DEFINITIONS

• Hypertensive Crisis
  • Urgency: Severe increase in BP with NO evidence of end organ damage
  • Emergency: Severe increase in BP WITH evidence of end organ damage (i.e. cardiac, renal, encephalopathy, seizures, dissection, CVA, hemorrhage, pre-eclampsia)
  • Severe increase usually means >180/110-120 although definitions differ and are usually not specific (each patient different, rate of change important as well)
WORK-UP: HISTORY

• History of hypertension, preoperative BP
• Medications (have they been restarted—rebound?)
• History of drug use (w/d)
• Associated symptoms (i.e. evidence of end organ damage)
WORK-UP: PHYSICAL EXAM

• Vitals (BP in both arms/legs) + UOP
• Make sure cuff is appropriate size
• A-line vs. cuff
• Mental status/neuro exam
• Cardiac and pulmonary exam
DIFFERENTIAL DIAGNOSIS

- Essential hypertension
- Drugs (i.e. patient on pressor or inotrope)
- Withdrawal
- Secondary causes
  - Pain
  - Fluid overload
  - Hypoxia
  - Hypercarbia
  - Hypoglycemia
  - Vasospasm (hypothermia)
  - Factitious (too small a BP cuff)
  - Gastric or bladder distention
WORK-UP: LABS/STUDIES

- CBC/BMP
- UA
- CXR
- Cardiac enzymes
- EKG
- ABG
- Etiology specific tests
TREATMENT

• Overall principles
  • Determine if there is end organ damage and treat hypertensive emergencies (and urgencies) emergently. Prolonged BP over 180/110 should be treated.
  • Do not lower by more than 20-25% in one hour, goal should be around 160/110
  • Keep patients within about 20 mmHg on either side of their baseline SBP
  • Work-up secondary causes after treatment initiated
  • Call senior
  • Document
TREATMENT

- Think about pain meds, anxiolytics, diuretics, foley placement, NGT placement, oxygen, etc.....
- Restart home meds as appropriate (more on this later)
TREATMENT: MEDICATIONS

• BP = CO x Total Peripheral Resistance
• CO = SV x HR
  • HR: beta blockers, CCB
  • SV:
    • Preload: Diuretics, RAS
    • Afterload: RAS blockers, alpha blockers, CCB
    • Contractility: Beta blockers, CCB
• TPR:
  • Alpha blockers, RAS blockers, CCB, Vasodilators
TREATMENT: MEDICATIONS

**Nitroprusside**
- 0.25 to 0.50 mcg/kg/min
- Often preferred medications
- Decreased arterial and venous tone
- Rapid onset and offset (1-2 min duration)
- Can cause cyanide toxicity

**Labetalol**
- 10-20 mg bolus
- 0.5 to 2 mg/min
- Alpha and beta
- Onset 5-10 minutes, last 3-6 hours
- Usually dose not cause severe drop in pressure
- Good in pregnancy, aortic dissection
- Do not use in asthma, CHF
### TREATMENT: MEDICATIONS

<table>
<thead>
<tr>
<th>Esmolol</th>
<th>Nitroglycerine</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Short acting beta 1 antagonist</td>
<td>• 5 mcg/min</td>
</tr>
<tr>
<td>• Onset 1-2 minutes, lasts 10-30 minutes</td>
<td>• Decreases venous tone</td>
</tr>
<tr>
<td>• 500 mcg/kg bolus</td>
<td>• 2-5 min onset</td>
</tr>
<tr>
<td>• 50-100 mcg/kg/min</td>
<td>• 5-10 min duration</td>
</tr>
<tr>
<td>• Can cause hypotension</td>
<td>• Good for patients with MI, pulmonary edema</td>
</tr>
<tr>
<td></td>
<td>• Tolerance develops quickly</td>
</tr>
<tr>
<td></td>
<td>• Can cause HA</td>
</tr>
</tbody>
</table>
TREATMENT: MEDICATIONS

Hydralazine

- Decreased arterial tone
- 10-20 mg IV Q 30 minutes
- Onset 10-20 minutes, lasts 1-4 hours
- Less predictable response compared with beta blockers
- Can cause tachycardia
- Good in pregnancy
- Do not use in aortic dissection, cardiac ischemia

ACE I

- Only IV is enalaprilat
- 1.25 mg Q6 hours
- 5-30 minute onset, lasts 6-12 hours
- Variable response, can cause hypotension
- Hyperkalemia, angioedema
- Do not use very often
TREATMENT: MEDICATIONS

- Nicardipine
  - 5-15 mg/h
  - 5-10 min onset
  - 15-30 minute duration
  - Tachycardia, HA, flushing, caution in CHF
## VUMC IV MEDICATIONS

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>ICU</th>
<th>Step-down</th>
<th>General Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metoprolol</td>
<td>X</td>
<td>X (no titration)</td>
<td>Tx first 24 hours 7T3</td>
</tr>
<tr>
<td>Labetalol</td>
<td>X</td>
<td>X (no titration)</td>
<td>Tx first 24 hours 7T3</td>
</tr>
<tr>
<td>Hydralazine</td>
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<tr>
<td>Esmolol</td>
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<td></td>
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</tr>
<tr>
<td>Enalaprilat</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Diltiazem</td>
<td>X</td>
<td>X (no titration)</td>
<td></td>
</tr>
<tr>
<td>Nicardipine</td>
<td>X</td>
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<td></td>
</tr>
<tr>
<td>Nitroglycerine</td>
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<td>X (no titration)</td>
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</tr>
<tr>
<td>Nitroprusside</td>
<td>X</td>
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</tr>
<tr>
<td>Verapamil</td>
<td>X</td>
<td>X (no titration)</td>
<td></td>
</tr>
</tbody>
</table>
FLOOR DESIGNATIONS

- ICU (Obvious)
- Step-down:
  - 11N
  - Burn
  - 10S
  - 9N
  - 7N
  - 7S
  - 6S
  - 5S

- General Care
  - Everything else including 9S, 7T3, round wing, etc....
SPECIAL CIRCUMSTANCES: CEA

- Decreased sensitivity of baroreceptor reflex
- Risk of low flow (thrombosis) vs. hyperperfusion syndrome and suture line disruption
  - Patient’s already maximally dilated
- BP 90-140
- MAPs within 20% of baseline or within 20 mmHg on either side of SBP baseline
SPECIAL CIRCUMSTANCES

- Tolerate higher BP in renal transplant patients (too high BP can cause bleeding)
- Be careful in patients with RAS (look over OR flows from anesthesia)
- Spinal cord injury/spinal surgery patients/head injury patients
  - CPP=MAP-ICP (like to keep MAPs>80)
- Dissection
  - BP <110-120, HR <70-80
HOME MEDICATIONS

• Keep in mind that hypertensive patients often have exaggerated responses to anesthesia (hyper—hypo—hyper). BP can be elevated up to 90mmHg above baseline SBP. Hypotension can lead to MI.

• Patients with preoperative BP >180/110 have significantly increased perioperative CV risk and many suggest delaying elective surgery unless this can be controlled (2X increase risk).

• Unless hypotensive will usually start:
  • Clonidine and beta blockers (cardioprotective, may protect against exaggerated response to anesthesia)
    • If patient no taking PO can start clonidine patch (ideally three days prior to sx)
  • CCB
    • Will not get rebound but protect against vasospasm
HOME MEDICATIONS

- Usually do NOT start
  - Diuretics (hypotension, electrolyte and volume abnormalities, ileus, arrhythmias, etc.)
  - ARBS/ACE I
    - Do not get rebound
    - Are vasoplegic (can cause prolonged hypotension with anesthesia)
    - Hyperkalemia

- Patients may still be hypertensive, BP usually returns to baseline in about 2-4 weeks
- Note that in transplant patients or other populations may want to start at lower doses
- Even if do not start home meds initially know what home meds are
CONVERTING TO IV

- PO diuretics ➞ IV lasix or bumetanide
- PO beta blocker ➞ IV metoprolol (5mg IV q 6 hours with hold parameters i.e. HOLD for SBP <100 or 110 and HR <60) or propranolol or esmolol
- PO ACE I ➞ Enalaprilat
- PO clonidine ➞ Clonidine patch
- PO CCB ➞ IV nicardipine
- Does not need to be same medication