Maternal Safety Bundle for Severe Hypertension in Pregnancy

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## Key Elements

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<td>• Diagnostic Criteria</td>
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# TYPES OF HYPERTENSION

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<th>Chronic Hypertension</th>
<th>Chronic Hypertension &amp; Superimposed Preeclampsia</th>
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<tr>
<td>• SBP ≥ 140 or DBP ≥ 90&lt;br&gt;• Pre-pregnancy or &lt;20 weeks</td>
<td>• Systolic BP of 160 mm Hg or higher, or diastolic BP of 110 mm Hg or higher on 2 occasions at least 4 hours apart while the patient is on bed rest (unless antihypertensive therapy is initiated before this time)&lt;br&gt;• Thrombocytopenia (platelet count less than 100,000/microliter)&lt;br&gt;• Impaired liver function as indicated by abnormally elevated blood concentrations of liver enzymes (to twice normal concentration), severe persistent right upper quadrant or epigastric pain unresponsive to medication and not accounted for by alternative diagnoses, or both&lt;br&gt;• Progressive renal insufficiency (serum creatinine concentration greater than 1.1 mg/dL or a doubling of the serum creatinine concentration in the absence of other renal disease)&lt;br&gt;• Pulmonary edema&lt;br&gt;• New-onset cerebral or visual disturbances</td>
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<tr>
<td>Gestational Hypertension</td>
<td>Preeclampsia – Eclampsia</td>
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<tr>
<td>• SBP ≥ 140 or DBP ≥ 90&lt;br&gt;• &gt; 20 weeks&lt;br&gt;• Absence of proteinuria or systemic signs/symptoms</td>
<td>• SBP ≥ 140 or DBP ≥ 90&lt;br&gt;• Proteinuria with or without signs/symptoms&lt;br&gt;• Presentation of signs/symptoms/lab abnormalities but no proteinuria</td>
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</table>

*Proteinuria not required for diagnosis eclampsia seizure in setting of preeclampsia*
SEVERE HYPERTENSION
• Systolic blood pressure ≥ 160 mm Hg or
• Diastolic blood pressure ≥ 110 mm Hg

HYPERTENSIVE EMERGENCY
• Persistent, severe hypertension that can occur antepartum, intrapartum, or postpartum
• Defined as:
  - Two severe BP values (≥ 160/110) taken 15-60 minutes apart
  - Severe values do not need to be consecutive
WHEN TO TREAT

SEVERE HYPERTENSION
SBP ≥ 160 or DBP ≥ 110

- Repeat BP every 5 min for 15 min
- Notify physician after one severe BP value is obtained

HYPERTENSIVE EMERGENCY
Persistent, severe hypertension that can occur antepartum, intrapartum, or postpartum
Two severe BP values (≥ 160/110) taken 15-60 minutes apart
Severe values do not need to be consecutive

- If severe BP elevations persist for 15 min or more, begin treatment ASAP. Preferably within 60 min of the second elevated value.
- If two severe BPs are obtained within 15 min, treatment may be initiated if clinically indicated
FIRST LINE THERAPIES

• Intravenous labetalol
• Intravenous hydralazine
• Oral nifedipine

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*
**Labetalol 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

1. Labetalol 20 mg IV over 2 minutes
2. Repeat BP in 10 minutes
3. If SBP ≥ 160 or DBP ≥ 110, administer labetalol 40 mg IV over 2 minutes; if BP below threshold, continue to monitor BP closely
4. Repeat BP in 10 minutes
5. If SBP ≥ 160 or DBP ≥ 110 at 20 minutes, obtain emergency consultation from specialist in MFM, internal medicine, anesthesia, or critical care
6. If SBP ≥ 160 or DBP ≥ 110, administer hydralazine 10 mg IV over 2 minutes; if below threshold, continue to monitor BP closely
7. Repeat BP in 20 minutes
8. Give additional antihypertensive medication per specific order as recommended by specialist
9. Once BP thresholds are achieved, repeat BP:
10. - Every 10 minutes for 1 hour
    - Then every 15 minutes for 1 hour
    - Then every 30 minutes for 1 hour
    - Then every hour for 4 hours

- 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:
   ④ symptoms at least once a week, or
   ⑤ use of an inhaler, corticosteroids for asthma during the pregnancy, or
   ⑥ 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

1. Administer hydralazine† 5 mg or 10 mg IV over 2 minutes

2. Repeat BP in 20 minutes

3. If SBP ≥ 160 or DBP ≥ 110, administer hydralazine 10 mg IV over 2 minutes

4. Repeat BP in 20 minutes

5. If SBP ≥ 160 or DBP ≥ 110, administer labetalol 20 mg† IV over 2 minutes; if BP below threshold, continue to monitor BP closely

6. Repeat BP in 10 minutes

7. If SBP ≥ 160 or DBP ≥ 110, administer labetalol 40 mg IV over 2 minutes, and obtain emergency consultation from specialist in MFM, internal medicine, anesthesiology, or critical care

8. Give additional antihypertensive medication per specific order as recommended by specialist

9. Once BP thresholds are achieved, repeat BP:
   - Every 10 minutes for 1 hour
   - Then every 15 minutes for 1 hour
   - Then every 30 minutes for 1 hour
   - Then every hour for 4 hours

10. Institute additional BP monitoring per specific order

- 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**

**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

1. Oral nifedipine† 10 mg
2. Repeat BP in 20 minutes
3. If SBP ≥ 160 or DBP ≥ 110, administer oral nifedipine 20 mg; If below threshold, continue to monitor BP closely
4. Repeat BP in 20 minutes
5. Give additional round of oral nifedipine 20 mg
6. If SBP ≥ 160 or DBP ≥ 110, administer IV labetalol† 40 mg; If below threshold, continue to monitor BP closely. Obtain emergency consultation from specialist in MFM, internal medicine, anesthesiology, or critical care.
7. Give additional antihypertensive medication per specific order as recommended by specialist
8. Once BP thresholds are achieved, repeat BP:
   - Every 10 minutes for 1 hour
   - Then every 15 minutes for 1 hour
   - Then every 30 minutes for 1 hour
   - Then every hour for 4 hours
9. Institute additional BP monitoring per specific order

- 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.
ADDITIONAL THERAPY RECOMMENDATIONS

IF NO IV ACCESS AVAILABLE:
• Initiate algorithm for oral nifedipine, or
• Oral labetalol, 200 mg  *Repeat in 30 min if SBP remains ≥ 160 or DBP ≥ 110 and IV access still unavailable

SECOND LINE THERAPIES (if patient fails to respond to first line tx):
Recommend emergency consult with:
• Maternal Fetal Medicine
• Internal Medicine
• Anesthesiology
• Critical Care
• Emergency Medicine

May also consider:
✓ Labetalol or nicardipine via infusion pump
✓ Sodium nitroprusside for extreme emergencies  *Use for shortest amount of time due to cyanide/thiocyanate toxicity
MONITORING BLOOD PRESSURE

MATERNAL

• Once BP is controlled (<160/110), measure
  ✓ Every 10 minutes for 1 hour
  ✓ Every 15 minutes for next hour
  ✓ Every 30 minutes for next hour
  ✓ Every hour for 4 hours

• Obtain baseline labs:
  ✓ CBC
  ✓ Platelets
  ✓ LDH
  ✓ Liver Function Tests
  ✓ Electrolytes
  ✓ BUN creatinine
  ✓ Urine protein

FETAL

• Fetal monitoring surveillance as appropriate for gestational age
Call for assistance

Designate team leader, checklist reader, primary RN

Ensure side rails are up

Administer seizure prophylaxis

Antihypertensive therapy within 1 hr for persistent severe range BP

Place IV; Draw PEC labs

Antenatal corticosteroids is <34 wks gestation

Re-address VTE prophylaxis requirement

Place indwelling urinary catheter

Brain imaging if unremitting headache or neurological symptoms

Debrief patient, family, OB team
### Eclampsia Checklist

- Call for assistance
- Designate team leader, checklist reader, primary RN
- Ensure side rails are up
- Protect airway + improve oxygenation
- Continuous fetal monitoring
- Place IV; Draw PEC 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

### 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
  - Labetalol (initial dose: 20 mg); 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
- Lorazepam (Ativan): 2-4 mg IV q 1-2 h, may repeat once after 10-15 min
- Diazepam (Valium): 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

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Safe Motherhood Initiative
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
<table>
<thead>
<tr>
<th>GUIDELINES FOR DOCUMENTATION</th>
<th>EXAMPLE 17</th>
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<tr>
<td><strong>ON ADMISSION</strong></td>
<td><strong>ASSESSMENT &amp; PLAN</strong></td>
</tr>
<tr>
<td>✓ Complete history</td>
<td>✓ Indicate diagnosis of preeclampsia</td>
</tr>
<tr>
<td>✓ Complete physical exam + preeclampsia symptoms:</td>
<td>o If no dx, indicate steps taken to exclude preeclampsia</td>
</tr>
<tr>
<td>o Unremitting headaches</td>
<td>✓ Antihypertensives taken (if any)</td>
</tr>
<tr>
<td>o Visual changes</td>
<td>o Specific medications</td>
</tr>
<tr>
<td>o Epigastric pain</td>
<td>o Dose, route, frequency</td>
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<tr>
<td>o Fetal activity</td>
<td>o Current fetal status</td>
</tr>
<tr>
<td>o Vaginal bleeding</td>
<td>✓ Delivery assessment</td>
</tr>
<tr>
<td>✓ Baseline BPs throughout pregnancy</td>
<td>o If indicated, note: timing, method, route</td>
</tr>
<tr>
<td>✓ Meds/drugs throughout pregnancy (illicit &amp; OTC)</td>
<td>o If not indicated, describe circumstances to warrant delivery</td>
</tr>
<tr>
<td>✓ Current vital signs, inc. O2 saturation</td>
<td>✓ Antenatal corticosteroids if &lt; 34 weeks of gestation</td>
</tr>
<tr>
<td>✓ Current and past fetal assessment:</td>
<td></td>
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<tr>
<td>o FHR monitoring results</td>
<td><strong>NOTE:</strong> Continue ongoing documentation every 30 min until patient stabilized at &lt; SBP 160 or DBP 110</td>
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<tr>
<td>o Est. fetal weight</td>
<td></td>
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<tr>
<td>o BPP, as appropriate</td>
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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
• 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)

ANTIHYPTERTENSIVE THERAPY

• Recommended for persistent postpartum HTN: SBP ≥ 150 or DBP ≥ 100 on at least two occasions at least 4 hours apart
• Persistent SBP ≥ 160 or DBP ≥ 110 should be treated within 1 hour
**Example 19**

**Call for assistance**

**Designate team leader, checklist reader, primary RN**

**Ensure side rails up**

**Call OB consult; Document call**

**Place IV; Draw PEC labs**

**Administer seizure prophylaxis**

**Administer antihypertensive therapy**

**Consider indwelling urinary catheter. Maintain strict I&O**

**Brain imaging if unremitting headache or neurological symptoms**
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:
  o Within 3-5 days
  o Again in 7-10 days after delivery (earlier if persistent symptoms)
**POST-DISCHARGE EVALUATION**

**ELEVATED BP AT HOME, OFFICE, TRIAGE**

**Postpartum triggers:**
- \( SBP \geq 160 \) or \( DBP \geq 110 \) or
- \( SBP \geq 140-159 \) or \( DBP \geq 90-109 \) with unremitting headaches, visual disturbances, or epigastric/RUQ pain

- Emergency Department treatment (OB / MICU consult as needed)
- AntiHTN therapy suggested if persistent \( SBP > 150 \) or \( DBP > 100 \) on at least two occasions at least 4 hours apart
- Persistent \( SBP > 160 \) or \( DBP > 110 \) should be treated within 1 hour

**Good response to antiHTN treatment and asymptomatic**

**Admit for further observation and management (L&D, ICU, unit with telemetry)**

**Signs and symptoms of eclampsia, abnormal neurological evaluation, congestive heart failure, renal failure, coagulopathy, poor response to antihypertensive treatment**

**Recommend emergency consultation for further evaluation (MFM, internal medicine, OB anesthesiology, critical care)**
CONCLUSION

- **Systolic BP ≥ 160 or diastolic BP ≥ 110** warrant:
  - Prompt evaluation at bedside
  - Treatment to decrease maternal morbidity and mortality

- Risk reduction and successful clinical outcomes require avoidance/management of severe systolic and diastolic hypertension in women with:
  - Preeclampsia
  - Eclampsia
  - Chronic hypertension + superimposed preeclampsia

- Increasing evidence indicates that standardization of care improves patient outcomes


Maurice L. Druzin, MD; Laurence E. Shields, MD; Nancy L. Peterson, RNC, PNNP, MSN; Valerie Cape, BSBA. “Preeclampsia Toolkit: Improving Health Care Response to Preeclampsia.” California Maternal Quality Care Collaborative Toolkit to Transform Maternity Care. 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, November 2013.


