proteinuria or systemic signs/symptoms
PREECLAMPSIA - ECLAMPSIA	<ul style="list-style-type: none"> ○ SBP \geq 140 or DBP \geq 90 ○ Proteinuria with or without signs/symptoms ○ Presentation of signs/symptoms/lab abnormalities but no proteinuria <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"> ○ Two severe BP values (SBP \geq 160 or DBP \geq 110) obtained 15-60 minutes apart ○ Persistent oliguria $<$500 ml/24 hours ○ Progressive renal insufficiency ○ Unremitting headache/visual disturbances ○ Pulmonary edema ○ Epigastric/RUQ pain ○ LFTs $>$ 2x normal ○ Platelets $<$ 100K ○ HELLP syndrome <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 and 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 mm³)
- 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 Triad: Hypothermia, Acidemia and DIC

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

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 ≥ 1.2 mg/dL = severe disease
- Pathology leads to oliguria (< 500 cc /24^o 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

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

❖ *Clinical Pearl*

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)

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

❖ *Clinical Pearl*

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 (MgSO_4)
- UK initiative demonstrated significant decrease in maternal morbidity and mortality

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

❖ *Clinical Pearl*

Hypertensive Disorders of Pregnancy

Preeclampsia

Seizure Prevention/Treatment

- Magnesium sulfate (MgSO₄) is the drug of choice.
- If MgSO₄ 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

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

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.

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

❖ *Critical Pearl*

Hypertensive Disorders of Pregnancy

Preeclampsia

Pulmonary Manifestations

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

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

Hypertensive Disorders of Pregnancy

Preeclampsia

HELLP Syndrome

- Pathophysiology is in a class of it's 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^3

- ❖ Presentation may be atypical (e.g. low platelets with mild elevation LFTs).

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

❖ *Critical Care Pearl*

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

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

| 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%

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

Eclampsia Algorithm

Call for help

1. Position patient in left lateral decubitus position
2. Establish open airway and maintain breathing
3. Check Oxygen level
4. Check blood pressure and pulse
5. Obtain IV access: 1 or 2 large-bore IV catheters

Magnesium Sulfate
4-6 gram IV loading dose
over 15-20 minutes; followed
by a 2 gram/hour
maintenance dose if renal
function is normal

If the patient seizes again
while on magnesium sulfate
maintenance dose:

If patient has a recurrent
seizure after a 2nd loading
dose of magnesium sulfate
consider the following:

1. Maintain airway and oxygenation
2. Give a 2nd loading dose of magnesium sulfate 2 grams over 5 minutes
3. Observe for signs of magnesium toxicity

1. Midazolam (versed) 1-2 mg IV (can repeat in 5-10 minutes) OR
2. Lorazepam (ativan) 4 mg IV over 2-5 minutes (can repeat in 5-15 minutes to maximum of 8 mg in 12 hours) OR
3. Diazepam (valium) 5-10 mg IV slowly (can repeat every 15 minutes up to 30 mg) OR
4. Phenytoin (dilantin) 1000 mg IV over 20 minutes
5. Monitor respiration and BP, ECG and signs of magnesium toxicity. Phenytoin may cause QRS or QT prolongation.

NOTE: These recommendations can be modified for use as each institution requires.

Resolution of seizures:

1. Maintain magnesium sulfate infusion until 24 hours after the last seizure or after delivery, whichever is later
2. Assess for any signs of neurologic injury/focal deficit: head imaging should be considered if neurologic injury is suspected
3. Once the patient is stabilized preparations should be made for delivery: mode of delivery is dependent upon clinical circumstances surrounding the pregnancy

Discontinuation of therapy:

Severe preeclampsia and eclampsia: 24 hours after delivery or after last seizure

NOTE: Administration beyond 24 hours may be indicated if the patient shows no signs of improvement

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.*

Sources: ACOG Safe Motherhood Initiative 2017

❖ *Clinical Pearl*

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

Sources: ACOG Safe Motherhood Initiative 2017 . ACOG Practice Bulletin NO. 203 January 2019

❖ *Clinical Pearl*

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*

Safe Motherhood Initiative



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

† "Active asthma" is defined as:

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

MAGNESIUM SULFATE

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

IV access:

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

No IV access:

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

ANTIHYPERTENSIVE MEDICATIONS

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

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

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

Note: If 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

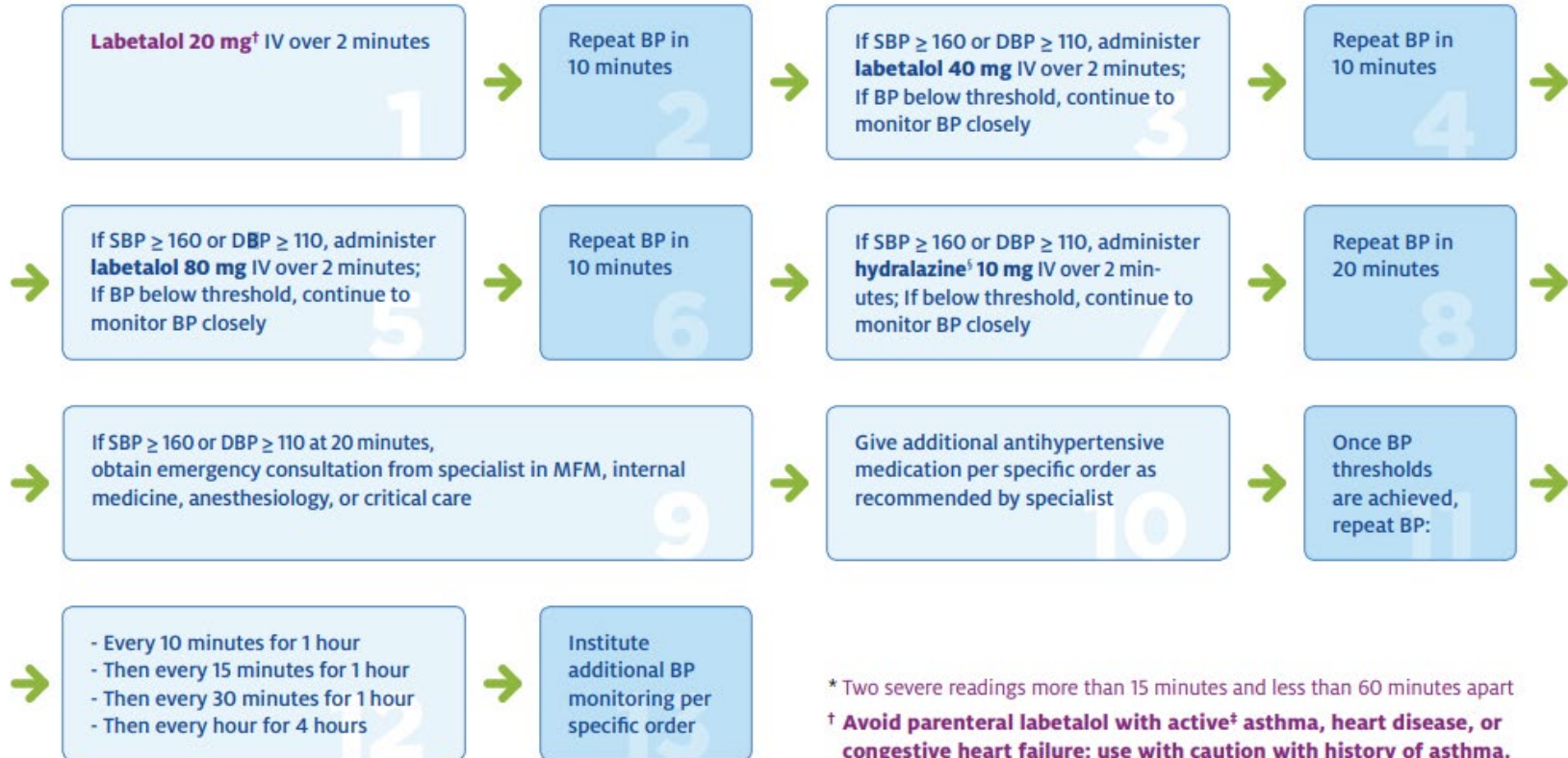
- Lorazepam (Ativan):** 2-4 mg IV x 1, may repeat once after 10-15 min
- Diazepam (Vallium):** 5-10 mg IV q 5-10 min to maximum dose 30 mg

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 ≥ 160 or DBP ≥ 110) persist* for 15 min or more **OR** If two severe elevations are obtained within 15 min and tx is clinically indicated



- 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[‡] 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

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



- 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[‡] asthma, heart disease, or congestive heart failure; use with caution with history of asthma. May cause neonatal bradycardia.**

‡ "Active asthma" is defined as:

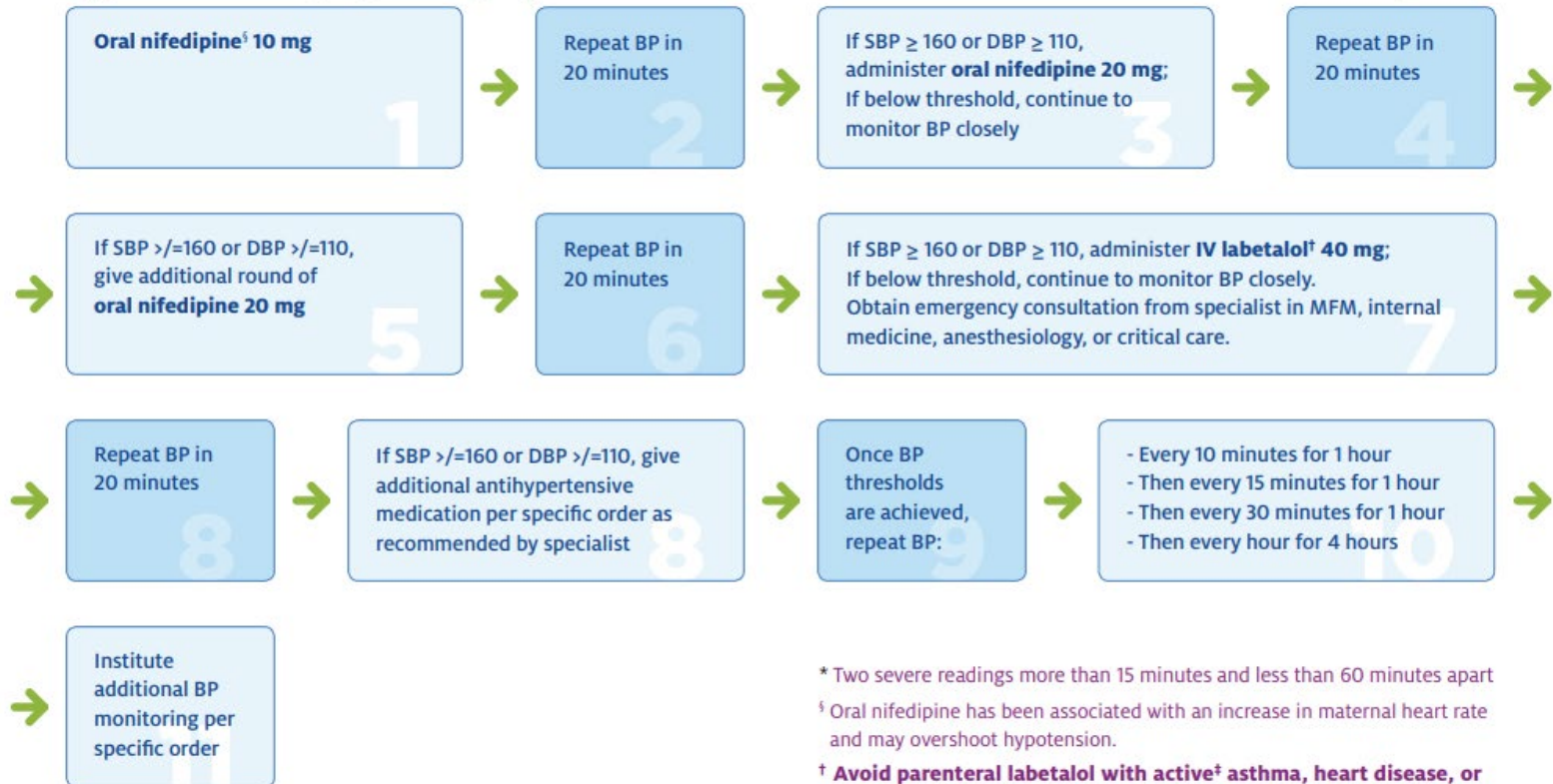
- Ⓐ symptoms at least once a week, or
- Ⓑ use of an inhaler, corticosteroids for asthma during the pregnancy, or
- Ⓒ any history of intubation or hospitalization for asthma.

§ Hydralazine may increase risk of maternal hypotension.

Oral Nifedipine Algorithm

EXAMPLE

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



- 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[‡] asthma, heart disease, or congestive heart failure; use with caution with history of asthma. May cause neonatal bradycardia.**

‡ "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.



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

† "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



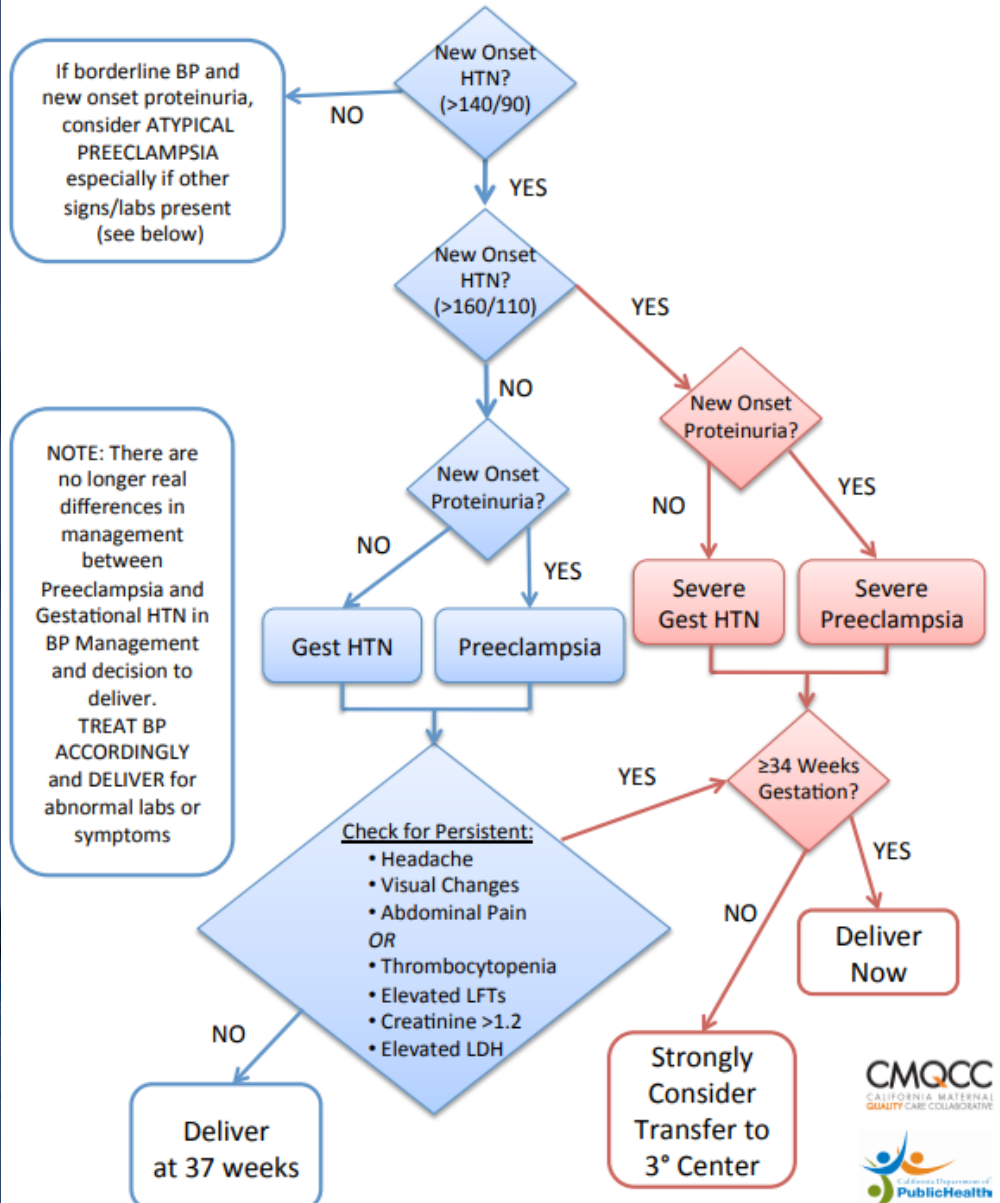
Baby

- Iatrogenic Prematurity with Resultant Morbidity & Mortality

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

SUSPECTED PREECLAMPSIA ALGORITHM

Suspected Preeclampsia Flowchart Diagnosis and Management



Hypertensive Disorders of Pregnancy

Conditions Precluding Expectant Management of Preeclampsia with Severe Features less than 34 Weeks

Maternal

- Uncontrolled severe-range blood pressures (persistent systolic blood pressure 160 mm Hg or more or diastolic blood pressure 110mm Hg or more, not responsive 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

Table 1. Guidance Regarding Timing of Delivery When Conditions Complicate Pregnancy at or After 34 Weeks of Gestation (*continued*)

Condition	Gestational Age* at Delivery	Grade of Recommendation†
Maternal issues		
Chronic hypertension—no medications‡	38–39 wk	B
Chronic hypertension—controlled on medication‡	37–39 wk	B
Chronic hypertension—difficult to control (requiring frequent medication adjustments) ‡	36–37 wk	B
Gestational hypertension§	37–38 wk	B
Preeclampsia—severe‡	At diagnosis (recommendation limited to pregnancies at or after 34 wk)	C

† Uncomplicated, thus no fetal growth restriction, superimposed preeclampsia, etc. If these are present, then the complicating conditions take precedence and earlier delivery may be indicated.



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



- ❖ Patients often get worse before they get better.
- ❖ Preeclampsia can commonly manifest itself as a post partum event

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
Kepra 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

- ✓ BP monitoring 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 [†]	<ul style="list-style-type: none"> • History of preeclampsia, especially when accompanied by an adverse outcome • Multifetal gestation • Chronic hypertension • Type 1 or 2 diabetes • Renal disease • Autoimmune disease (ie, systemic lupus erythematosus, the antiphospholipid syndrome) 	Recommend low-dose aspirin if the patient has one or more of these high-risk factors
Moderate [‡]	<ul style="list-style-type: none"> • Nulliparity • Obesity (body mass index greater than 30) • Family history of preeclampsia (mother or sister) • Sociodemographic characteristics (African American race, low socioeconomic status) • Age 35 years or older • Personal history factors (eg, low birth weight or small for gestational age, previous adverse pregnancy outcome, more than 10-year pregnancy interval) 	Consider low-dose aspirin if the patient has more than one of these moderate-risk factors [§]
Low	<ul style="list-style-type: none"> • Previous uncomplicated full-term delivery 	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.

| 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.

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

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.



Marco Mention, left, dresses his daughter Serenity at their home in Nesmith, SC. He balances work as a school bus driver with the demands of raising three daughters alone.
~Jack Gruber/USA TODAY

“It seems like a nightmare and I wake up. Trying to be a mother and a father is hard.”

~Marco Mention

Healthcare is a TEAM sport -- **Individuals Fail, Teams Win** -- Get the word out!

Thank you

Frank R. Kolucki, Jr. M.D., FACOG

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