

# **HYPERTENSION AND ORAL HEALTH: EPIDEMIOLOGIC AND CLINICAL PERSPECTIVES**

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**December 9, 2016**

# GOAL

**Provide an overview of concerns with treating patients with hypertension and provide recommendations that will be helpful in managing a broad spectrum of these patients.**

# EVALUATION

Evaluation for hypertension has three objectives:

- 1. to assess lifestyle and identify other cardiovascular risk factors or concomitant disorders that may affect prognosis and guide treatment.**
- 2. to reveal identifiable causes of high BP.**
- 3. to assess the presence or absence of target organ damage and cardiovascular disease (CVD).**

# TARGET ORGAN DAMAGE

## Heart

Left ventricular hypertrophy

Angina or prior myocardial infarction

Prior coronary revascularization

Heart Failure

## Brain

Stroke or transient ischemic attack

Chronic kidney disease

Peripheral artery disease

Retinopathy

# INTRODUCTION

**The relationship between BP and risk of CVD events is continuous, consistent, and independent of other risk factors.**

**The higher the BP, the greater is the chance of heart attack, heart failure, stroke, and kidney disease.**

**The risk of developing CVD doubles for every increment of 20 mm Hg Systolic (SBP) or 10 mm Hg of Diastolic (DBP).**

**The risk of dying of ischemic heart disease and stroke increases progressively and linearly when blood pressure exceeds 115/75 mm Hg.**

# INTRODUCTION

**The 7th and 8th Joint National Committee (JNC-7 and 8) reports provide guidelines for blood pressure management and treatment.**

**The JNC-8 panel confirms that the >140/90 mmHg definition for hypertension from the JNC 7 report remains the standard for diagnosis for individuals who do not have additional comorbidities.**

**It is recommended that for patients with diabetes or chronic kidney disease a target blood pressure of <130/80 mmHg.**

# INTRODUCTION

**Older than 50 years, SBP > 140 mmHg is a much more important CVD risk factor than DBP.**

**Normal blood pressure at age 55 to 65 years: 80-90% risk of developing hypertension by the age of 80 to 85 years.**

**SBP of 120–139 mmHg or DBP of 80–89 mmHg: considered as pre-hypertensive and requires promoting lifestyle modification to prevent CVD.**

# EPIDEMIOLOGY

Hypertension is known as the “silent killer” and affects 80 million adults over the age of 20 in the U.S. alone and just under 1 billion worldwide.

People with hypertension in the U.S. and globally, undiagnosed hypertension and the future growth of the disease makes hypertension a significant public health concern.

Important oral healthcare providers are well versed on the challenges involved in prevention, management and treatment.



# EPIDEMIOLOGY

Estimated that 17.3% of the 80 million U.S. adults with hypertension are undiagnosed.

By 2025, the number of patients diagnosed with hypertension is expected to be 1.56 billion.

Hypertension is responsible for over 7 million deaths annually and is one of the leading risk factors for cardiovascular disease mortality.

Undiagnosed hypertension has been proven to shorten a life-span by 10-20 years

# Classification

# CHARACTERIZATION

Divided into two main categories:

Essential/Primary

Secondary

# **ESSENTIAL/PRIMARY HYPERTENSION**

**Causative factors are  
unknown**

**about 90-95% of all  
hypertensive cases**

# SECONDARY HYPERTENSION

**Identifiable cause**

**5-10% of U.S. adults**

**Disorders associated with secondary disease**

**renal parenchymal disease**

**renovascular diseases**

**coarctation of the aorta**

**Cushing's syndrome**

**sleep apnea**

**primary hyperaldosteronism**

**pheochromocytoma**

**hyperthyroidism**

**hyperparathyroidism**

# CLASSIFICATION

BP Classification	SBP mm Hg	DBP mm Hg	Lifestyle Modification	Initial Drug Therapy	
				Without Compelling Indication	With compelling Indications
Normal	<120	and <80	Encourage	No meds indicated	N/A
Prehypertension	120-139	or 80-89	Yes		
Stage 1	140-159	or 90-99	Yes	Thiazide-type diuretics for most. May consider ACEI, ARB, BB, CCB, or combination	Meds include diuretics, ACEI, ARB, BB, or CCB
Stage 2	≥160	or ≥100	Yes	Two drug combination for most (usually thiazide-type diuretic with ACEI, ARB, BB, or CCB)	

# GUIDELINES

<b>Normal blood pressure</b>	<b>Systolic &lt;120 mmHg and diastolic &lt;80 mmHg</b>
<b>Prehypertension</b>	<b>Systolic 120 to 139 mmHg or diastolic 80 to 89 mmHg</b>
<b>Stage 1 hypertension</b>	<b>Systolic 140 to 159 mmHg or diastolic 90 to 99 mmHg</b>
<b>Stage 2 hypertension</b>	<b>Systolic <math>\geq</math>160 mmHg or diastolic <math>\geq</math>100 mmHg</b>
<b>Hypertensive urgency</b>	<b>Severe hypertension (diastolic pressure usually &gt;120 mmHg) - no end-organ damage</b>
<b>Hypertensive emergency</b>	<b>Severe hypertension (diastolic pressure usually &gt;120 mmHg) - end-organ damage</b>
<b>“White Coat” hypertension</b>	<b>Elevated blood pressure secondary to fear and anxiety from a healthcare provider</b>

# MEASUREMENT

Blood pressure can be easily measured via the auscultatory method with a mercury, aneroid, or hybrid sphygmomanometer.

The mercury sphygmomanometers are considered the most accurate devices to measure blood pressure, but the use of these devices has decreased.

Aneroid devices are the type most commonly used in dental offices.

Automatic digital devices for the arm, wrist, or finger are also widely used among practicing physicians and patients who monitor their pressures from home.



# RISK FACTORS

Age

Menopause

Family History

Race

Reduced nephron number

Diabetes

Dyslipidemia

Stress

High-sodium diet

Excessive alcohol consumption

Physical inactivity

Personality traits/ depression

Hypovitaminosis D

Low education

Socioeconomic Status

Tobacco

Obesity

Contraceptives

# **PATIENT MANAGEMENT**

**Medical history**

**Physical examination**

**Routine laboratory tests**

**Other diagnostic  
procedures**

# MEDICAL MANAGEMENT

Those patients who are normotensive or prehypertension, providing thorough education is key for prevention.

Explaining risk factors associated with the disease and providing advice on lifestyle modifications such as;

- weight loss
- diet modifications
- decrease in sodium intake
- physical activity and
- limiting alcohol intake

# METHOD FOR TAKING BLOOD PRESSURE

## Taking Blood Pressure

Hypertension detection begins with proper blood pressure measurements.

Repeated BP measurements will:

- determine whether initial elevations persist and require prompt attention
- have returned to normal and need only periodic surveillance.

Blood pressure should be measured in a standardized fashion using equipment that meets certification criteria.

## **METHOD FOR TAKING BLOOD PRESSURE**

**All measurements, including both SBP and DBP, should be recorded.**

**The first two or more readings separated by 2 minutes should be averaged when determining risk.**

**If the first two readings differ by more than 5 mm Hg, additional readings should be obtained and averaged.**

# MEASUREMENT

Proper technique for obtaining accurate blood pressure measurements mandates;

- Patient should be seated quietly for at least 5 minutes in a chair.
- Feet on the floor, and arms supported at heart level.
- An appropriate-sized cuff, a cuff bladder that encircles at least 80% of the arm, to ensure accuracy.
- At least two measurements should be taken during the visit

# Pharmacology

# PHARMACOLOGY

**Medications used in the treatment of hypertension are substantial and cover a variety of categories.**

**Most drugs work on baroreceptors and the sympathetic nervous system or the renin-angiotensin-aldosterone system.**

**Antihypertensive drugs can be used as single therapy or in combination.**

**Target goal depends on severity of the disease.**

**Standard doses of most antihypertensive agents reduce blood pressure by 8–10/4–7 mmHg**



# **EFFECT OF MEDICATION ON BLOOD PRESSURE CONTROL**

**The dental provider should be familiar with medications that could potentially adversely impact blood pressure control**

**Commonly prescribed antihypertensive medications, their side effects and drug-drug interactions.**

# COMMON MEDICATIONS

The literature suggests almost equivalent blood pressure–lowering effects of the following major classes of antihypertensive agents when used as monotherapy;

- Thiazide diuretics
- Adrenoreceptor blockers (ARBs)
  - Beta blockers (BB)
  - Alpha blockers
- Anticholinergic esterase inhibitors (ACEIs)
- Calcium Channel blockers (CCB)/antagonist

# DIURETICS

**Alters the way the kidney controls sodium**

**This regulation occurs at various segments of the renal tubular system**

**Promotes the production of urine**

**Decreases blood volume**

**Diuretics used in the management of hypertension include:**

- **loop**
- **thiazide**
- **potassium sparing diuretics**

# COMMONLY USED ANTIHYPERTENSIVE DRUGS

## Diuretics

### Thiazides

Chlorothiazide (Diuril®)

Hydrochlorothiazide (HCTZ,  
Hydrodiuril®)

## Loops

Furosemide (Lasix®)

Tosemide,

Bumetanide

## Potassium-sparing

Spiro lactone  
(Aldactone®)

Amiloride

Triamterene

eplerenone

# **SIDE EFFECTS OF POTASSIUM-SPARING**

**hypokalemia**

**hyperlipidemia**

**constipation**

**hyperglycemia**

**muscle cramps**

**headache**

**increased perspiration**

**dehydration**

# DRUG-DRUG INTERACTIONS

**Non-steroidal anti-inflammatory  
drugs (NSAIDs)**

**decreased antihypertensive  
effect, concomitant**

**Barbiturates**

**orthostatic hypertension, and  
elevated plasma levels of  
fluconazole and erythromycin  
when used simultaneously**

# ADRENORECEPTOR BLOCKERS

Drugs that bind to  $\alpha$  and  $\beta$  adrenoceptors reduce the rate and contractility of the heart

Impacts cardiac output

Two subgroups: cardio-selective and nonselective beta-blockers

# BETA-ADRENERGIC BLOCKERS

## Selective

$\beta$ -1 receptors

## Mode of action

Block beta-adrenergic receptor sites and probably have direct effects on myocardium.

Avoiding the  $\beta$ -2 receptors of the lungs and vascular smooth muscle cells.

## Nonselective

Block both  $\beta_1$  ( $\beta_1$ ) and  $\beta_2$  ( $\beta_2$ ) receptors



# **CARDIOSELECTIVE AND NONSELECTIVE**

## **Nonselective**

**Drugs include: propranolol,  
nadolol and sotalol**

## **Cardioselective**

**Drugs include: metoprolol,  
atenolol, nebivolol and  
bisoprolol.**

# COMMON SIDE EFFECTS

Bradycardia

Hypotension

Dizziness

Shortness of breath

Fatigue

Adverse drug-drug interactions with NSAIDs can decrease antihypertensive effects

Interactions with local anesthetics can lead to a decreased rate of amide metabolism when taken together.

# ALPHA-ADRENERGIC BLOCKERS

Antagonize the effect of sympathetic nerves on blood vessels

Binding to alpha-adrenoceptors located on the vascular smooth muscle

Decrease peripheral vascular resistance

Categorized as non-competitive and competitive alpha-adrenoceptor blockers

non-competitive antagonists are usually reserved for use in hypertensive emergencies caused by a pheochromocytoma

Often used in combination with other drugs due to weak therapeutic outcomes when used alone

# ALPHA-ADRENERGIC BLOCKERS

## Medication

Prazosin

Doxazosin

Labetalol

## Mode of action

Block alpha receptor sites on blood vessels producing dilation

## Considerations

Orthostatic hypotension

Prolonged use of NSAIDs can reduce antihypertensive effects

# ANGIOTENSIN CONVERTING ENZYME INHIBITORS (ACEI)

Decreasing the production of angiotensin II

Increasing bradykinin levels

Reducing sympathetic nervous system activity

Decreasing cardiac work

Commonly prescribed drugs: captopril (Capoten<sup>®</sup>), enalapril (Vasotec<sup>®</sup>), lisinopril (Prinivil<sup>®</sup>, Zestril<sup>®</sup>), benazepril (Lotensin<sup>®</sup>), and ramipril (Altace<sup>®</sup>)

# **ADVERSE EFFECTS ACEI**

**Dry, non-productive cough**

**Angioedema**

**Hypotension**

**Headache**

**Weakness**

**Abnormal taste**

**Renal impairment**

# **ADVERSE EFFECTS ACEI**

**Use of cyclosporine with ACEI  
may cause acute renal failure**

**Use of NSAIDs may lead to  
antihypertensive effects  
similar to what is seen with  
beta-blockers**

# ANGIOTENSIN II RECEPTOR BLOCKERS (ARBs)

Elective inhibition of angiotensin II by competitive antagonism of the angiotensin II receptors

Commonly prescribed drugs: irbesartan, candesartan, telmisartan, olmesartan, losartan and valsartan

Adverse effects present similarly to ACEi, however cough and angioedema are significantly less

Losartan, due to its association with the cytochrome p 450 system, is likely to interfere with other drugs, such as cimetidine, fluconazole, indomethacin, phenobarbital, and rifampin



# **CALCIUM CHANNEL BLOCKERS (CCB)**

**Reduce vascular resistance through L-channel blockade**

**Reduces intracellular calcium**

**Vasodilation**

**By blocking calcium entry into the cell CCBs;**

- **cause vascular smooth muscle relaxation (vasodilation)**
- **decreased myocardial force generation (negative inotropy)**
- **decreased heart rate (negative chronotropy)**
- **decreased conduction velocity within the heart (negative dromotropy), particularly at the atrioventricular node**

# **CALCIUM CHANNEL BLOCKERS (CCB)**

**Three major classes of calcium channel blockers**

- **smooth muscle selective class, dihydropyridines**
- **non-dihydropyridines**
- **phenylalkylamines**

**Commonly prescribed drugs;**

- **dihydropyridines - amlodipine (Norvasc<sup>®</sup>), felodipine (Plendil<sup>®</sup>), nifedipine (Procardia XL<sup>®</sup>, Adalat<sup>®</sup>), isradipine, nicardipine, and nisoldipine**
- **non-dihydropyridines – benzothiazepines (diltiazem)**
- **phenylalkylamine - Verapamil**

# **ADVERSE AND DRUG INTERACTIONS**

**Adverse reactions include;**  
flushing  
headache  
dizziness  
excessive hypotension  
reflex tachycardia  
peripheral edema

# ADVERSE AND DRUG INTERACTIONS

Gingival overgrowth in 1.7% to 38% is associated with nifedipine use

Surgery may reduce the painful bleeding gums, drug cessation is usually necessary for a complete resolution

Drug-drug interactions;

- combining calcium channel blockers and benzodiazepines can result in increased sedation.
- Elevated levels of cyclosporine when taken concurrently with CCBs.
- erythromycin, cimetidine, and rifampin have been reported to increase and/or decrease plasma levels of CCB.

# CENTRAL SYMPATHOLYTICS

## Mode of action

- Inhibition of sympathetic outflow from the central nervous system

## Considerations

- Orthostatic hypotension
- Nausea/vomiting
- Enhance CNS depressants
- Prolonged use of NSAIDs can reduce antihypertensive effects

# **CENTRAL SYMPATHOLYTICS**

**Clonidine**

**Guanabenz**

**Guanfacine**

**Methyldopa**

**PERIPHERAL  
ADRENERGIC  
ANTAGONIST**

**Seldom used**

**Guanethidine**

**Guanadrel**

**Reserpine**

# PERIPHERAL ADRENERGIC ANTAGONIST

## Mode of action

- Deplete tissue stores of catecholamines and serotonin

## Considerations

- Orthostatic hypotension
- Enhance CNS depressants
- Prolonged use of NSAIDs can reduce antihypertensive effects



# DIRECT VASODILATORS

Hydralazine

Minoxidil

# **DIRECT VASODILATORS**

## **Mode of action**

**Direct dilatation of arteries**

## **Considerations**

**Orthostatic hypotension**

**Prolonged use of NSAIDs can  
reduce antihypertensive  
effects**

# FACTORS INTERFERE WITH BLOOD PRESSURE CONTROL

**Non Narcotic Analgesics**

**Nonsteroidal anti-inflammatory agents**

**Aspirin**

**Selective COX-2 Inhibitors**

**Sympathomimetic agents**

**Stimulants**

**Alcohol**

**Oral contraceptives**

**Cyclosporine**

**Erythropoietin**

**Natural licorice**

**Herbal compounds (ephedra or ma huang)**

**Pentazocine**

**Corticosteroids**

**Venlafaxine**

**Grape Fruit/Orange Juice**

# HYPERTENSIVE CRISIS

Subdivided into urgency and emergency.

hypertensive urgency - elevated blood pressure (systolic pressure  $\geq 180$  and/or diastolic pressure  $\geq 120$  mmHg) with no associated end-organ damage is categorized.

hypertensive emergency is defined as elevated blood pressure with target organ damage.

Many risk factors are associated with hypertensive crisis, but medication noncompliance is one of the most significant factors.

**Management**

# PATIENT MANAGEMENT

Important to be comfortable with identifying those with hypertension and making decisions about treatment needed.

Obtaining blood pressure status in order to identify those that may be medically unstable before the administration of local anesthesia provides a baseline go treatment.

This practice should be invoked on both new and routine patients.

Not only provide a safe environment for treatment, but also help to improve future health outcomes for patients diagnosed with hypertension

# ASA PHYSICAL STATUS CLASSIFICATION SYSTEM

<b>ASA PS 1</b>	<b>Normal healthy patient</b>
<b>ASA PS 2</b>	<b>Patients with mild systemic disease</b>
<b>ASA PS 3</b>	<b>Patients with severe systemic disease</b>
<b>ASA PS 4</b>	<b>Patients with severe systemic disease that is a constant threat to life</b>
<b>ASA PS 5</b>	<b>Moribund patients who are not expected to survive without the operation</b>
<b>ASA PS 6</b>	<b>A declared brain-dead patient whose organs are being removed for donor purposes</b>
<b>E</b>	<b>The addition of “E” denotes Emergency surgery: (An emergency is defined as existing when delay in treatment of the patient would lead to a significant increase in the threat to life or body part)</b>

# **METABOLIC EQUIVALENTS**

**One MET is defined as 3.5 milliliters of oxygen consumed per kilogram body mass per minute.**

**The use of METs is a quantifying value used as a test of one's ability to perform physical work.**

**It has been estimated that those patients that are able to perform tasks 10 METs or more, have significantly less risk for experiencing an adverse cardiovascular event.**



# ESTIMATED ENERGY REQUIREMENT FOR VARIOUS ACTIVITIES

Estimated Energy	Activity
1 MET	<ul style="list-style-type: none"><li>- Self Care</li><li>- Eating, dressing, or using the toilet</li><li>- Walking indoors and around the house</li><li>- Walking one to two blocks on level ground at 2 to 3 mph</li></ul>
4 METs	<ul style="list-style-type: none"><li>- Light housework (eg dusting, washing dishes)</li><li>- Climbing a flight of stairs or walking up a hill</li><li>- Walking on level ground at 4 mph</li><li>- Running a short distance</li><li>- Heavy housework (eg scrubbing floors, moving heavy furniture)</li><li>- Moderate recreational activities (eg golf, dancing, doubles tennis, throwing a baseball or football)</li></ul>
> 10 METs	<ul style="list-style-type: none"><li>- Strenuous sports (eg swimming, singles tennis, football, basketball, skiing)</li></ul>

# MEDICAL HISTORY

**A thorough medical history  
should be taken**

**Check for medication  
adherence**

**Monitor vital signs**

# **SIGNS AND SYMPTOMS**

**Neurologic deficits associated with ischemic or hemorrhagic stroke**

**Nausea and vomiting associated with hypertensive encephalopathy and increased intracranial pressure**

**Chest discomfort associated with myocardial ischemia or aortic dissection**

**Back pain associated with aortic dissection**

**Dyspnea associated with pulmonary edema**

# PREGNANCY

Preeclampsia

Eclampsia

Drugs that can produce a hyperadrenergic state can cause significant rise in blood pressure such as;

- cocaine
- amphetamine
- phencyclidine
- monoamine oxidase inhibitors
- recent discontinuation of clonidine or other sympatholytic agents

# **HYPERTENSIVE EMERGENCY DRUGS**

**Fenoldopam - peripheral dopamine-1 receptor agonist**

**Hydralazine – Vasodilator**

**Nicardipine - Calcium Channel Blocker  
(Dihydropyridine)**

**Nitroglycerin – Vasodilators**

**Esmolol - Beta Blocker (Beta-1 cardioselective)**

**Labetalol - Combined Alpha/ Beta**

# TREATMENT

## Goals of Therapy

Reduction of cardiovascular and renal morbidity and mortality.

Treating SBP and DBP to targets that are  $<140/90$  mmHg is associated with a decrease in CVD complications

Hypertension and diabetes or renal disease, the BP goal is  $<130/80$  mmHg.

# TREATMENT

**Lifestyle modifications**

**(prevention and treatment):**

**regular aerobic physical activity**

**limited alcohol intake**

**Dietary Approaches**

**weight loss**

**reduced sodium intake**

# UNCOMPLICATED HYPERTENSION

Thiazide-type diuretics should be used in drug treatment for most patients with uncomplicated hypertension, either alone or combined with drugs from other classes.

Certain high-risk conditions are compelling indications for the initial use of other antihypertensive drug classes (ACEI, beta-blockers, calcium channel blockers).

If BP > 20/10 mmHg above goal blood pressure, consideration should be given to initiating therapy with two agents, one of which usually should be a thiazide-type diuretic.



# COMPLICATED HYPERTENSION

Treatment: combinations of medication

- ACE inhibitors
  - angiotensin II receptor blockers
  - $\alpha$ -blockers,  $\alpha/\beta$ -blockers
  - calcium antagonists
  - and diuretics
- 
- When multiple drugs are used to achieve a target blood pressure of approximately 130/80 mmHg, the possibility of adverse drug interactions increases.

# **DENTAL CONSIDERATIONS**

**Determining Risk / Providing  
Dental Treatment**

# DENTAL SIDE EFFECTS AND DRUG-DRUG

<b>Drug Class</b>	<b>Dental Side Effects</b>	<b>Common Drug Interactions</b>
<b>Beta-Blockers</b>	<b>Dry mouth, taste changes, lichenoid reaction</b>	<b>NSAIDs, epinephrine, local anesthetics, bronchodilators</b>
<b>ACE Inhibitors</b>	<b>Dry cough, loss of taste, dry mouth, ulceration, angioedema, burning mouth, lichenoid reactions</b>	<b>NSAIDs, cyclosporines</b>
<b>Angiotensin II Receptor Blockers</b>	<b>Dry mouth, angioedema, sinusitis, taste loss</b>	<b>Systemic antifungals, sedatives, lithium, and rifampin</b>
<b>Calcium Channel Blockers</b>	<b>Gingival enlargement, dry mouth, altered taste</b>	<b>Benzodiazepines, parenteral anesthetic agents, aspirin, NSAIDs</b>
<b>Alpha-Blockers</b>	<b>Dry mouth, orthostatic hypotension</b>	<b>NSAIDs, CNS depressants</b>
<b>Diuretics</b>	<b>Dry mouth, lichenoid reaction, orthostatic hypotension</b>	<b>NSAIDs, barbiturates, fluconazole</b>

# **LOCAL ANESTHETICS**

# LOCAL ANESTHETIC

Local anesthetics are recommended for patients with hypertension because they can decrease pain and increase comfort.

The selection of a local anesthetic :

- duration of the procedure
- the need for hemostasis
- the required degree of pain control

# VASOCONSTRICTORS

Vasoconstrictors added to local anesthetics to aid in hemostatic control and to increase the duration

Risk of epinephrine:  
sympathomimetic effect on cardiac  $\beta_1$ -receptors.

# PROCEDURE

The type of injection (block versus infiltration)

Vascularity of the area where the local anesthetic is being deposited

Avoid Norepinephrine or levonordefrin

- unopposed activation of  $\alpha_1$ -receptors in HT increase the duration of the drug's effect (activation lead to uncontrolled increases in BP)

# LOCAL ANESTHETICS

**2% lidocaine with 1:100,000 epinephrine**

- **most commonly used to achieve the necessary degree of anesthesia for most dental situations.**

**Maximum recommended dose of local anesthetic solution for hypertension (poorly controlled): two 1.8-ml cartridges (total dose of 3.6 ml) with 1:100,000 (0.036 mg) epinephrine per appointment.**



# CONTRAINDICATIONS LOCAL ANESTHETICS WITH VASOCONSTRICTORS

Include severe uncontrolled hypertension

Caution when administering local anesthetics at dosages higher than recommended

Should also be aware of the potential interactions between commonly used local anesthetics and antihypertensive drugs

# CONTRAINDICATIONS

Lengthy procedures are anticipated, the epinephrine should be diluted to a ratio of 1:200,000.

Apprehensive, sweating, or nervous patient likely has increased levels of endogenous epinephrine.

Administration of epinephrine to the nervous or apprehensive stage 2 patient would be contraindicated.

## **POTENTIAL PROBLEM RELATED TO DENTAL CARE**

- 1. Stress and anxiety may cause increase in BP; angina, MI or CVA**
- 2. Treated with antihypertensive agents may become nauseated or hypotensive, or may develop orthostatic hypotension**
- 3. Excessive use of vasopressors may cause significant elevation of blood pressure**
- 4. Sedative medication may bring about hypotensive episode**

# MANAGEMENT

Reduce stress and anxiety by premedication, short appointments, nitrous oxide (avoid hypoxia).

If overly stressed, terminate appointment.

Avoid orthostatic hypotension (changing position slowly, supporting).

Avoid stimulating gag reflex.

Select sedative medication and dosage cautiously.

# BLEEDING

Elevated blood pressure can lead to excessive intraoperative bleeding.

History of the patient and meds plays a role in deciding when to perform certain procedures.

Due to a number of different comorbidities, those with hypertension may be taking blood thinners.

It is generally recommended that for patients that have an INR value of  $\leq 3$  for minor surgery, anticoagulation is not terminated.

Aspirin and other antiplatelet drugs, such as Xarelto and Plavix the recommendation is to continue medication for minor surgery without interruption.

Various hemostatic agents can be used to help control bleeding.

# DRUG CONSIDERATIONS

Minimal concentration (epinephrine 0.036 mg), aspirate before injection and injection slowly.

Caution when using vasoconstrictors in patient taking a nonselective beta-blocker.

Do not use gingival packing material that contains epinephrine.

Reduce dosage of barbiturates and other sedative (action may enhance by antihypertensive agent).

Epinephrine used judiciously with MAO inhibitor.

**NORMAL/  
PREHYPERTENSION**

**Systolic 139 or lower**

**Diastolic 89 or lower**

**No contraindications to  
elective dental treatment.**

## **STAGE 1 HTN**

**Systolic 140 - 159 or**

**Diastolic 90 - 99**

- 1. Retake and confirm blood pressure.**
- 2. Proceed with elective dental treatment.**
- 3. Monitor BP during appointment.**



## **STAGE 2 HTN**

**Systolic 160 or higher or  
Diastolic 100 or higher**

- 1. Retake and confirm blood pressure.**
- 2. Emergency or non- invasive elective treatment only**
- 3. Monitor BP during appointment.**
- 4. Refer patient to physician for medical evaluation.**
- 5. Medical consult required prior to elective dental treatment.**

# URGENT

A blood pressure measurement of 180/110 mmHg is the absolute cutoff for any dental treatment.

Studies have shown that there is no increased risk for adverse perioperative outcomes for patients undergoing treatment with a blood pressure <180/110 mmHg.

For patients who have histories that include previous hypertensive-related organ damage, (myocardial infarctions, strokes, or labile angina) this number may be too high to undergo treatment, even on an emergent basis.

# EMERGENT

**Systolic >210 or Diastolic >120**

- 1. Retake and confirm blood pressure with alternate device**
- 2. If blood pressure is unchanged, consider immediate referral of the patient to a physician or emergency room for evaluation.**
- 3. No treatment of any type**
- 4. Medical consult required prior to any dental treatment.**

# HYPERTENSIVE EMERGENCY DRUGS

Drug	Drug Class	Dosage
Fenoldopam	Peripheral Dopamine-1 Receptor Agonist	- 0.1 mcg/kg/min as IV infusion - Can be titrated to a maximum of 1.6 mcg/kg/min
Hydralazine	Vasodilator	- 10 to 20 mg IV, 10 to 40 mg IM - Must be administered in 30-min intervals
Nicardipine	Calcium Channel Blocker (Dihydropyridine)	- 5 to 15 mg/hour IV infusion, Titrate by 2.5mg/h at 5-15 min intervals - Some patients may require up to 30 mg/hr
Nitroglycerin	Vasodilators	- 5 to 100 mcg/min IV infusion - Titrate at 3-5min intervals; no response increase by 10-20 mcg/min
Esmolol	Beta Blocker (Beta-1 cardioselective)	- 80 to 500 mcg/kg loading dose over one minute; then initiate IV infusion at 25 to 300 mcg/kg/min - Titrate incrementally up to maximum of 300 mcg/kg/min
Labetalol	Combined Alpha/ Beta Blocker	- Maximum 300 mg per 24 hours
Metoprolol	Beta Blocker (Beta-1 cardioselective)	- Initial 1.25 to 5 mg IV followed by 2.5 to 15 mg IV every 3 to 6 hours
Phentolamine	Alpha Blocker (Nonselective)	- 5 to 15 mg IV bolus every 5 to 15 minutes
Clonidine	Alpha-2 Agonists, Central-Acting	- 200mg po, followed by 200mg every hour until desired effect - Max dose: 1, 200mg
Captopril	ACE Inhibitor	- 25mg po, Dosing range: 6.25-50mg po - Max Dose: 50mg po

# CONCLUSION

A dental provider must have knowledge of the disease, know current therapeutic options, and possess the ability to educate and provide access to care for patients.

Management of the patient is mainly based on one's judgment as a practitioner.

Before providing care to these patients, the practitioner should be able to assess patient health status

Decisions to treat should be based on the following factors: baseline blood pressure, urgency of the procedure, functional and physical status, and time and invasiveness of the procedure.

When in doubt, consider medical advice.

# QUESTIONS

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