

HYPERTENSIVE EMERGENCY

www.nurseinfo.in



Hypertensive Crisis

Hypertensive Urgency

Elevated BP **WITHOUT** evidence of ACUTE end organ damage

Hypertensive Emergency

Elevated BP **WITH** evidence of ACUTE end organ damage

Malignant Hypertension

Retinal hemorrhages, exudates, and papilledema
Renal involvement in the form of malignant nephrosclerosis
Usually associated with a DBP greater than 130 mm Hg

Accelerated Hypertension

Similar to malignant hypertension but papilledema is absent
Better prognosis than malignant hypertension

Blood pressure > 220/120 mmHg

Neurologic signs (hypertensive encephalopathy, hemorrhagic or ischemic stroke).
Hypertensive retinopathy: grade 3–4.
Chest pain as a presenting symptom of ischemic heart disease or dissecting aortic aneurysm.
Pulmonary edema, toxemia, catecholamine excess, acute renal failure.

Hypertensive emergency

Intravenous treatment with close monitoring in an intensive care unit. Oral treatment should be added.

Headache without neurologic signs, no acute target organ damage

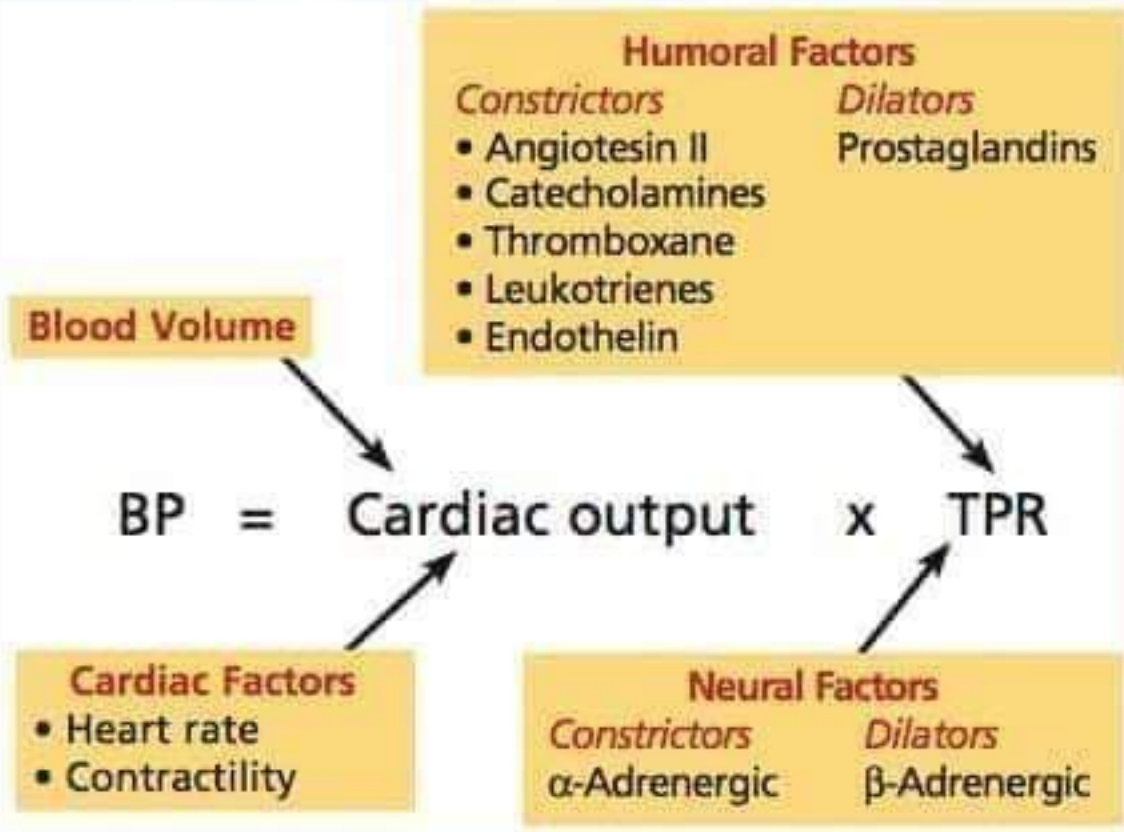
Hypertensive urgency

Identify the cause
Anxiety: antianxiety treatment
Pain: analgesic
Unknown cause: oral antihypertensive treatment to lower blood pressure within 12–24 hours

www.nurseinfo.in

FIGURE 1

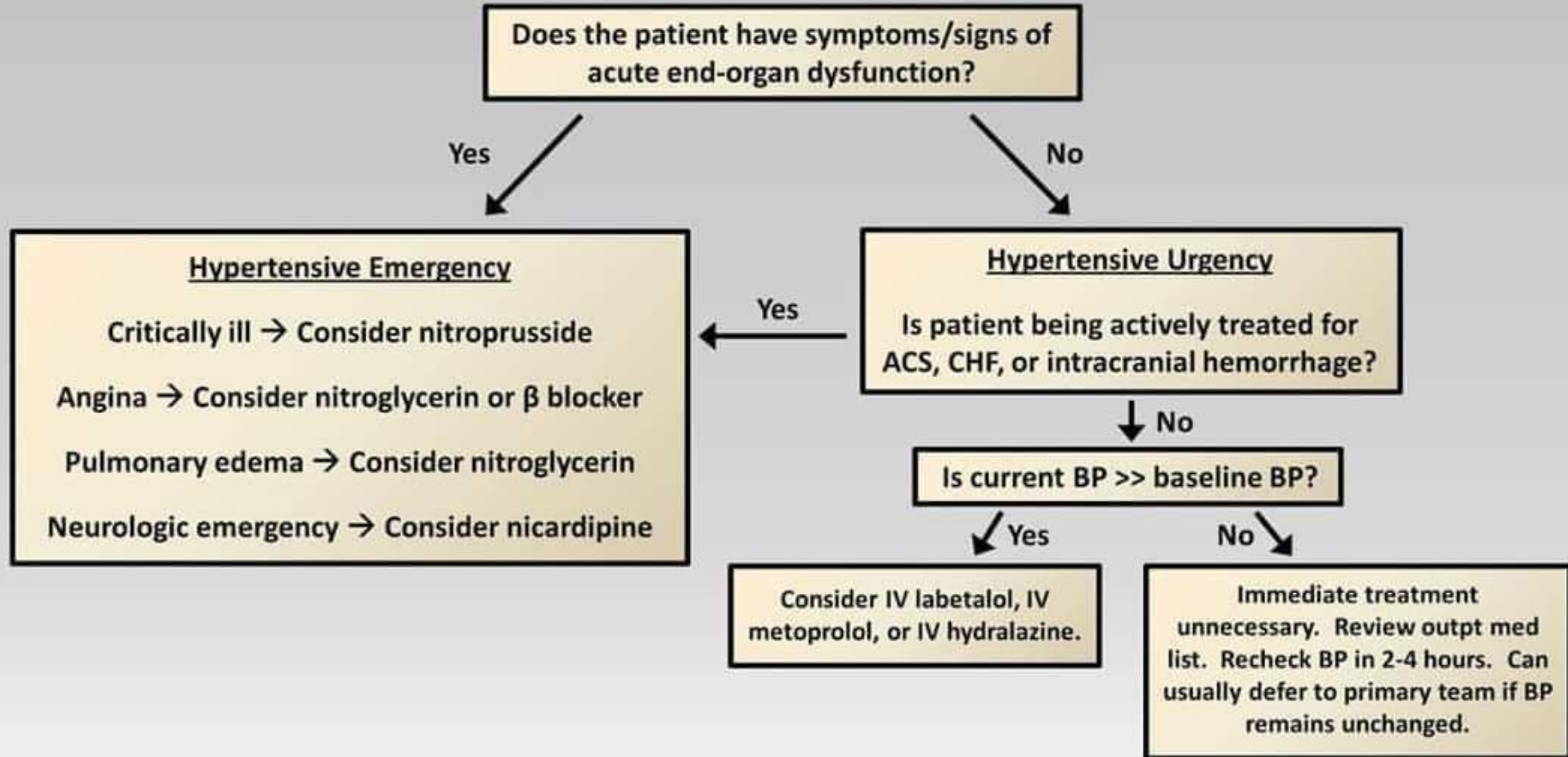
Pathophysiology of Hypertension^{3,4}



Abbreviation: TPR, total peripheral resistance.

Sources: Flanigan and Vitberg. *Med Clin North Am.* 2006;³ Aggarwal and Khan. *Cardiol Clin.* 2006.⁴

Order Treatment



Etiology

- Essential HTN
- Renal:
 - Vascular disease
 - Parenchymal disease
- Coarctation of the aorta
- CNS disorders:
 - Head trauma
 - CVA/ICH
 - Brain tumor
 - Spinal cord injury
- Endocrine:
 - Pheochromocytoma
 - Cushing syndrome
 - Primary hyperaldosteronism
 - Renin-secreting tumor
- Drugs:
 - Cocaine, phencyclidine, amphetamines
 - Erythropoietin, tacrolimus, cyclosporine, corticosteroids, oral contraceptives
 - MAOI interactions
 - Antihypertensive medication withdrawal
 - Lead intoxication
- Autonomic hyperreactivity:
 - Guillain–Barré syndrome
 - Acute intermittent porphyria
- Postop pain and/or anesthesia complications
- Pregnancy related:
 - Preeclampsia/eclampsia

Diagnosis

Signs and Symptoms

History

- Inquire about:
 - Use of any prescribed and OTC medication
 - Duration and control of pre-existing HTN
 - Prior end-organ damage
 - Details of antihypertensive therapy
 - Comorbid conditions (obesity, CAD, DM)
 - Recreational drug use
- Assess for end-organ compromise in decreasing order of frequency:
 - Dyspnea
 - Chest pain
 - Headache
 - Altered mental status/confusion
 - Focal neurologic symptoms

Physical Exam

- BP measured in both arms
 - Use proper cuff size
- Assess for end-organ compromise:
 - Neurologic:
 - Level of consciousness
 - Visual fields
 - Focal motor/sensory deficits
 - Ophthalmologic:
 - Funduscopic exam (retinal hemorrhages, papilledema)
 - Cardiovascular:
 - Elevated JVP
 - Lung crackles
 - Aortic insufficiency murmur
 - S3
 - Asymmetrical pulses

Essential Workup

- 12-lead EKG:
 - Ischemic changes, LV hypertrophy
- Assess kidney function
 - Acute renal failure may be asymptomatic

Diagnostic Tests and Interpretation

Lab

www.nurseinfo.in

- CBC
 - Anemia and thrombocytopenia are present in thrombotic microangiopathy
- Standard hospital protocols for chest pain
- BUN, creatinine
- Electrolytes
 - Hypokalemia present in primary mineralocorticoid excess
- Urinalysis:
 - Proteinuria, hematuria, and casts
- Urine toxicology screen:
 - If recreational drugs are suspected
- HCG

Imaging

- Chest x-ray:
 - If cardiopulmonary symptoms are present
- Head CT:
 - If headache, confusion, neurologic findings
- CTA chest and abdomen:
 - If concern for aortic dissection

Diagnostic Procedures/Other

- Arterial line
- Lumbar puncture:
 - Exclude subarachnoid hemorrhage

Differential Diagnosis

- Acute coronary syndrome (ACS)
- Acute heart failure (AHF)
- Aortic dissection
- Intracerebral hemorrhage (ICH)
- CVA (ischemic or hemorrhagic)
- Preeclampsia/eclampsia
- Withdrawal syndromes:
 - β -blockers
 - Clonidine (central α_2 -agonist)
- States of catecholamine excess:
 - Pheochromocytoma
 - Cocaine/sympathomimetic drug intoxication
 - Tyramine ingestion when on MAOIs

Treatment

Pre Hospital

- ABCs
- Consider gentle BP reduction.

Initial Stabilization/Therapy

- ABC, cardiac monitoring, pulse oximetry
- Oxygen administration
- IV access

Ed Treatment/Procedures

- Hypertensive urgency:
 - No need to treat, but close follow-up
 - Use oral agents only
 - Give any missed home dose
 - Goal: Lower the BP gradually over 24–48 hr
- Hypertensive emergency:
 - Treat end-organ damage, not absolute BP
 - Reduce MAP by $\leq 20\text{--}25\%$ in the 1st hr
 - Goal: Systolic ~ 160 mm Hg, diastolic ~ 100 mm Hg in 2–6 hr
 - Once BP stable with IV therapy, transition to oral therapy within 6–12 hr
 - More gradual reduction recommended in:
 - Acute ongoing injury to CNS
 - More rapid reduction recommended in:
 - Aortic dissection
- *Hypertensive encephalopathy*:
 - Goal: MAP lowered by max. 20% or to DBP 100–110 mm Hg within 1st hr then gradual reduction in BP to normal over 48–72 hr
 - Drug of choice: Nicardipine, clevidipine, or labetalol

DR.SUN BUNLORN

- *Ischemic stroke:*
 - $CPP = MAP - ICP$
 - Decreased CPP from hypotension (low MAP) or cerebral edema (high ICP) may extend infarct
 - Treat only SBP >220 mm Hg or DBP >120 mm Hg
 - Lytic candidates should have BP lowered to <185/110 mm Hg
 - Goal: MAP lowered by no more than 15–20%, DBP not <100–110 mm Hg in first 24 hr
 - Goal post tPA: BP <180/105 mm Hg
 - Drug of choice: Nicardipine, clevidipine, or labetalol
- *Hemorrhagic CVA or SAH:*
 - Treat if SBP >180 mm Hg/DBP >100 mm Hg
 - Goal: MAP lowered by 20–25% within the 1st hr or SBP 140–160 mm Hg
 - Drug of choice: Nicardipine, clevidipine, or labetalol
 - Avoid dilating cerebral vessels with nitroglycerin or nitroprusside
- *ACS:*
 - Goal: MAP to 60–100 mm Hg
 - Drug of choice: Labetalol or esmolol in combination with nitroglycerin
 - Avoid: Hydralazine (reflex tachycardia) and nitroprusside (“coronary steal”)

- *AHF:*
 - Goal: MAP to 60–100 mm Hg
 - Drug of choice nitroprusside or NTG with ACEI and/or loop diuretic
- *Acute renal failure/microangiopathic anemia:*
 - Goal: MAP lowered by 20–25% within 1st hr
 - Drug of choice: Nicardipine, clevidipine, or fenoldopam. For scleroderma renal crises ACEI are drugs of choice.
- *Aortic dissection:*

DR.SUN BUNLORN

 - Reduce shear force (dP/dT) by reducing both BP and HR
 - β -blockade must precede any drug that may cause reflex tachycardia
 - Goal: SBP 100–120 mm Hg and HR <65 bpm within 1st 20 min
 - Drug of choice: Esmolol in combination with dihydropyridine CCB or nitroprusside
 - Consult vascular surgery if type A
- *Sympathomimetics (pheochromocytoma, cocaine, amphetamines):*
 - Goal: MAP lowered by 20–25% within 1st hr
 - Avoid pure β -blockade (α is left unopposed)
 - Drug of choice: Phentolamine or calcium channel blocker with benzodiazepine. Use clonidine in cases of clonidine withdrawal

Pregnancy Considerations

- ***Preeclampsia:***
 - Definition: SBP >140 or DBP >90 mm Hg with proteinuria (>300 mg/24 hr or a urine protein/creatinine >0.3 or dipstick 1+)
 - Occurs >20 wk gestation – 4 wk postpartum
 - Headache, vision changes, peripheral edema, RUQ pain
 - Complications: Eclampsia, HELLP
 - Goal: SBP 130–150 mm Hg and DBP 80–100 mm Hg
 - Drug of choice: Labetalol, nicardipine, hydralazine, magnesium
 - Consult Obstetrics
- ***Esmolol:***
 - β 1-blockade
 - Onset 60s, duration 10–20 min
 - Avoid in AHF, COPD, heart block
- ***Labetalol:***
 - Combined α - and β -blocker
 - Onset 2–5 min, duration 2–6 hr
 - No reflex tachycardia due to β -blockade
 - Avoid in: COPD, AHF, bradycardia
- ***Clevidipine:***
 - 3rd generation dihydropyridine CCB
 - Onset 2–4 min, duration 5–15 min
 - Elimination independent of liver/renal function
 - Avoid in allergies to soy or egg products, defective lipid metabolism, AFib

- Nicardipine:
 - 2nd generation dihydropyridine CCB
 - Onset 5–15 min, duration 4–6 hr
 - Avoid in: AHF, coronary ischemia
- Nitroglycerin:
 - Venous > arteriolar dilation
 - Onset 2–5 min, duration 10–20 min
 - Perfuses coronaries, decreasing ischemia
 - Causes reflex tachycardia, tachyphylaxis, methemoglobinemia
- Nitroprusside:
 - Short-acting arterial and venous dilator
 - Onset 3 s, duration 1–2 min
 - Complications:
 - Reflex tachycardia, “coronary steal”, increase ICP
 - Cyanide toxicity after prolonged use
 - Avoid in pregnancy, renal failure (relative)
- Hydralazine:
 - Arteriolar dilator
 - Onset 5–15 min, duration 3–10 hr
 - Hypotensive effect may be less predictable
 - Safe in pregnancy
- Enalaprilat:
 - ACE inhibitor
 - Onset 0.5–4 hr, duration 6 hr
 - Avoid in: Pregnancy, AMI

- Fenoldopam:
 - Selective postsynaptic dopaminergic receptor agonist (DA1)
 - Onset 5–15 min, duration 1–4 hr
 - No reflex tachycardia
 - Maintains renal perfusion
 - Avoid in: Glaucoma
- Phentolamine:
 - α 1-blocker, peripheral vasodilator
 - Onset 1–2 min, duration 10–30 min

Medication

- Clevidipine: 1–16 mg/h IV infusion
- Enalaprilat: 1.25–5 mg q6h IV bolus
- Esmolol: 80 mg IV bolus, then 150 μ g/kg/min infusion
- Fenoldopam: 0.1–0.6 μ g/kg/min IV infusion
- Hydralazine: 10–20 mg IV bolus
- Labetalol: 20–80 mg IV bolus q10min (total 300 mg); 0.5–2 mg/min IV infusion
- Nicardipine: 2–15 mg/h IV infusion
- Nitroglycerin: 5–100 μ g/min IV infusion; USE NON-PVC tubing
- Nitroprusside: 0.25–10 μ g/kg/min IV infusion
- Phentolamine: 5–15 mg q5–15min IV bolus

Ongoing Care

Disposition

Admission Criteria

- All patients with end-organ damage
- ICU for cardiac and BP monitoring

Discharge Criteria

- Absence of end-organ damage
- Likely to be compliant with primary care
- Known history of HTN
- Reversible precipitating cause (e.g., medication noncompliance)
- Able to resume previous medication regimen
- Return with chest pain or headache

Follow-Up Recommendations

Initiation of a suitable medication regimen under care of a primary care provider

Pearls and Pitfalls

- Avoid IV agents for hypertensive urgency
- BP goal in hypertensive emergency is a reduction of the MAP by 20–25% within the 1st hr except in ischemic CVA and aortic dissection
- Avoid excessive or precipitous decrease in BP because it may exacerbate end-organ damage
- Avoid reflex tachycardia in aortic dissection
- Avoid unopposed α in catecholamine excess