

## Managing Hypertension in the Emergency Department: Review Questions

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### QUESTIONS

Choose the single best answer for each question.

- All of the following statements are true about the management of hypertensive emergencies EXCEPT:**
  - Mean arterial pressure (MAP) should be reduced by 20% to 25% over the first 2 to 3 hours in a patient with hypertensive encephalopathy.
  - Myocardial ischemia in a patient with a blood pressure (BP) of 174/110 mm Hg is considered a hypertensive emergency.
  - An asymptomatic patient with a BP of 170/116 mm Hg requires immediate pressure reduction prior to discharge.
  - The presence of proteinuria, hematuria, and casts in the urine of a patient with severe hypertension suggests a hypertensive emergency.
  - Papilledema distinguishes malignant hypertension from accelerated hypertension.
- Which of the following is NOT a cause of secondary hypertension?**
  - Pheochromocytoma
  - Coarctation of the aorta
  - Renal parenchymal disease
  - Steroid and oral contraceptive use
  - Diabetes mellitus
- All of the following pairs of antihypertensive agents and side-effects/complications are correctly matched EXCEPT:**
  - Nitroglycerin: methemoglobinemia
  - Nicardipine: local phlebitis
  - Fenoldopam: fluid retention
  - Phentolamine: tachycardia, flushing, headache
  - Trimethaphan: paresis of bowel and bladder
- A 10-year-old child presents to the emergency department following complaints of lower extremity weakness. BP recordings reveal systolic and diastolic pressures that are lower in the legs than in the arms. A chest radiograph demonstrates rib notching and a figure-three silhouette of the aorta. The most likely cause of these findings is:**
  - Aortic dissection
  - Incorrect cuff size when measuring lower extremity pressures
  - Renal stenosis
  - Coarctation of the aorta
  - Tetralogy of Fallot
- A 48-year-old man presents with a 2-day history of worsening morning occipital headaches and blurring of vision in his right eye. He has a BP of 220/130 mm Hg and a heart rate of 78 bpm. On fundoscopic examination, the physiologic cup of the optic disc in the right eye is obscured. Flame-shaped hemorrhages are noted. The remainder of the physical examination is normal. Laboratory findings include hematuria (2+) and a serum creatinine level of 2.1 mg/dL. Optimal management of this patient would be:**
  - Gradual reduction of diastolic BP to 90 to 100 mm Hg over 2 days
  - Reduction of diastolic BP to 90 mm Hg over 2 to 3 hours
  - Reduction of MAP to 120 mm Hg over 2 to 3 hours
  - Reduction of MAP to 120 mm Hg over 6 to 12 hours
  - Measurement of intracranial pressure prior to lowering the BP

*(turn page for answers)*

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EXPLANATION OF ANSWERS

- 1. (C) An asymptomatic patient with a BP of 170/116 mm Hg requires immediate pressure reduction (FALSE).** An increase in BP above an arbitrarily determined level does not define a hypertensive crisis or emergency. A hypertensive emergency exists when severe elevations of BP cause ongoing damage to susceptible target organs (eg, brain, eyes, heart, kidneys). Signs and symptoms indicating dangerous increases in BP include headache, seizures, visual disturbances, focal neurologic findings, myocardial ischemia, and renal failure (presence of protein, blood, and casts in the urine). Also, a marked elevation of the diastolic BP combined with fundoscopic changes such as flame-shaped hemorrhages and cotton-wool exudates implies accelerated hypertension, whereas these findings plus papilledema suggest malignant hypertension. Autoregulatory responses diminish in patients with chronic hypertension, and a precipitous lowering of BP may result in a stroke or myocardial infarction. Obtaining a “normal” BP should not be the objective. A reasonable goal is to lower MAP by 25% in the first 2 to 3 hours in patients with hypertensive emergencies.
- 2. (E) Diabetes mellitus.** In approximately 90% of cases of hypertension, the etiology of high BP remains unknown and is termed *primary* or *essential hypertension*. A secondary cause accounts for the remaining 10% of hypertension cases. Several medical conditions may provoke hypertension. Pheochromocytoma, an adrenal or sympathetic nervous system tumor, causes paroxysmal bouts of hypertension from catecholamine surges. Coarctation of the aorta, a congenital narrowing of the aorta, produces hypertension in the upper extremities but low or normal BP in lower extremities. Renal parenchymal disease is the most common etiology of secondary hypertension. Drugs, including steroids and oral contraceptives, are important causes to consider when investigating unexplained hypertension. Diabetes mellitus may cause renal or vascular disease, but diabetes mellitus alone does not give rise to hypertension.
- 3. (C) Fenoldopam: fluid retention.** Nitroglycerin, used in treatment of hypertension coexisting with myocardial ischemia/infarction, may impair oxygen transport if methemoglobinemia is induced. Nicardipine, an intravenous calcium channel blocker, can initiate a localized phlebitis. Fenoldopam, a selective parenteral dopamine agonist, may be as efficacious as sodium nitroprusside. Also, intravenous fenoldopam offers

advantages to sodium nitroprusside because fenoldopam produces both a diuresis and natriuresis, opposing fluid retention, and is neither light sensitive nor associated with cyanide toxicity. Phentolamine, a competitive  $\alpha$ -agonist can provoke tachycardia, flushing, and headache. Trimethaphan, an older ganglionic blocking agent, was used to treat hypertension that accompanied aortic dissection. However, troublesome adverse reactions, including bowel and bladder paresis, orthostatic hypotension, and visual disturbances, have limited its use.

- 4. (D) Coarctation of the aorta.** Coarctation of the aorta typically occurs just distal to the origin of the left subclavian artery. Differential pulses and pressures are much higher in the upper extremities than in lower extremities. A chest radiograph may reveal notching of the ribs caused by subsequent enlargement of intercostal arteries. An additional important finding on chest radiography that is pathognomonic for coarctation is the figure-three silhouette shaped by the dilation of the subclavian artery and aorta proximal to the narrowing (coarctation), and poststenotic dilation of the aorta. Angiography confirms the diagnosis of coarctation of the aorta. Aortic dissection, incorrect cuff size when measuring lower extremity pressures, renal stenosis, and tetralogy of Fallot do not cause this constellation of findings.
- 5. (C) Reduction of MAP to 120 mm Hg over 2 to 3 hours.** Although uncommon, hypertensive encephalopathy is the prototype hypertensive emergency. This reversible condition arises when elevations in BP exceed cerebral autoregulation capability. Findings suggestive of target organ damage obligate a prompt reduction in BP to prevent permanent organ dysfunction and death. Current guidelines call for a reduction of MAP by 20% to 25% over the first 2 to 3 hours. A satisfactory reduction of BP should cause the encephalopathic syndrome to promptly resolve within hours. Lack of improvement with BP reduction indicates other possible pathology. Although knowing the intracranial pressure (ICP) would be useful because cerebral perfusion pressure equals MAP minus ICP, this knowledge is generally impractical in most settings and could contribute to unnecessary time delays in initiating therapy.

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*Adapted from Levy DB: Managing hypertension in the emergency department. Hospital Physician Emergency Medicine Board Review Manual 1997:2(2).*