Hypertension in the ED

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Most ED patients with hypertension will present either without symptoms or with only mild headache. This review covers the most up-to-date guidelines for treating these patients.

Case Scenarios

Case 1

You had just started your shift, and your first patient presented with symptoms of headache and dizziness, and a blood pressure (BP) of 240/130 mm Hg, without any vomiting or visual symptoms. Physical examination revealed an alert, pleasant 65-year-old black man whose ocular, neurological, and cardiovascular (CV) examinations were normal. The patient reported a history of borderline hypertension, but had never taken any medications for it.

After placing some initial orders, including an electrocardiogram (ECG), basic metabolic panel (BMP), and head computed tomography (CT) scan, and ordering 10 mg intravenous (IV) prochlorperazine and 25 mg IV diphenhydramine to treat the patient's headache, you are left asking yourself what steps you should take next.

Case 2

Your next patient was a 90-year-old white woman who had been referred to the ED by her primary care physician (PCP) for "hypertensive urgency." She had no complaints to report. Similar to the first patient, this patient's physical examination was also normal, with the exception of a persistently elevated BP of 220/140 mm Hg. Her history was significant for congestive heart failure (CHF), but she exhibited no current CV signs or symptoms. The patient had been taking furosemide but was not on any other antihypertensive medications.

Case 3

In the room next to your 90-year-old patient is a 32-year-old uninsured hypertensive white woman. During the history taking, the patient stated that she was trying to become pregnant and was not currently using any form of contraception. Similar to the second patient, she had no complaints to report. Regarding her reason for presentation, the patient stated that when she had her BP checked at a pharmacy earlier that day, the reading was "too high," and the pharmacist had advised her to go to the ED. She seemed anxious but otherwise well. Her initial BP at presentation was 240/100 mm Hg, but her physical examination was otherwise normal.

Hypertensive Emergencies

As emergency physicians (EPs), we see hypertensive patients every day. According to the US Centers for Disease Control and Prevention, 33% of American adults have hypertension, which is defined by a BP of ≥140/90 mm Hg (**Table 1**). Hypertension remains uncontrolled in over 50% of these patients[1] and contributes to a large disease burden, including stroke, CV disease, and kidney failure. Treatment of hypertension has been proven effective in reducing morbidity and mortality.[2]

Almost 25% of total annual US adult ED visits are directly or indirectly related to hypertension, and about 1% of all ED visits are due solely to elevated BP.[3] In an ambulatory care survey for 2007, moderate

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Table 1. Definition and Classification of Ambulatory Blood Pressure in Adults[15,17]

Category	Systolic (mm Hg)	Diastolic (mm Hg)
Optimal	<120	<80
High normal	120-139	80-89
Grade 1 hypertension	140-159	90-99
Grade 2 hypertension	160-179	100-109
Grade 3 (severe) hypertension	≥180	≥110

or severe hypertensive BP readings were found to be more common in patients presenting to the ED (43.5%) than to primary care clinics (27%).[4] Patients presenting to the ED with hypertensive BP readings disproportionately represented patients who were older, male, non-Hispanic black, Medicare beneficiaries, or uninsured. Certainly, some patients presenting to the ED have hypertensive BP readings due to pain or anxiety, but multiple studies have suggested that 50% to 70% of ED patients who have hypertensive BP readings will be diagnosed with hypertension on office follow-up.[5,6] While a minority of these patients present to the ED with hypertensive emergencies, the majority present either without symptoms of hypertension or with only mild headache. Given the disease burden of hypertension combined with the benefits of treatment, it is worthwhile for the practicing EP to review the most up-to-date guidelines on outpatient management of hypertension.

When a patient presents to the ED with a hypertensive BP reading, the initial priority of the EP is to exclude hypertensive emergency. Hypertensive emergencies are defined by the presence of hypertension (generally grade 3/severe hypertension with BP ≥180/110 mm Hg; see **Table 1**) in conjunction with evidence of target organ damage. The organs that manifest the complications of severe hypertension and their associated hypertensive emergencies are listed in **Table 2**. The organs affected include the heart and vascular system, eyes, brain, and kidneys.

Target Organ Manifestations

The acuity and/or presence of target organ damage are not always clear on initial ED evaluation. For instance, when a patient who has no history of primary care presents to the ED with severe hypertension, laboratory evaluation may demonstrate protein and blood in his or her urine and an elevated serum creatinine level. In the absence of values from past laboratory studies, it is difficult to determine whether these test results represent normal laboratory parameters for this patient due to longstanding hypertensive kidney disease (ie, hypertensive nephrosclerosis) or if they represent a true hypertensive emergency, (ie, hypertensive emergency-related nephropathy).[7] In patients with severe hypertension and possibly new acute kidney injury, it is probably safest to either assume hypertensive emergency-related nephropathy and to treat accordingly or consult with nephrology services. The picture of hypertensive emergency-related nephropathy often only becomes clear after renal biopsy results and improvement in renal parameters with BP control.

The ocular manifestations of hypertensive emergency require detailed fundoscopy, which at times can be challenging in the ED. In assessing for cardiac target organ damage, at our institution, we typically ask patients if they have experienced symptoms of dyspnea and chest pain or pressure. Generally, we also evaluate cardiac enzymes, B-type natriuretic peptide, and order ECG and chest X-ray studies when suggested by history or physical examination. Alarmingly, a study of 161 ED hypertensive (average BP of 183/109 mm Hg), asymptomatic, predominantly black patients found that 146 (90.7%) had subclinical hy-

pertensive heart disease on point-of-care echocardiogram.[8]

Neurological/Hypertensive Encephalopathy

Hypertensive encephalopathy is a diagnosis of exclusion as alternate causes of confusion and headache, such as intracranial hemorrhage, are excluded and mental status improves with titrated BP control. Nonetheless, it is difficult to confidently state from the literature that patients who present with headache but have a normal mental status in the presence of severe hypertension are not on an early spectrum of hypertensive encephalopathy. Therefore, it is likely that the degree of symptoms should define whether target organ damage exists, though there is certainly a spectrum of hypertensive emergency—the strict definition of which is not always clear.

When a hypertensive emergency is diagnosed, management typically involves the use of antihypertensive IV medication in the intensive care unit. While such management is outside the scope of this paper, Adebayo and Rogers[9] have published an excellent review of the care of hypertensive emergencies.

Asymptomatic Hypertension

The American College of Emergency Physicians (ACEP) has developed two clinical policies on the evaluation and management of asymptomatic hypertension in the ED. The original, published in 2006, advised that initially high BP readings of ED patients should be repeated: two separate high readings are adequate for screening, and those patients with hypertension should be referred for follow-up. Further-

Table 2. Organ Damage Reflecting Hypertensive Emergencies[9]

Organ Systems Affected by Hypertensive Emergency	Disease State(s) Caused by Severe Hypertension	Physical/Laboratory/ Radiographic Evaluation
Ocular system	Hypertensive retinopathy (papilledema, flame hemorrhages)	Fundoscopy
Cardiovascular system	Pulmonary edema Myocardial ischemia Aortic dissection	Electrocardiogram Chest X-ray imaging Cardiac enzymes Computed tomography angiography of the chest/abdomen
Central nervous system	Hypertensive encephalopathy Cardiovascular accident Posterior reversible encephalopathy syndrome Hypertensive intracranial hemorrhage	Noncontrast head computed tomography Magnetic resonance imaging
Renal system	Acute renal failure Hypertensive emergency Renal disease Microangiopathic hemolytic anemia	Urinalysis Basic metabolic panel Complete blood count Lactate dehydrogenase Haptoglobin Indirect bilirubin

If treatment for hypertension is initiated in the ED, such management should attempt only to gradually lower BP, and not to normalize it during the initial ED visit.

more, ACEP policies note that initiating treatment in the ED is not necessary when patients are referred for follow-up. If treatment for hypertension is initiated in the ED, ACEP recommends that such management should attempt only to gradually lower BP, and not to normalize it during the initial ED visit.[10]

The 2013 update to ACEP's clinical policy on managing asymptomatic hypertension expanded on the original policy. The updated policy advised against routine testing for target organ damage in patients who have asymptomatic severe hypertension. However, ACEP policy notes that evaluating serum creatinine in these patients with poor follow-up may influence patient disposition.[11]

The 2013 policy further stated that medical intervention is not required in ED patients who have asymptomatic severe hypertension, but may be considered in patients with poor follow-up. The policies emphasize that all asymptomatic hypertensive patients should be referred for follow-up. The literature cited for the recommendation that ED patients with asymptomatic severe hypertension do not require routine investigation stems from two observational studies. These studies found that screening asymptomatic ED patients who presented with severe hypertension revealed serum creatinine abnormalities in approximately 6%, which impacted patient disposition, though it was not clear from the study results whether admission correlated to meaningful patient outcomes.[12,13]

Patient Disposition

Since ACEP's 2013 clinical policy, a study from the Cleveland Clinic has been published. This retrospective cohort study reviewed 6 years of data looking at all patients in its system with a BP of ≥180/110 mm Hg, and compared those office patients discharged to home to those referred to the ED or directly admitted to the inpatient hospital solely on the basis of severe hypertension.[14] The study found that 0.5% of 387 patients referred to the ED by primary care clinics for asymptomatic severe hypertension had confirmed acute kidney injury on BMP.[14] The Cleveland Clinic study also found that 2.1% of patients had evidence of target organ damage and 5.5% had any abnormal results.[14] In addition, referral to the ED from the clinic for hypertension was associated with a slightly higher rate of major adverse CV events at 7 days (2 of 426 [0.5%] versus 61 of 58,109 [0.1%]; $P = .02$).[14]

The results of the Cleveland Clinic study confirm that in the absence of target organ damage, hypertension is probably best managed in the outpatient setting. The European Task Force hypertensive guidelines state "hospitalization for hypertension is regarded as inappropriate in most European countries."[15] However, from 2006 to 2012, 26% of US ED patients with primary diagnoses of hypertension were admitted to the hospital.[3] In Canada's most populous province of Ontario, from 2002 to 2011, approximately 8% of hypertensive patients were admitted.[16] Part of this discrepancy may be due to the sometimes ambiguous nature of the presentation of patients with hypertension, making it unclear whether a true hypertensive emergency exists. Many patients perceive visual symptoms, headache, dizziness, and even chest pressure as the result of their elevated BP—without clear findings on fundoscopy, ECG, or cardiac marker testing. Perhaps more of these patients would be discharged if EPs felt comfortable initiating appropriate initial antihypertensive treatment.

Management

Initiating Antihypertensive Treatment

Some EPs may feel that an accurate diagnosis of hypertension requires repeat BP testing in the primary care office setting, and for this reason are reluctant to initiate antihypertensive treatment in the ED. The most recent guidelines by the Joint National Committee (JNC 8) do not address

how many BP readings are necessary to diagnose hypertension, but JNC 7 suggested that diagnosis of hypertension requires two separate office visits.[17] Evidence cited in ACEP's first clinical policy states that two separate BP measurements in the ED are adequate for screening—but not necessarily for initiating treatment.[10] However, European and British outpatient clinical recommendations advocate initiation of antihypertensive medication for a single visit in patients who have an elevated BP categorized as grade 3/severe hypertension (BP of ≥180/110 mm Hg).[15,18] Furthermore, for patients with severe hypertension seen in the ED, as many as 97% are likely to have true hypertension at office follow-up.[6] Those ED patients presenting with severe hypertension are very likely to have a true diagnosis of hypertension.

A recent retrospective analysis of a group of hypertensive ED patients by Brody et al[19] found that patients prescribed BP medications by an EP were more likely to have improved BP control at follow-up 2 weeks later. In their study, the decision to prescribe antihypertensive medications were at the discretion of the EP. Seventy-six patients were given one or more prescriptions for antihypertensive therapy, compared to a control group of 141 patients who were not given a prescription. On follow-up at 2 weeks, there was an 11 mm Hg greater reduction of BP in the group who received prescriptions compared to the control group. None of the patients in either group on follow-up had experienced any new neurological deficits, ischemic events, life-threatening anaphylactic reactions, or clinically significant hypotension.

The Cleveland Clinic study[14] also reported on those patents given who received new prescriptions from the ED. Similar to the study by Brody et al,[19] none of the 82 patients discharged to home from the ED with a new antihypertensive prescription had any major adverse event at 30-day follow-up.[14]

Pharmacological Treatment Recommendations

When choosing to treat patients with new prescriptions for antihypertensives, it is important to follow the most current outpatient treatment recommendations. In 2014, JNC 8 released new guidelines for the outpatient management of adults with hypertension.[20] The panel issued recommendations based on its systematic review of randomized controlled trials on antihypertensive treatments. The key recommendations are as follows:

- In patients aged 60 years or older, initiate pharmacological treatment at a BP of ≥150/90 mm Hg.
- In patients aged 18 to 59 years, initiate pharmacological treatment at a BP of ≥140/90 mm Hg.
- In the general nonblack population, initial antihypertensive treatment should include a thiazide-type diuretic, a calcium channel blocker (CCB), an angiotensin-converting enzyme inhibitor (ACE-I), or an angiotensin receptor blocker (ARB).
- In the general black population, initial treatment should include a thiazide-type diuretic or a CCB.
- In patients with chronic kidney disease (CKD) (including black patients), initial (or add-on) antihypertensive treatment should include an ACE-I or ARB to improve kidney outcomes—but not both.
- If goal BP is not reached within 1 month of initial treatment, increase the dose of the initial drug or add a second agent (eg, thiazide-type diuretic, CCB, ACE-I, or ARB). If goal is not reached with two drugs, use the third drug from that list if no contraindications exist, but do not use both an ACE-I and an ARB together in the same patient.

Of note, JNC 8, in departure from JNC 7, no longer recommends beta-blockers as first-line therapy for isolated hypertension (there may be compelling alternate indications, such as atrial fibrillation or postmyocardial infarction (MI), such that a beta-blocker would still be the first medication

considered). The reason for this stems from a single randomized controlled trial of 9,193 patients that found that despite equivalent BP reduction, use of a beta-blocker in comparison to an ARB resulted in a higher rate of a composite outcome of death, MI, or stroke.[21] The main difference was a 25% relative risk reduction for stroke with use of an ARB (losartan) in comparison to a beta-blocker (atenolol). The most recent European guidelines still include beta-blockers among its first-line recommended BP medications, but do acknowledge that they are not as effective in reducing stroke incidence as other alternative medications.[15] The European guidelines otherwise include the same list of first-line agents. The British guidelines mirror JNC 8 in terms of first-line antihypertensive medication choices.[18]

Since the release of JNC 8, the Systolic Blood Pressure Intervention Trial (SPRINT) has been published, and will likely impact future national recommendations on BP management. The SPRINT study was a randomized controlled trial enrolling over 9,000 hypertensive nondiabetic patients older than age 50 years that treated individuals to a standard BP goal (systolic BP of 140 mm Hg) versus an intensive BP goal (systolic BP of 120 mm Hg) over a 3.5-year period. The trial was stopped early for safety as a 25% mortality reduction was observed in the intensive treatment group (1.65 vs 2.19 deaths/y).[22] This was in contrast to previous trials that had mostly failed to show this sort of benefit, though previous trials were smaller in number or included only diabetic patients.[23] While it is likely that this trial may influence lowering treatment thresholds from the office, it is not likely to impact care from the ED.

The recommendations of JNC 8 do not necessarily coincide with current US EP practice. In the study by Brody et al,[19] of patients provided ED antihypertensive prescriptions, 54% received thiazide-type diuretics, 26% ACE-I, 10% CCBs, and 6%

Table 3. Compelling and Possible Contraindications to the Use of Antihypertensive Drugs[13]

Drug	Compelling Contraindication(s)	Possible Contraindication(s)
Thiazide-type diuretics	Gout	Metabolic syndrome Hypokalemia Glucose intolerance Pregnancy Hypercalcemia
Calcium channel blockers (dihydropyridines)		Heart failure Tachyarrhythmia
Angiotensin-converting enzyme inhibitors	Pregnancy Hyperkalemia Angioedema Bilateral renal artery stenosis	Women with child-bearing potential
Angiotension receptor blockers	Pregnancy Hyperkalemia Bilateral renal artery stenosis	Women with child-bearing potential

beta-blockers. This is noteworthy because 96% of those in the study were black patients who would benefit most from either a thiazide or a CCB. Another recent study of ED patients showed that of patients who were both treated in the ED and discharged with antihypertensive medications, 34% received a diuretic prescription, 32% clonidine, 15% a beta-blocker, 19% an ARB or ACE-I, 12% a CCB, and 2% hydrazine.[24] These results are important because according to many published guidelines, including JNC 8, clonidine is only considered one of several fourth-line options for severe resistant hypertension.[15,18,20] Since clonidine use can be complicated by rebound hypertension, it is not an ideal agent to be prescribed de novo to patients in the ED. This is particularly true if these patients are not already on maximum doses of the three most recommended agents previously noted, or if there are concerns over patient compliance.

Of the drug classes recommended by JNC 8, **Table 3** lists the absolute and relative contraindications. Of note, potential side effects associated with thiazide diuretics are hypokalemia and hyponatremia. The ARB or ACE-I antihypertensives can worsen or induce hyperkalemia. For this reason, patients typically started on a thiazide should have periodic evaluation of sodium and potassium levels.[15,17,25] Patients who have renal disease or who are at risk for renovascular disease should have repeat BMP evaluation 1 to 2 weeks after starting an ARB or ACE-I.[26] Therefore, while ACEP may advise baseline testing of hypertensive patients is unnecessary, if choosing to start an ACE-I, ARB, or thiazide diuretic, a BMP should probably be checked. Oftentimes this will need to be repeated in the primary care office 1 to 2 weeks later. This may complicate choosing any of these agents from the ED.

In clinical trials, amlodipine is among the most effective BP medications and is considered first-line therapy for all groups of patients with hypertension.[15,18,20] A simplistic approach for most patients presenting with severe asymptomatic hypertension (BP of ≥180/110 mm Hg) not currently on treatment would be to recheck the BP and assure it remains elevated over the period of the ED visit. If it does, refer for follow-up, and consider prescribing amlodipine on ED discharge. In patients with baseline CKD or with history of CHF, consider alternatively starting them on an ARB or ACE-I. If starting an ARB or ACE-I, a baseline BMP should probably be checked and patients at risk for renovascular disease should be advised they require follow-up for repeat BMP in 1 to 2 weeks. **Table 4** lists the commonly prescribed antihypertensive medications and typical dose ranges.

Conclusion

Hypertension is among the most common medical conditions for which emergency patients seek care. The ACEP clinical policies provide guidance on the appropriate work-up and treatment of these patients. Given the occasional lack of clarity on whether a patient's presentation is on the spectrum of more acute/serious, EPs may feel more comfortable in discharging patients with poor follow-up if they are able to safely prescribe antihypertensive treatment. Prior to prescribing treatment, EPs should refer to the JNC 8 guidelines to appropriately start antihypertensive treatment in select patient groups in the ED. The guidelines of JNC 8 are therefore worth referring to in order to appropriately start treatment in select patient groups from the ED.

Case Scenarios Continued

Case 1

[The 65-year-old black man who presented with headache and dizziness, and had an initial BP of 240/130 mm Hg.]

After treating the patient with prochlorperazine and diphenhydramine, his headache resolved. His BP improved but remained elevated at 190/120 mm Hg. On further questioning, the patient reported a

Table 4. First-line Treatment Options for the Outpatient Treatment of Hypertension[20]

Drug	Dose Range	Average Price/1-Month Supply
Calcium channel blockers (dihydropyridine)	5-10 mg/d	$4.00 (Average cost on many retailer prescription lists)
—Amlodipine		
Thiazide-type diuretics		$4.00 (Average cost on many retailer prescription lists)
—Chlorthalidone	12.5-25 mg/d	
—Hydrochlorothiazide	12.5-50 mg/d	
Angiotensin-converting enzyme inhibitors		$4.00 (Average cost on many retailer prescription lists)
—Benazepril	20-40 mg/d	
—Captopril	25-50 mg twice daily dosing	
—Lisinopril	10-40 mg/d	
Angiotensin receptor blockers		
—Irbesartan	150-300 mg/d	~$10.00
—Losartan	80-320 mg/d	~$25.00 (dose-dependent)
—Valsartan	50-100 mg/d	~$15.00

history of similar headaches and wondered whether it was related to his BP. The head CT scan was negative for any acute hemorrhage, infarct, or mass; the ECG only showed evidence of left ventricular hypertrophy; and the BMP showed normal renal function.

After a long discussion with the patient, you agreed to start him on amlodipine 5 mg/d and referred him for follow-up with a local PCP.

Case 2

[The 90-year-old white woman with a history of CHF and an initial BP of 220/140 mm Hg at presentation.]

The BMP evaluation showed a baseline creatinine level of 1.3 mg/dL. Given this patient's history of CHF, amlodipine would not be the ideal next agent to prescribe. After discussion with her PCP, you elected to start her on losartan at 25 mg/d, and instructed her to follow-up with her PCP within 1 week.

Case 3

[The 32-year-old white woman who presented at the advice of a pharmacist and had an initial BP of 240/100 mm Hg.]

While reviewing the patient's work-up and history, you noted her plans to become pregnant, and recalled a recent review on BP management, noting the contraindications associated with ARB or ACE-I in pregnancy. Based on the patient's uninsured status and poor follow-up, you considered prescribing amlodipine. Prior to issuing the prescription, you performed a repeat BP check and noted that the patient's BP had decreased to 130/85 mm Hg. Given the marked improvement in the patient's BP during her ED course, you were not convinced that she truly had hypertension.

Instead of prescribing an antihypertensive agent, which may not ultimately benefit this patient, you advised her to seek follow-up care at an outpatient clinic to have her BP rechecked. The patient agreed, and you referred her to a local free clinic.

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