

Management of Preoperative Hypertension



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Systemic hypertension is an extremely common diagnosis in the US surgical population, with approximately 30% of Americans having the condition.

Management Guidelines

The Eighth Joint National Committee (JNC 8) panel released the current *Guidelines for Management of High Blood Pressure in Adults* in 2014.³ It is notable that, in contrast to JNC 7, these guidelines do not define prehypertension and hypertension, nor do they subdivide hypertension into stages based on severity. The new guidelines are more practical in nature and focus on outlining a set of parameters for initiation and goals of treatment.

According to the latest guidelines, treatment should be initiated for patients aged at least 60 years when blood pressure (BP) is 150/90 mm Hg or higher, with a goal of less than 150/90 mm Hg. For patients aged 18 to 59 years, treatment should be initiated for BP 140/90 mm Hg or higher, with a goal of less than 140/90 mm Hg.

Published studies have shown that the incidence of hypertension in preoperative patients ranges from 10% to 25%.¹ The main risk for preoperative hypertension is intraoperative hemodynamic instability; both hypertension and hypotension are significantly more common in patients who present as hypertensive.² Patients who experience instability may go on to develop further sequelae such as stroke and myocardial ischemia.

The onset of end-organ damage and the urgency of the case are important factors when deciding whether to initiate treatment and/or to proceed with anesthesia and surgery. However, there remains a paucity of data to support a blood pressure goal or cutoff at which an elective case should be cancelled and rescheduled, or if treatment should be initiated prior to proceeding with an urgent case.

The evidence level for lowering diastolic blood pressure (DBP) to less than 90 mm Hg for patients at least 30 years of age, and for controlling systolic blood pressure (SBP) to less than 150 mm Hg for patients at least 60 years old, is Grade A (strong recommendation). In contrast, the recommendation for BP control in all other groups falls to the level of expert opinion (Grade E).

It is interesting to note that the change in cutoff SBP from 140 to 150 mm Hg in the elderly population was controversial. Several groups objected, including the influential American Heart Association (AHA), whose recommendations still reflect those of the JNC 7. It is expected that the American College of Cardiology (ACC) and AHA will release their own recommendations within approximately one year.⁵

Whereas the JNC and other organizations post guidelines for the management of ambulatory blood pressure, similar guidelines regarding perioperative hypertension are not as readily available. The latest 2014 ACC/AHA Perioperative Guidelines do not mention hypertension.⁶ The 2007 version stated, "Numerous studies have shown that stage 1 or stage 2 hypertension (systolic blood pressure below 180 mm Hg and diastolic blood pressure below 110 mm Hg) is not an independent risk factor for perioperative cardiovascular complications."⁷

A more cautious approach was outlined for patients presenting with BP higher than 180/110, taking into account patient and surgical factors, but this was based solely on recommendations by experts. In one study cited by ACC/AHA, patients arriving for surgery with preoperative DBP 110 to 130 were randomized either to receive 10 mg nifedipine intranasally and proceed to surgery, or to have the case cancelled, patient admitted for BP control, and the surgery rescheduled for a later date.⁸ Selected patients had no other major cardiovascular risk factors. There were no differences in the outcomes between the 2 groups.

Although the medical literature shows increased rates of myocardial ischemia and other end-organ damage in

patients with BP higher than 180/110, there is a dearth of evidence regarding outcomes in patients with severe hypertension in the perioperative period. Given the concern that severe, uncontrolled hypertension increases myocardial stress, it is reasonable to consider case delay or cancellation in selected patients.

Hypertensive Crisis

According to the AHA, BP higher than 180/110 constitutes a hypertensive crisis.⁹ At this level of hypertension, the patient is at risk for end-organ damage. When encountered with this finding, it is critical to determine whether or not end-organ damage has indeed already begun to occur. This will differentiate between treating for a hypertensive urgency (severe asymptomatic hypertension) or a hypertensive emergency.

The preoperative patient who presents with SBP higher than 180 or DBP higher than 110 (120, according to some sources) without symptoms of end-organ damage is considered to be undergoing a hypertensive urgency. It is important to check that the patient's BP was taken with an appropriate-sized cuff, and to check it against another extremity. The patient should also be allowed to sit in a comfortable, relaxed environment for at least 5 minutes before reattempting the measurement to minimize the effects of anxiety and physical stress.

However, a significant number of patients will likely have elevated BP due to anxiety and/or white coat hypertension. It is reasonable to treat these patients with standard anxiolytics and to recheck BP prior to instituting any other therapy.

The medication list must be reviewed carefully if the patient is known to have hypertension. If any medicines were withheld or doses accidentally missed, consideration should be given to administering them or a dose of a similar-acting medication parenterally. If the patient is otherwise fit for surgery and has no major cardiovascular risk factors, and the proposed surgery is of low or intermediate risk, it is reasonable to proceed. Because

Table 1. Signs and Symptoms of End-Organ Damage in Hypertensive Emergency

Chest pain, arrhythmia, dyspnea, orthopnea, peripheral edema
Headache, vomiting, depressed consciousness, seizure
Hematuria, proteinuria
Numbness, weakness, slurred speech
Retinal hemorrhage, papilledema, blurred vision
Severe anxiety

Table 2. Typical Conditions Underlying Hypertensive Emergencies

Aortic dissection
Cocaine toxicity
Intracranial hemorrhage
Ischemic stroke
Myocardial infarction
Newly diagnosed hypertension or patient not taking prescribed meds
Pheochromocytoma
Preeclampsia or eclampsia
Pulmonary edema

Table 3. Drugs for Acute Management of Severe Hypertension

Drug	Class	Mechanism	Dose
Clevidipine	Dihydropyridine calcium channel blocker	Vasodilation	Start: 2 mg/h; dose may be doubled every 90 sec. Maximum: 32 mg/h.
Enalaprilat	ACE-I	Vasodilation more than venodilation	1.25-5 mg q6h
Esmolol	Selective β_1 antagonist	Negative inotropy and chronotropy	Bolus 500 mcg/kg; start infusion 50-100 mcg/kg/min; repeat bolus and increase dose by 50 mcg/kg/min q15min until target achieved, up to 300 mcg/kg/min
Fenoldopam	Dopamine D ₁ agonist	Vasodilation; increases RBF; induces diuresis and natriuresis	Start: 0.1-0.3 mcg/kg/min. Increase by 0.05-0.1 mcg/kg/min increments q15min until target achieved, up to 1.6 mcg/kg/min
Hydralazine	Direct peripheral vasodilator	Not completely known	10-20 mg q4-6h
Labetalol	Selective α_1 /nonselective β receptor blocker	Causes vasodilation without affecting heart rate	Initial dose 20 mg; dose may be repeated q10 min up to dose of 300 mg or infusion can be started at 0.5-2 mg/min
Nicardipine	Dihydropyridine calcium channel blocker	Vasodilation	Start: 5 mg/h. Increase by 2.5 mg/h q15min up to 15 mg/h. When BP stable, attempt to wean to lowest stable dose.
Nitroglycerin	Nitrate	Venodilation more than vasodilation	Start: 5 mcg/min; increase by 5 mcg/min q3-5min; if inadequate response at 20 mcg/min, increase by 10 mcg/min q3-5min up to 200 mcg/min
Sodium nitroprusside	Nitrovasodilator	Vasodilation more than venodilation	Start: 0.3-0.5 mcg/kg/min; increase by 0.5 mcg/kg/min; maximum: 10 mcg/kg/min (rarely need more than 4 mcg/kg/min)

CAD, coronary artery disease; **COPD**, chronic obstructive pulmonary disease; **ICP**, intracranial pressure; **NTG**, nitroglycerin; **RBC**, red blood cell; **RBF**, renal blood flow; **SNP**, sodium nitroprusside

severe hypertension puts the patient at risk for myocardial ischemia, one may consider delaying the operation if there are other significant cardiovascular risk factors or if the surgery is high-risk, with the goal of lowering BP by not more than 25% within an hour. If this proves to be unattainable, the operation may be postponed until BP is controlled on an outpatient basis with oral medications. Hypertensive urgency does not generally require admission to the hospital.

If the patient presents for surgery with severe hypertension (BP >180/80) and symptoms reflecting end-organ damage (Table 1, page 21), this should be considered a hypertensive emergency. The practitioner should carefully examine for any signs or symptoms of stroke, encephalopathy, myocardial ischemia or infarction, renal or visual impairment, or heart failure (Table 2, page 21). Aortic dissection should be ruled out. Pregnant women with severe hypertension should receive prophylaxis and monitoring for eclampsia.

Antihypertensive therapy should be initiated immediately. In general, the goal should be to decrease BP by approximately 25% within the first hour. More rapid reductions theoretically may compromise organ perfusion further, especially if BP has been uncontrolled for an extended period and autoregulation has been affected. If the scheduled surgery is not urgent, the patient should be transferred to the ICU for further BP control.

The ideal medication for controlling BP in a hypertensive crisis would have rapid onset and rapid termination for easy titratability, and a favorable side-effect profile. Several drugs from different classes meet these criteria to some extent. Selection of a particular drug may be guided by factors such as underlying cause of the hypertensive emergency, comorbidities and allergies. A summary of the most useful drugs for acutely managing severe hypertension is presented in Table 3.¹⁰

Onset	Duration of Effectiveness	Comments
90 sec-4 min	5-15 min	Relatively new (2008), expensive. Titratability almost comparable to SNP, but more predictable response. Studies in cardiac surgery show similar outcomes as with SNP, NTG and nicardipine. Ongoing studies to determine effects on ICP. Metabolized by plasma esterases.
15-30 min	12-24 h	Caution in renal dysfunction. Contraindicated in renal artery stenosis. Long half-life limits usefulness.
1-5 min	15-30 min	Rapidly cleared by RBC esterases. Initial drug of choice in aortic dissection. Contraindicated as single therapy for cocaine toxicity, pheochromocytoma, high-grade heart block. Caution in asthma and COPD.
5-10 min	20-60 min	Reflex tachycardia; caution in aortic dissection and CAD. Use with β -blockers may induce hypotension. May be beneficial in suspected or known kidney injury.
10-30 min	4-6 h	Reflex sympathetic stimulation possible; caution in CAD or aortic dissection. Unpredictable hypotensive response and long duration of action preclude large or frequent doses.
5-10 min, with peak -30 min	2-6 h	One of few drugs available for pre-eclampsia. Good for patients with CAD. Caution in COPD and asthma. Long half-life means potential for overshoot.
10 min	2-6 h	Main drawback is prolonged duration. Does not increase ICP, good choice in stroke. Does not depress heart function.
2-5 min	5-10 min	Primary role in coronary ischemia or angina associated with hypertension. Tolerance may occur.
Seconds	2-3 min	Gold standard pharmacotherapy for hypertensive emergency. Increases ICP, do not use in stroke. Caution in myocardial ischemia or renal injury. Possibility of rapid changes in BP mandates continuous monitoring. Cyanide and thiocyanate toxicity more common with higher dose, longer infusions and liver or kidney impairment.

Conclusion

Hypertension is a problem that anesthesiologists are required to manage daily, whether it be making a new diagnosis of suspected hypertension or a patient with known hypertension presenting with uncontrolled BP. There is no significant difference in outcomes between hypertensive and normotensive surgical patients when their preoperative BP is less than 180/110 mm Hg.

Patients presenting for surgery in hypertensive crisis (BP >180/110) must be interviewed and examined carefully to determine whether this level of hypertension is acute or chronic, and whether there are signs and symptoms of end-organ damage. The patient with asymptomatic severe hypertension (hypertensive urgency) may proceed to the operating room. However, if the patient has cardiac risk factors and/or is to undergo nonemergent high-risk surgery, it is not unreasonable

to delay surgery until BP is controlled with oral medication on an outpatient basis.

If the patient with severe hypertension does have signs of end-organ damage, this is considered a hypertensive emergency. Unless it is also a surgical emergency, the case must be rescheduled and IV anti-hypertensive therapy immediately initiated. Although there is no perfect pharmacologic agent for managing hypertensive emergency, a logical first choice can be selected based on the likely etiology and the patient's comorbidities.

Despite its high prevalence in the surgical population, there is very little good evidence regarding the management of preoperative hypertension. There is a need for well-designed studies to help anesthesiologists care for these patients from an evidence-based approach.

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