Preventing Maternal Morbidity and Mortality via Expanded Scope of Nursing Practice As First Responder in Hypertensive Crisis of Preeclampsia

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Preeclampsia-Eclampsia

Advances
- New Protocols for Antihypertensive Drugs
- New Rescue Antihypertensive Agent
- New Challenges
  - Expanded Scope of Nursing Practice as First Responder in Hypertensive Crisis

Stroke in Pregnancy

Stroke in pregnancy
- Incidence:
  - approximately 9 to 34 per 100,000
- Types
  - Intracerebral hemorrhage during carries the highest morbidity and mortality, with an in-hospital mortality of 20%.

Causes
- Unique to pregnancy
  - Preeclampsia/eclampsia,
  - Postpartum angiopathy
  - Amniotic fluid embolism
  - Postpartum cardiomyopathy
- Seen in non-pregnant women
  - Hypertension
  - Diabetes
  - Vasculitis
  - Arteriovenous malformations
  - Aneurysms.

Stroke Risk Factors

- >35 years
- African–American
- Preeclampsia/eclampsia/gestational hypertension
- Thrombophilias
- Migraine headaches
- Diabetes
- Chronic hypertension
- Hyperemesis gravidarum
- Anemia
- Thrombocytopenia
- Postpartum hemorrhage
- Transfusion
- Fluid, electrolyte and acid-base disorders
- Infection

ACOG Hypertensive Emergency Treatment Guidelines, CO #514

Emergent Therapy for Acute-Onset, Severe Hypertension With Preeclampsia or Eclampsia

ACOG CO #541, Dec. 2011

“Acute-onset, severe hypertension that is accurately measured using standard techniques and is persistent for 15 minutes or more is considered a hypertensive emergency.”

ACOG CO #541

Hypertensive Emergency

- Acute-onset
- Severe Hypertension
  - Systolic ≥160 mm Hg, OR
  - Diastolic ≥110 mm Hg,
  - OR Both
- Accurately measured using standard techniques and
- Persistent for ≥15 minutes [is considered] a hypertensive emergency.

Link to ACOG CO To HYTN Emergency – Preeclampsia-Eclampsia

http://journals.lww.com/greenjournal/Citation/2011/12000/Committee_Opinion_No__514___Emergent_Therapy_for.53.aspx

Antihypertensive Meds
Blood Pressure = Flow x Resistance

Cardiac Output (CO) \times \text{Peripheral Vascular Resistance}

BP = Flow \times \text{Resistance}

- Antihypertensive agents will typically reduce “flow” (cardiac output) or “resistance” (SVR).
- Some side effects are therefore, consequences of too much reduction in flow or resistance.

Emergent Therapy for Acute-Onset, Severe Hypertension With Preeclampsia or Eclampsia

- Intravenous labetalol and hydralazine\(^*\) are both considered first-line drugs for the management of acute, severe hypertension in this clinical setting.
- Close maternal and fetal monitoring by the physician and nursing staff are advised.
- Order sets for the use of labetalol and hydralazine for the initial management of acute, severe hypertension in pregnant or postpartum women with preeclampsia or eclampsia have been developed.

Hydralazine?\(^*\)

- Cochrane Library –
  - There are superior drugs to use as first line antihypertensive agents in pregnancy with less side effects and safety profile
  - Labetalol (US)

Hypertensive Crisis Algorithm

1. Notify physician if systolic \(>160\) mm Hg or if diastolic \(>110\) mm Hg
2. Institute fetal surveillance if undetermined fetal status is visible
3. Administer labetalol (20 mg IV over 2 minutes)
4. Repeat BP measurement in 10 minutes and record results.
5. If either BP > threshold, administer labetalol (40 mg IV over 2 minutes). If BP is below threshold, continue to monitor BP closely.
6. Repeat BP measurement in 10 minutes and record results.
7. If either BP > threshold, administer labetalol (80 mg IV over 2 minutes). If BP is below threshold, continue to monitor BP closely.
8. Repeat BP measurement in 10 minutes and record results.
9. If either BP > threshold, administer hydralazine (10 mg IV over 2 minutes). If BP is below threshold, continue to monitor BP closely.
10. Repeat BP measurement in 5 minutes and record results.
11. If either BP > threshold, obtain emergency consultation from MFM, IM, anesthesia, or critical care specialists.
12. Give additional antihypertensive medication per specific order (Nicardipine).
13. 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 20 minutes for 1 hour, and then every hour for 4 hours.
14. Institute additional BP timing per specific order.

Some side effects are therefore, consequences of too much reduction in flow or resistance.

Flow or resistance.

\(\text{Flow} = \text{Cardiac Output (CO)} \times \text{Peripheral Vascular Resistance}\)
### Order Set for Severe IP or PP Hypertension Initial First-Line Therapy

1. Notify physician if systolic BP is greater than or equal to 160 mm Hg or if diastolic BP is greater than or equal to 110 mm Hg.
2. Implement additional BP timing per specific order.
3. Institute fetal surveillance if undelivered and fetus is viable.
4. Give additional antihypertensive medication per specific order.
5. If either BP threshold is still exceeded, administer labetalol (40 mg IV over 2 minutes).
6. Repeat BP measurement in 10 minutes and record results.
7. If either BP threshold is still exceeded, administer labetalol (20 mg IV over 2 minutes).
8. Repeat BP measurement in 20 minutes and record results.
9. If either BP threshold is still exceeded, administer hydralazine (10 mg IV over 2 minutes).
10. Repeat BP measurement in 20 minutes and record results.
11. Administer hydralazine (5 mg or 10 mg IV over 2 minutes).
12. Institute additional BP timing per specific order.

### Hypertensive Crisis Algorithm

**First Line Therapy**

1. Notify physician if systolic BP is greater than or equal to 160 mm Hg or if diastolic BP is greater than or equal to 110 mm Hg.
2. Implement additional BP timing per specific order.
3. Institute fetal surveillance if undelivered and fetus is viable.
4. Give additional antihypertensive medication per specific order.
5. If either BP threshold is still exceeded, administer labetalol (40 mg IV over 2 minutes).
6. Repeat BP measurement in 10 minutes and record results.
7. If either BP threshold is still exceeded, administer labetalol (20 mg IV over 2 minutes).
8. Repeat BP measurement in 10 minutes and record results.
9. If either BP threshold is still exceeded, administer labetalol (40 mg IV over 2 minutes)
10. Obtain emergency consultation from MFM, IM, anesthesia, or critical care specialists.
11. Give additional antihypertensive medication per specific order.
12. If either BP threshold is still exceeded, administer hydralazine (10 mg IV over 2 minutes).
13. Repeat BP measurement in 10 minutes and record results.
14. If either BP threshold is still exceeded, administer hydralazine (10 mg IV over 2 minutes).
15. Repeat BP measurement in 10 minutes and record results.

**Second Line Alternatives to Consider**

- Intravenous labetalol or nicardipine by infusion pump
- Transplacental passage and changes in umbilical artery Doppler velocimetry are minimal
Nicardipine hydrochloride injection is a calcium ion influx inhibitor (slow channel blocker or calcium channel blocker). Nicardipine hydrochloride produces significant decreases in systemic vascular resistance. It is indicated for the short-term treatment of hypertension when oral therapy is not feasible or not desirable. Because the liver extensively metabolizes nicardipine, plasma concentrations are influenced by changes in hepatic function. Nicardipine hydrochloride injection is contraindicated in patients with advanced aortic stenosis because part of the reduced afterload. Reduction of diastolic pressure in these patients may worsen rather than improve myocardial oxygen balance. Pregnancy Category C

### Drug Half Life (time)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Half Life (time)</th>
</tr>
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<tbody>
<tr>
<td>Labetalol</td>
<td>5.5 hours</td>
</tr>
<tr>
<td>Hydralazine</td>
<td>4 hours</td>
</tr>
<tr>
<td>Nicardipine*</td>
<td>2 to 5 minutes</td>
</tr>
<tr>
<td>Nifedipine</td>
<td>2 to 5 hours</td>
</tr>
</tbody>
</table>

*Contraindications to the use of nicardipine are hypersensitivity to nicardipine, severe aortic stenosis, hypotension, and shock.

### Starting Dose and Titration

- **Non-pregnant patient:**
  - Starting dose 3 to 5 mg/hour
  - Increase rate by 2.5 mg/hour every 5 minutes to a maximum of 15 mg/hour
- **Pregnancy**
  - Starting dose 1 to 3 mg/hour
  - Increase by 0.5 to 1.0 mg/hour to maximum of 10 mg/hour until the target BP is reached

### Maternal and fetal/neonatal adverse effects of intravenous nicardipine in 147 patients

<table>
<thead>
<tr>
<th>Maternal</th>
<th>Fetal/Neonatal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transient</td>
<td>Bradycardia 0</td>
</tr>
<tr>
<td>Hypotension</td>
<td>Decelerations 2</td>
</tr>
<tr>
<td>Nausea</td>
<td>Loss of variability 1</td>
</tr>
<tr>
<td>Palpitations</td>
<td>Preterm delivery 59</td>
</tr>
<tr>
<td>Headache</td>
<td>Small for gestational age 24</td>
</tr>
<tr>
<td>Flushing</td>
<td>Apgar score &lt;7 after 5 mins 3</td>
</tr>
</tbody>
</table>

### Labetalol Algorithm

1. **Systolic > 160 OR Diastolic > 110**
   - Labetalol 20 mg IV
   - BP > Threshold?
     - Labetalol 40 mg IV
     - BP > Threshold?
       - Labetalol 80 mg IV
       - BP > Threshold?
         - Apresoline 10 mg
         - **Nicardipine**
         - Repeat BP 10 min
   - No
     - When BP < threshold, repeat BP:
       - every 10 min x 1 hour
       - then every 15 min x 1 hour,
       - then every 30 min x 1 hour,
       - then every hour for 4 hours.

Institute additional BP timing per specific order.

Non-responders: Sodium Nitroprusside (Nipride®)

“When Nothing Works . . .”

- Sodium nitroprusside should be reserved for extreme emergencies and used for the shortest amount of time possible.
- Rationale/side effects:
  - Cyanide and thiocyanate toxicity in the mother and fetus or newborn (monitor maternal levels during administration)
  - Increased intracranial pressure with potential worsening of cerebral edema in the mother.

Challenges

Nurse-led Interventions

- Nurse-led titration of angiotensin converting enzyme inhibitors, beta-adrenergic blocking agents and angiotensin receptor blockers for patients with left ventricular systolic dysfunction

  Andrea Driscoll, Judy Currey, Andrew Tonkin, Henry Krum
  Published Online: 13 JUN 2012
  Editorial Group: Cochrane Heart Group

Allied health professional-led interventions for improving control of blood pressure in patients with hypertension

- Chris E Clark, Lindsay FP Smith, Liam G Glynn, Rod S Taylor, John Campbell
- Editorial Group: Cochrane Hypertension Group
- Published Online: 9 NOV 2011

Summary

Thank you, for your attention.

Carol Harvey