



## OKLC LB OB Hypertension Protocol Mercy Hospital Oklahoma City

<b>Approved by:</b>	Mercy Hospital Oklahoma City - Medical Executive Committee, Emily Eriksson (Vice President-Patient Care Sv), Laura Beck (Exec Director-Nursing)	<b>Approval Date:</b>	04/16/2024
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Mercy has developed these guidelines to help Mercy providers in the appropriate standards of care for evaluation and treatment of patients with hypertension. These guidelines do not replace clinical judgment in the appropriate care of patients. These guidelines are a consensus of the Mercy Women’s Services Specialty Council.

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## I. Introduction

Hypertensive disorders of pregnancy occur in 12-22% of pregnancies. These disorders are a leading cause of maternal mortality and are responsible for approximately 17% of maternal mortality in the U.S.

Previously emphasis was placed on the prevention of eclamptic seizures which have a significant risk of increased maternal and neonatal morbidity and mortality. Recently, more emphasis has been placed on controlling blood pressure to reduce the risk of maternal stroke and other adverse consequences. It is well documented that severe range blood pressure, defined as systolic blood pressure 160 mm Hg or greater and/or diastolic blood pressure 110 mm Hg or greater, is associated with patients dying of cerebrovascular accident in the context of a preeclampsia/eclampsia diagnosis.

According to ACOG guidelines, the diagnosis of preeclampsia is no longer dependent on the presence of proteinuria. Evidence shows organ problems with kidneys and liver can occur without proteinuria. The amount of protein in the urine does not predict disease progression or risk for perinatal and maternal morbidity. Massive proteinuria has been eliminated from consideration as a severe feature of preeclampsia.

Preeclampsia is diagnosed by new onset of high blood pressure that develops after 20 weeks gestation up to 6 weeks postpartum that can be associated with proteinuria, development of thrombocytopenia, kidney or liver dysfunction, and pulmonary edema or cerebral edema causing potential seizures and/or neurologic symptom such as headache or visual disturbances. As of this time there is no single, reliable, cost-effective screening test for preeclampsia. Low dose aspirin has been found to lower risks of preeclampsia in high risk population. Otherwise, there are no well-established measures for primary prevention.

Use of the labels "mild" or "severe" preeclampsia are no longer recommended. Preeclampsia is considered a dynamic process; the disease progresses but at different rates in different women. Frequent re-evaluation is required to identify severe features of the disease which will guide appropriate treatment.

## II. Standards for evaluation and treatment of patients with hypertension

### A. Accurate method to measure blood pressure (BP):

Equipment and technique:

- Mercury sphygmomanometer is gold standard, can use validated equivalent automated equipment
- Use a sitting or semi-reclining position with HOB at 30 degrees with back supported and arm at heart level
- Patient to sit quietly for 5 minutes prior to measurement
- Bare upper arm of any restrictive clothing
- Patients feet should be flat, not dangling from examination table or bed, and her legs uncrossed

**B. Use appropriate size blood pressure cuff:**

- American Heart Association’s recommended BP cuff size

ARM CIRCUMFERENCE	CUFF	SIZE
22 to 25 cm	Small adult	12 x 22 cm
27 to 34 cm	Adult	16 x 30 cm
35 to 44 cm	Large adult	16 x 36 cm
45 to 52 cm	Adult thigh	16 x 42 cm

- Accurate blood pressure measurements in obese women can be challenging and it is extremely important to use an appropriately sized cuff.

Leadership responsibilities:

- Ensure appropriate size blood pressure cuff is available.
- Assess staff for blood pressure measurement competency

**C. Standard diagnostic criteria for hypertension and preeclampsia:** (these criteria are for pregnant and postpartum patients and may not apply to other patients)

- Hypertension: Blood pressure greater than 140/90 on two separate measurements at least 4 hours apart
- Chronic hypertension: hypertension diagnosed before pregnancy, before the 20th week of pregnancy, or that persists more than 12 weeks after delivery
- Gestational hypertension:
  - Blood pressure greater than 140/90
  - Pregnancy duration of at least 20 weeks
  - No previous history of hypertension
  - Does not meet criteria for preeclampsia
  - No protein in urine (proteinuria)
- Preeclampsia
  - Blood pressure greater than 140/90
  - Typically have proteinuria but not always
  - May have severe features
    - Neurologic symptoms such as headache or visual changes
    - Epigastric pain

- Thrombocytopenia (< 100K)
- Elevated AST/ALT (2 x upper normal range)
- Elevated creatinine > 1.1 or double baseline value
- Pulmonary edema
- Oliguria
- Chronic hypertension with superimposed preeclampsia:
  - A woman with chronic hypertension who develops preeclampsia after 20 weeks
- Severe hypertension: blood pressure greater than or equal to 160/110

**D. Treatment of severe hypertension:**

- If a patient has a severe range blood pressure it should be repeated within 15 minutes. If severe range blood pressure persists it should be treated within a short period of time (30-60 minutes)
- Patients with severe hypertension, particularly if patient has preeclampsia, are at risk for stroke, heart attack and placental abruption, complications that occur rapidly and can lead to serious maternal and/or fetal injury and even death
- Persistent severe hypertension needs to be treated within 30-60 minutes
- Any of the following medications can be used for treatment of severe range hypertension. There are no significant differences regarding either safety or efficacy between the different agents.
  - Hydralazine (onset of action 10-20 minutes)
    - Initial 5 mg IV dose
    - If after 20 minutes BP remains in severe range, administer an additional 10 mg IV
    - Can administer 5-10 mg every 20-40 minutes to a maximum cumulative dosage of 20 mg
    - If after 20-40 minutes BP remains in severe range consider switching to IV Labetalol or PO Procardia
    - Higher or frequent dose associated with maternal hypotension, headaches, and abnormal fetal heart rate tracings
  - Labetalol (onset of action 1-2 minutes)
    - Initial 10-20 mg IV dose
    - If BP remains in severe range after 10 minutes administer 40 mg IV
    - If BP remains in severe range after 10 minutes, administer 80 mg IV
    - Can administer 20-80 mg every 10-30 minutes to a maximum cumulative dosage of 300 mg
    - Alternative option of constant infusion of 1-2 mg/min IV

- If BP remains in severe range after 20-40 minutes, consider switching to IV hydralazine or PO Procardia
- Tachycardia is less common and fewer adverse effects
- Avoid in women with asthma, preexisting myocardial disease, decompensated cardiac function, and heart block and bradycardia
- Procardia (onset of action 5-10 minutes)
  - Procardia 10-20 mg orally, can repeat in 20 minutes if needed
  - Can give 10-20 mg every 2-6 hours; maximum daily dose is 180 mg
  - If BP remains in severe range after 20-40 minutes, consider switching to IV Labetalol
  - May observe reflex tachycardia and headache
- See Appendix 1, 2, and 3 (tables from ACOG Practice Bulletin Number 203: Sample order sets for treatment of severe range blood pressure)
- Moderate hypertension: Blood pressure greater than or equal to 150/100 but less than 160/110
  - This blood pressure threshold is often used to initiate or change antihypertension medications
  - Patients with persistent or intermittent blood pressure greater than or equal to 150/100 may need to stay in hospital
  - Patients with blood pressure greater than or equal to 150/100 should have their blood pressure repeated within 2-4 hours. If BP is persistently greater than or equal to 150/100, a physician should be notified to evaluate patient

**E. Suspected preeclampsia algorithm diagnosis and management**

- See Appendix 4

**F. Patient management of gestational hypertension and preeclampsia**

- Recommend delivery for patients with gestational hypertension or preeclampsia at 37 weeks or greater
- Recommend delivery for patients with preeclampsia with severe features at 34 weeks or greater
- Patients with severe features of preeclampsia at less than 34 weeks gestation may be most appropriately managed at a tertiary center and/or with Maternal-Fetal Medicine consultation
- Some patient with preeclampsia with severe features (e.g., severe range hypertension) may be managed expectantly at less than 34 weeks. The following conditions preclude expectant management:
  - Maternal conditions:
    - Uncontrolled severe-range blood pressure (not responsive to anti-hypertensive medications)
    - Persistent headache not responsive to treatment
    - Epigastric or RUQ pain unresponsive to repeat analgesics
    - Visual disturbances, motor deficit or altered sensorium

- Stroke
- Myocardial infarction
- HELLP syndrome
- New or worsening renal function (serum creatinine greater than 1.1 or double baseline)
- Pulmonary edema
- Suspected acute placental abruption or vaginal bleeding in the absence of placenta previa
- Fetal conditions:
  - Abnormal fetal testing
  - Fetal death
  - Fetus without expectation for survival at time of maternal diagnosis (e.g., lethal anomaly, extreme prematurity)
  - Persistent reversed end-diastolic flow in the umbilical artery
- Delaying delivery to administer betamethasone at less than 34 weeks with preeclampsia with severe features is generally not appropriate but can be considered in select cases
- Magnesium sulfate to prevent seizures should be given to any patient with preeclampsia with severe features. Magnesium sulfate to prevent seizures can be given to patients with preeclampsia without severe features although there is not compelling evidence that this practice will improve outcomes.
- Nursing assessment frequency for hypertension and preeclampsia
  - Per nursing care path

**G. Magnesium Sulfate to prevent seizures when severe features of preeclampsia are present**

- Magnesium sulfate is the therapy to prevent seizures for patients with preeclampsia with severe features, and to treat seizures associated with preeclampsia
- In the setting of preeclampsia with severe features, magnesium sulfate should be administered at the time of diagnosis, continued during labor (or intraoperatively if cesarean delivery) and continued until 24 hours after birth
- Administration of magnesium sulfate
  - Per order set
- Magnesium toxicity
  - Excessive levels of magnesium are associated with respiratory depression and cardiac arrest
  - Associated with decreased urine output; magnesium sulfate is excreted exclusively in urine. Urine output less than 30 L/hr may lead to increased levels of serum magnesium and toxicity
  - For patients with renal insufficiency (serum creatinine greater than 1.0-1.5 mg/dL) or decreased urine output less than 30 mL/hr, the loading dose of 4-6 g should be followed by a maintenance dose of 1 gm/hr or less, and monitoring magnesium levels every 4 hours

MAGNESIUM LEVEL	ASSESSMENT
4-7 mEq/L	Therapeutic level to prevent seizure
Greater than 7 mEq/L	Loss of deep tendon reflexes
Greater than 10 mEq/L	Respiratory depression
Greater than 25 mEq/L	Cardiac arrest

- Magnesium toxicity treatment
  - Calcium gluconate
    - 1 gm IV over 3 minutes; may repeat as necessary
  - Calcium gluconate should be immediately available to any patient on magnesium sulfate
- Treatment of eclampsia
  - See Appendix 4

**H. Postpartum assessment and treatment of patients with severe range BP/preeclampsia**

- If patient has a diagnosis of preeclampsia or hypertension (chronic or gestational), assess for the following symptoms at every evaluation. If a patient has any of these symptoms call attending/resident for evaluation:
  - Headache
  - Visual changes
  - Epigastric pain
  - Shortness of breath or chest pain
- Patients with a diagnosis of preeclampsia or hypertension may need to be assessed more frequently than the standard orders in the care path/order set
- If systolic blood pressure greater than or equal to 160 or diastolic blood pressure greater than or equal to 110, repeat within 15 minutes. Check repeat blood pressure with patient sitting or HOB at 30 degrees.
  - If repeat blood pressure still elevated (systolic blood pressure greater than or equal to 160 or diastolic blood pressure greater than or equal to 110) call attending/resident for evaluation and treatment; persistent severe hypertension needs to be treated within 30-60 minutes.
  - Patient with persistent severe hypertension should not be left unattended for prolonged periods of time
  - Consider transferring to unit with higher level of care (L&D, ICU); if transfer cannot occur in timely manner treatment for hypertension needs to be initiated on postpartum
  - If patient does not have IV access, start IV
  - Initiate treatment (see Appendix 1,2 and 3)
    - IV labetalol
    - IV hydralazine

- PO Procardia
  - Consider drawing labs
  - Consider Magnesium Sulfate (MgSO<sub>4</sub>) for seizure prevention
- If systolic blood pressure is greater than or equal to 150 but less than 160 or diastolic blood pressure is greater than or equal to 100 but less than 110, repeat blood pressure within 2-4 hours
- If repeat systolic blood pressure is greater than or equal to 150 or diastolic blood pressure is greater than or equal to 100, call attending/hospitalist/resident for evaluation/orders

### III. Patient education/follow-up at discharge

- A. All patients with significant gestational hypertension or preeclampsia should receive discharge instructions which include information on preeclampsia, information on symptoms of severe features of preeclampsia and instructions on medications to treat hypertension. Instructions should be given verbally, and written material should be supplied. Patients can also be referred to websites such as [www.preeclampsia.org](http://www.preeclampsia.org) for additional information.
- B. Many patients will be monitoring their blood pressure at home. They should receive specific instructions how to take their blood pressure.
- C. All patients should receive instructions about when they should call or return to the hospital including blood pressure thresholds which require follow-up.
- D. All patients should be scheduled for a follow-up appointment within 1 week of discharge.

### IV. Quality improvement and outcomes measurements

- A. Multidisciplinary review of all maternal ICU admissions, maternal seizures, or perinatal or maternal mortality related to hypertension/preeclampsia
  - Swarms
  - SAFE event
  - RCA
- B. Periodic monitoring and review of HTN safety bundle by perinatal safety committee
- C. Quality measures (suggested)
  - Treatment of persistent severe hypertension within appropriate time period (30-60 minutes)
  - Appropriate use of Magnesium Sulfate (MgSO<sub>4</sub>) for preeclampsia with severe features

### V. Staff education, protocols, and drills

- A. Algorithms will be readily available for reference in units where patients will be admitted or treated
- B. Twice daily safety rounds during which all patients will be reviewed
- C. Simulation
  - If available, rare events such as eclampsia are excellent opportunities for simulation exercises

### VI. ED evaluation and treatment of postpartum patients with preeclampsia





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- A. OB department and ED department should jointly establish protocols and guidelines for evaluation and treatment of postpartum patients with hypertension/preeclampsia
- B. All patients within 6 weeks of delivery who are evaluated in the ED with hypertension should have an OB consult; if patient has severe hypertension or other severe features of preeclampsia the consult should be requested immediately
- C. See Appendix 6



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## VII. References

Emergent Therapy for Acute-Onset, Severe Hypertension During Pregnancy and the Postpartum Period. Committee Opinion No 623. American College of Obstetricians and Gynecologists. *Obstetrics and Gynecology* 2015; 125: 521-5

Hypertension in Pregnancy. Task Force on Hypertension in Pregnancy. American College of Obstetricians and Gynecologist

American College of Obstetricians and Gynecologists District II Safe Mother Initiative. Maternal Safety Bundle for Severe Hypertension in Pregnancy

California Maternal Quality Care Collaborative. A California Toolkit to Transform Maternity Care. Preeclampsia Care Guidelines and CMQCC Preeclampsia Toolkit. 2013

Missouri Hospital Association. Statewide Quality Improvement Immersion Pilot Project. Obstetrical Harm Reduction: Improved Management of Preeclampsia. 2015

ACOG Practice Bulletin, Number 202, Gestational Hypertension and Preeclampsia, American College of Obstetricians and Gynecologist, 2019

ACOG Practice Bulletin, Number 203, Chronic Hypertension in Pregnancy, American College of Obstetricians and Gynecologists, 2019

## Appendix 1

**Box 4. Sample Order Set for Severe Intrapartum or Postpartum Hypertension Initial First-line Management With Immediate-Release Oral Nifedipine\*†**

- Notify physician if systolic blood pressure (BP) is greater than or equal to 160 mm Hg or if diastolic BP is greater than or equal to 110 mm Hg.
- Institute fetal surveillance if undelivered and fetus is viable.
- If severe BP elevations persist for 15 minutes or more, administer immediate-release nifedipine capsules (10 mg orally).‡
- Repeat BP measurement in 20 minutes and record results.
- If either BP threshold is still exceeded, administer immediate-release nifedipine capsules (20 mg orally). If BP is below threshold, continue to monitor BP closely.
- Repeat BP measurement in 20 minutes and record results.
- If either BP threshold is still exceeded, administer nifedipine immediate release capsule (20 mg orally). If BP is below threshold, continue to monitor BP closely.
- Repeat BP measurement in 20 minutes and record results.
- If either BP threshold is still exceeded, administer labetalol (20 mg intravenously for more than 2 minutes) and obtain emergency consultation from maternal–fetal medicine, internal medicine, anesthesia, or critical care subspecialists.
- Give additional antihypertensive medication per specific order.
- Once the aforementioned BP thresholds are achieved, repeat BP measurement every 10 minutes for 1 hour, then every 15 minutes for 1 hour, then every 30 minutes for 1 hour, and then every hour for 4 hours.
- Institute additional BP timing per specific order.

\*Please note there may be adverse effects and contraindications.

†When used with magnesium sulfate, facilities should monitor maternal vital signs as described above in reference to blood pressure, with attention to normal heart rate and blood pressure.

‡Capsules should be administered orally and not punctured or otherwise administered sublingually.

Data from Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, et al. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure*, National Heart, Lung, and Blood Institute, National High Blood Pressure Education Program Coordinating Committee. *Hypertension* 2003;42:1206–52; Vermillion ST, Scardo JA, Newman RB, Chauhan SP. A randomized, double-blind trial of oral nifedipine and intravenous labetalol in hypertensive emergencies of pregnancy. *Am J Obstet Gynecol* 1999;181:858–61; Raheem IA, Saaid R, Omar SZ, Tan PC. Oral nifedipine versus intravenous labetalol for acute blood pressure control in hypertensive emergencies of pregnancy: a randomised trial. *BJOG* 2012;119:78–85; Shekhar S, Sharma C, Thakur S, Verma S. Oral nifedipine or intravenous labetalol for hypertensive emergency in pregnancy: a randomized controlled trial. *Obstet Gynecol* 2013;122:1057–63; and Duley L, Meher S, Jones L. Drugs for treatment of very high blood pressure during pregnancy. *Cochrane Database of Systematic Reviews* 2013, Issue 7. Art. No.: CD001449. Available at [https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD001449.pub2/media/CDSR/CD001449/CD001449\\_standard.pdf](https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD001449.pub2/media/CDSR/CD001449/CD001449_standard.pdf).

## Appendix 2

### **Box 5. Sample Order Set for Severe Intrapartum or Postpartum Hypertension Initial First-line Management With Hydralazine\***

- Notify physician if systolic BP is 160 mm Hg or more or if diastolic BP is 110 mm Hg or more.
- Institute fetal surveillance if undelivered and fetus is viable.
- If severe BP elevations persist for 15 minutes or more, administer hydralazine (5 mg or 10 mg IV for more than 2 minutes).
- Repeat BP measurement in 20 minutes and record results.
- If either BP threshold is still exceeded, administer hydralazine (10 mg IV for more than 2 minutes). If BP is below threshold, continue to monitor BP closely.
- Repeat BP measurement in 20 minutes and record results.
- If either BP threshold is still exceeded, administer labetalol (20 mg IV for more than 2 minutes). If BP is below threshold, continue to monitor BP closely.
- Repeat BP measurement in 10 minutes and record results.
- If either BP threshold is still exceeded, administer labetalol (40 mg IV for more than 2 minutes) and obtain emergency consultation from maternal–fetal medicine, internal medicine, anesthesia, or critical care subspecialists.
- Give additional antihypertensive medication per specific order.
- Once the aforementioned BP thresholds are achieved, repeat BP measurement every 10 minutes for 1 hour, then every 15 minutes for 1 hour, then every 30 minutes for 1 hour, and then every hour for 4 hours.
- Institute additional BP timing per specific order.

Abbreviations: BP, blood pressure; IV, intravenously.

\*Please note there may be adverse effects and contraindications.

Data from Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, et al. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, National Heart, Lung, and Blood Institute, National High Blood Pressure Education Program Coordinating Committee. Hypertension 2003;42:1206–52.*

### Appendix 3

#### **Box 6. Sample Order Set for Severe Intrapartum or Postpartum Hypertension, Initial First-line Management With Labetalol\***

- Notify physician if systolic BP measurement 160 mm Hg or more or if diastolic BP measurement is 110 mm Hg or more.
- Institute fetal surveillance if undelivered and fetus is viable.
- If severe BP elevations persist for 15 minutes or more, administer labetalol (20 mg IV for more than 2 minutes).
- Repeat BP measurement in 10 minutes and record results.
- If either BP threshold is still exceeded, administer labetalol (40 mg IV for more than 2 minutes). If BP is below threshold, continue to monitor BP closely.
- Repeat BP measurement in 10 minutes and record results.
- If either BP threshold is still exceeded, administer labetalol (80 mg IV for more than 2 minutes). If BP is below threshold, continue to monitor BP closely.
- Repeat BP measurement in 10 minutes and record results.
- If either BP threshold is still exceeded, administer hydralazine (10 mg IV for more than 2 minutes). If BP is below threshold, continue to monitor BP closely.
- Repeat BP measurement in 20 minutes and record results.
- If either BP threshold is still exceeded, obtain emergency consultation from maternal–fetal medicine, internal medicine, anesthesia, or critical care subspecialists.
- Give additional antihypertensive medication per specific order.
- Once the aforementioned BP thresholds are achieved, repeat BP measurement every 10 minutes for 1 hour, then every 15 minutes for 1 hour, then every 30 minutes for 1 hour, and then every hour for 4 hours.
- Institute additional BP timing per specific order.

Abbreviations: BP, blood pressure; IV, intravenously.

\*Please note there may be adverse effects and contraindications.

Data from Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, et al. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, National Heart, Lung, and Blood Institute, National High Blood Pressure Education Program Coordinating Committee. Hypertension 2003;42:1206–52.

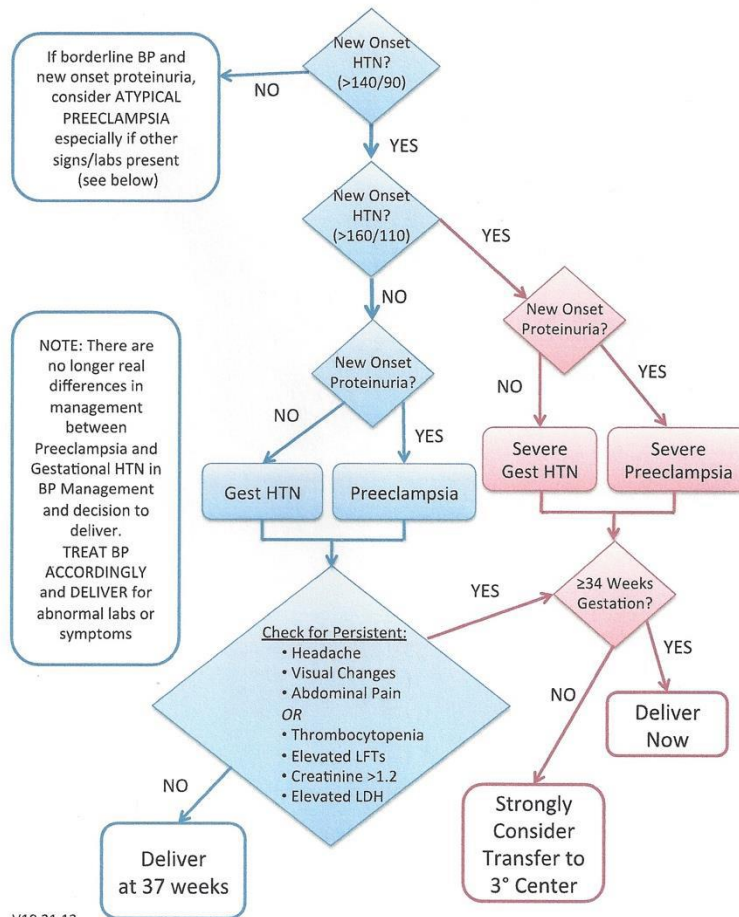


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## **Appendix 4**

**Appendix C: Suspected Preeclampsia Algorithm Diagnosis and Management**

Suspected Preeclampsia Flowchart  
Diagnosis and Management



V10.21.13

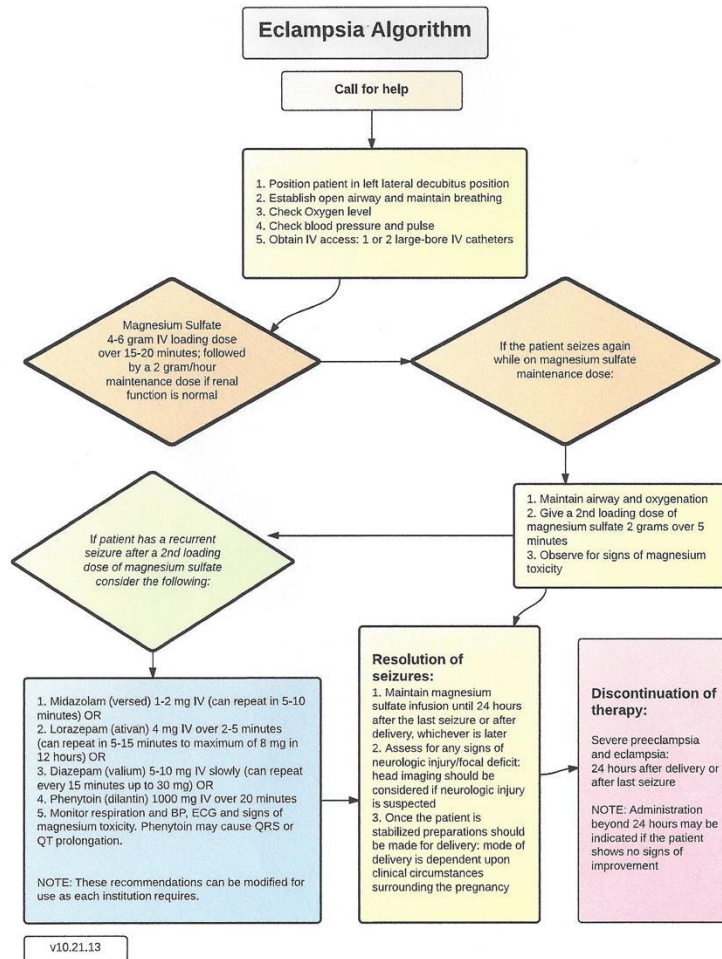


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**Appendix 5**



**Appendix E: Eclampsia Algorithm**





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**Appendix 6**