Blood Pressure Training Curriculum

for the Dental Team

2018

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LEARNING OBJECTIVES

At the end of this training, the participant should:

- Understand the basics of hypertension.
- Identify various categories of hypertension.
- Understand the appropriate technique of recording blood pressure.
- Recognize the need to measure blood pressure for every new patient, and at least annually on follow-up visits.
- Recognize the need to refer a patient with hypertension to a primary care provider.

Hypertension: An Introduction

What is blood pressure?

Blood pressure is the force of blood pushing against the walls of the arteries that carry blood from the heart to other parts of the body. Blood pressure normally rises and falls throughout the day based on an individual's activity. High blood pressure, also known as hypertension (HTN), is a disease that occurs when blood pressure stays above normal for a long time. As a result, the walls of arteries get stretched beyond their healthy limit and damage occurs creating a variety of other health problems.[1]

What is the burden of hypertension?[2]

- Hypertension is the **13th leading cause of death** in the United States.
- In North Carolina in 2015, hypertension was the primary cause of 942 deaths (about 1% of all deaths) and a contributing cause to 23,495 heart disease and stroke deaths. That means high blood pressure causes or contributes to at least **26% of all deaths in North Carolina each year**.
- Almost one out of every three adults in the United States (29% or 75 million people) has been diagnosed with hypertension. In addition, up to one out of five adults with HTN may be unaware of their condition.
- About 2.7 million North Carolina adults **(35%)** have been diagnosed with HTN by a health professional.
- The North Carolina Medicaid program spent $775 million on 398,305 beneficiaries with HTN in 2015. That's about $1,946 per beneficiary with hypertension.

What are the risk factors for hypertension?

Hypertension has many modifiable and non-modifiable risk factors such as:

Non-modifiable risk factors	Modifiable risk factors
Advancing age: Blood vessels lose flexibility with age which can contribute to increasing pressure throughout the system.	**Overweight or obesity**
Race/ethnicity: Hypertension is particularly common among African Americans, often developing at an earlier age than it does in Whites. Serious complications, such as stroke, heart attack, and kidney failure also are more common in African Americans.	**Physical inactivity**
Family history/Genetic factors: Hypertension tends to run in families.	**Poor diet**, especially one that is high in sodium and low in potassium
	Smoking, second-hand smoke and use of other tobacco products
	Excessive alcohol consumption

It is important to bear in mind that a few of the risk factors mentioned above have dental implications as well. Advancing age puts people at risk for darkened teeth, dry mouth, diminished sense of taste, root decay, gum disease, tooth loss, uneven jaw bone and denture-induced stomatitis.[3] Smoking and use of tobacco products lead to stained teeth and tongue, diminished sense of taste and smell, slow healing after tooth extraction or oral surgery, gum disease and oral cancer.[4]

What are the signs or symptoms of hypertension?

Hypertension is frequently referred to as the silent killer, because it often has no warning signs or symptoms, and many people do not know they have it. Rarely, HTN can cause symptoms such as headache or vomiting. Even though it typically has no symptoms, HTN can have fatal consequences if not treated. Having HTN increases risk for heart disease and stroke, which are leading causes of death in the United States. There is only one way to know whether you have hypertension—have a doctor or other health professional measure it.

What are the effects of hypertension?

Uncontrolled HTN can lead to:

- **Damage to the heart and coronary arteries.** HTN can harden the arteries, which decreases the flow of blood and oxygen to the heart, and lead to heart disease. In addition, decreased blood flow to the heart can cause chest pain (angina), heart failure, and heart attack.
- **Stroke.** Hypertension can burst or block arteries that supply blood and oxygen to the brain, causing a stroke. Brain cells die during a stroke because they do not get enough oxygen. Stroke can cause serious disabilities in speech, movement and other basic activities, and a stroke can be fatal.
- **Kidney damage.** Adults with HTN have a high risk of developing chronic kidney disease. Hypertension is the second leading cause of kidney failure, and approximately one in five adults with HTN has chronic kidney disease.
- In addition, uncontrolled HTN can lead to **memory loss, vision loss, erectile dysfunction** and **peripheral artery disease**, especially the extremities (narrowing of the arteries in the legs).

How is hypertension diagnosed?

Hypertension is diagnosed by performing a simple, quick and painless blood pressure test using various types of blood pressure measurement devices. The bicep/upper arm cuff device yields the most accurate reading among various types of devices. (More information in the section on Recording Blood Pressure)

What do the blood pressure numbers mean?

Blood pressure is measured using two numbers. The first or the top number, called systolic blood pressure, measures the pressure in blood vessels when the heart beats. The second or the bottom number, called diastolic blood pressure, measures the pressure in blood vessels when the heart rests between beats.

If the measurement reads 120 systolic and 80 diastolic, you would say "120 over 80" or write "120/80 mmHg." A systolic BP reading ≥ 140 mm Hg and/or a Diastolic BP reading of ≥ 90 mm Hg over repeated measurements is considered hypertension. If the patient has diabetes or chronic kidney disease, a blood pressure of 130/80 mmHg or higher is considered hypertension.

The following chart reflects blood pressure categories defined by The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of Hypertension (JNC 7).[5]

Blood Pressure Classification

JNC 7 Definition

Blood Pressure (mm Hg)		
Systolic	**Diastolic**	**Category**
<120	and <80	Normal
120–139	or 80–89	Prehypertension
140–159	or 90–99	Stage 1 hypertension
≥160	or ≥100	Stage 2 hypertension

Hypertension: Implications for the Dental Team

The dental office can play an important role in the detection and management of hypertension because dental care is one of the few health care services utilized consistently by a large section of the general population. The Centers for Disease Control and Prevention (CDC) estimated that 65.4% of Americans older than two years had at least one dental visit in 2009. Furthermore, studies indicate that in 2008, of the 26.0% of children and 24.1% of adults who did not have contact with a general health care provider, a sizeable proportion (34.7% of these children and 23.1% of these adults) did visit a dental practice that year.[6] Studies have also shown that dental care professionals can play an important role in a patient's overall health by measuring blood pressure, potentially identifying undiagnosed or uncontrolled hypertension, and referring individuals to their physicians when treatment is indicated.[7] It is because of this opportunity and the relative ease of measuring blood pressure that we recommend screening for hypertension at dental office visits.

The American Dental Association (ADA) recommends that all dental care providers become involved in the detection and management of hypertension. **The ADA recommends that dental offices should take blood pressure on all new patients and annually on recalls.**

Recommendation

It should be standard practice to measure blood pressure of every patient at every visit to the dental office. It is also a good practice to conduct a detailed evaluation of a patient with hypertension—taking detailed history of the condition, duration, medications, any existing complications and a family history of cardiovascular disease and other related diseases. (See Appendix A for a list of anti-hypertensive medications.)

Managing care in patients with hypertension

The ADA recommends that non-emergent procedures be avoided in patients with a blood pressure of greater than 180/110 mm Hg. Below are recommendations on dental care based on blood pressure level.[8]

Dental Treatment and Hypertension*

SBP†	DBP‡	MRF§	Dentist Guidelines
120–139	80–89	Yes/No	Routine dental treatment OK; discuss high blood pressure guidelines
140–159	90–99	Yes/No	Routine dental treatment OK; consider sedation for complex dental or surgical procedures; refer for medical consult
160–179	100–109	No	Routine dental treatment OK; consider sedation for complex dental or surgical procedures; refer for medical consult
160–179	100–109	Yes	Urgent dental treatment OK; refer for medical consult
180–209	110–119	No	No dental treatment without medical consultation; refer for prompt medical consult
180–209	110–119	Yes	No dental treatment; refer for emergency medical treatment
≥210	≥120	Yes/No	No dental treatment; refer for emergency medical treatment

*Source: Herman WW, Konzelman JL Jr, Prisant LM. New national guidelines on hypertension: a summary for dentistry. JADA 2004; 135: 576-84. These recommendations are based on the blood pressure categories defined by The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of Hypertension.

†SBP: Systolic blood pressure.

‡DBP: Diastolic blood pressure.

§MRF: Medical risk factors (such as prior myocardial infarction, angina, high coronary disease risk, recurrent stroke prevention, diabetes, kidney disease).

Patients with hypertension are at an increased risk of developing adverse effects in a dental office. It is important that patients with hypertension be monitored throughout each dental visit, especially visits that involve complex procedures, since elevations of blood pressure can increase a patient's risk of experiencing a stroke or heart attack in the dental chair.[9] Local anesthetics that contain epinephrine or other vasoconstrictors can increase blood pressure and risk of development of an arrhythmia which is dangerous in patients with hypertension. Because of the high prevalence of disease and medication use for hypertension, dentists should also be aware of the oral side effects of antihypertensive medications.

Anti-Hypertensive Medications: Implications for Dentistry[9]

1. Orthostatic Hypotension

Those at greatest risk are:

- Older adults
- Those on multiple antihypertensive medications
- Those undergoing lengthy dental procedures

2. Xerostomia (Dry Mouth)

Caused by many antihypertensive medications, particularly:

- Central α2-agonists and other centrally acting drugs
- α1-adrenergic blockers
- β-adrenergic blocking agents
- Diuretics
- ACE inhibitors
- Calcium channel blockers

Risk increases when taking multiple xerostomic medications.


3. Gingival Overgrowth

Caused by most calcium channel blockers, particularly Nefidipine.



4. Lichenoid Reactions

Caused by several anti-hypertensive medications, particularly:

- Thiazides (diuretics)
- Furosemide (diuretic)
- Spironolactone (diuretic)
- Propanalol (β-blocker)
- Labetalol (β-blocker)
- ACE inhibitors
- Methyldopa


5. Dysgeusia (Taste Alteration)

Caused by:

- ACE inhibitors
- Diltiazem (calcium channel blocker)

6. Potential Drug Interactions

Epinephrine in local anesthetics can interact with:

- Non-selective β-blockers leading to reduced cardiac output
- Non-potassium-sparing diuretics leading to dysrhythmias

Recording Blood Pressure

Always keep in mind the following three things before recording blood pressure:

1. **Preparation**
2. **Positioning**
3. **Equipment**

Preparation

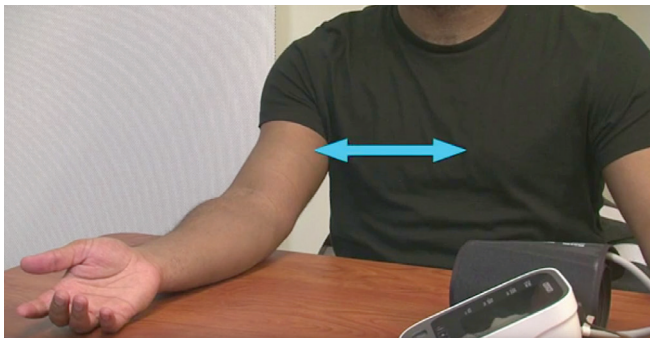
Effort should be made to help the patient relax for at least five minutes before measuring blood pressure. Care should be taken to eliminate external factors, such as a noisy environment. Patient should be reassured that results of the blood pressure measurement will be confidential.

The patient should not smoke, drink caffeinated beverages or exercise for 30 minutes prior to the measurement. The patient should also empty his/her bladder, as a full bladder can increase blood pressure slightly. (All of these can be advised to the patient at the time of making an appointment or during a telephone confirmation if applicable.)

Positioning

The patient should be seated in a relaxed, comfortable position with back well supported, feet flat on the floor and legs uncrossed. If the feet do not reach the floor, use a book or similar object on which to rest the feet. If the patient is slouched, both the systolic and diastolic pressures will be inaccurately high.

The cuff should preferably be placed on bare skin. If one is going to roll up a sleeve to place the blood pressure cuff, it must be rolled up as high as possible, and it must be possible to place two fingers under the sleeve with no difficulty.



The arm should be slightly flexed, the palm of the hand facing up, with the entire forearm supported on a smooth, flat surface. The brachial artery must be at heart level. Desk-high tables will position the arm at heart level. If an individual is exceptionally tall or short, adjustments should be made to position the arm properly. If the brachial artery is above the level of the heart, both the systolic and diastolic blood pressures will be inaccurately low. If the brachial artery is below the level of the heart, the opposite will be true.

The patient should not talk and should stay still while blood pressure is being measured.

Equipment

If you are using an aneroid manometer (manual), make sure the instrument is **calibrated** every six months or as recommended by the manufacturer. Note: The dial position at the zero mark of an aneroid manometer under no pressure does not mean the instrument is accurate; routine calibration is necessary.

For automatic blood pressure monitors, make sure you purchase only **validated devices**. The instrument also needs to be checked for accuracy as recommended by the manufacturer.

It is highly recommended that you use an **upper arm/bicep cuff** for measuring blood pressure. The **www.dableducational.org** website provides information regarding validated blood pressure devices. This is a great resource to check regarding blood pressure device quality. It lists if the devices are acceptable via criteria set by the British Hypertension Society, the International Protocol of the European Society for Hypertension and the American Association of Medical Instrumentation.

Finger blood pressure devices are not recommended for use, but some wrist devices have been validated. Wrist devices can be used without having to remove clothing, and they are small and easily transportable. Additionally, since wrist circumference varies less with body weight than upper arm circumference, wrist devices can be used with larger patients. The disadvantage of wrist devices is that accuracy is dependent on precise patient positioning—having the arm at heart level during the measurement (see manufacturer's instructions for the device). The position of the lower arm can greatly influence the measurement from a wrist device. Visit **dableducational.org** for more information regarding wrist devices.

Another aspect of using the right equipment is using the right cuff size to measure blood pressure. It is advised that you measure the patient's upper arm and use the appropriate cuff. **For adults**, the bladder (the inflatable portion inside a cuff) of the cuff length must encircle at least **80%** of the upper arm circumference. The width of the bladder must encircle at least **40%** of the arm circumference.

For routine adult screening activities, four different cuff/bladder sizes are required. See table below:

Name of cuff	Arm Size (circumference)	Bladder Size
Small Adult	9–10 inches	5 inches wide X 9 inches long
Adult	10–13 inches	6 inches wide X 12 inches long
Large Adult	13–17 inches	6 inches wide X 14 inches long
Thigh	17–20 inches	6 inches wide X 16.5 inches long

If you use a cuff that is too small, the resulting blood pressure reading will be too high. If you use a cuff that is too large, the reading will be too low.

There are two additional checks to do to make sure the cuff is applied correctly.

1. The lower edge of the cuff should be at least one inch (2-1/2 cm) above the bend in the elbow (antecubital fossa). Palpate the location of the brachial pulse at the antecubital fossa, and center the inflatable bladder directly above the brachial artery. Wrap the cuff smoothly and snugly around the arm.

2. Test for proper cuff application by placing both thumbs under the applied cuff and tug gently; the cuff should not move. If the cuff is too loose, the blood pressure will be incorrectly high.

To watch a short video demonstrating the right technique to measure blood pressure, visit **startwithyourheart.com/Resources**.

Special Case Scenarios

Blood pressure recording in an:

- **Anxious patient:** Allow the patient to relax in a calm environment at least five minutes before measuring blood pressure. It is also advisable to take two blood pressure readings, one to two minutes apart, and average the readings to obtain an accurate blood pressure.
- **Patient with white coat hypertension or masked hypertension: White coat hypertension** refers to a persistently elevated office blood pressure with normal blood pressure outside of the office, which has been attributed to anxiety, or a conditional response to the unusual situation. **Masked hypertension** refers to when a patient has a normal office blood pressure but has hypertension outside of the office. The prevalence of white coat hypertension during physician visits is approximately 20%, but its prevalence in the setting of visits to the dentist's office has not been established. White-coat hypertension and masked hypertension can be diagnosed through various methods including home blood pressure monitoring and 24-hour ambulatory blood pressure monitoring.[10]
- **Patient with signs of illicit drug use, arteriovenous fistula, lymphedema, wounds or prior blood work:** Determine if the opposite arm is more suitable for recording blood pressure.

Close the Loop: Refer to the Primary Care Physician

Hypertension-associated morbidity and mortality is a major heath concern; however, with appropriate treatment, hypertension can be managed and the associated complications reduced. The key to controlling this disease depends on proper and timely prevention, detection, evaluation and treatment. The involvement of dental care providers in strategies to identify individuals with undiagnosed or uncontrolled hypertension will extend disease prevention and control efforts, and provide a portal for individuals who do not see a physician on a regular basis to enter into the general health care system.

The dental team plays a very important role in creating a **patient-centered health home** for a patient to experience more effective and coordinated evidence-based health care that integrates medicine, dentistry and social/environmental factors. A patient-centered health home is a model of health care delivery which is patient-centered, comprehensive, coordinated, accessible, and committed to quality and safety.

Dentists and members of the dental team can and should play an important role in the fight against hypertension and its complications, by monitoring blood pressure and detecting undiagnosed/uncontrolled hypertension. The most important message to this training is to **"CLOSE THE LOOP"** by referring a patient with hypertension (≥140/90 mm Hg) to either his/her primary care physician or to a local safety net provider, so that the condition can be appropriately managed and/or treated. The dental team therefore plays a vital role not only in caring for their patients' oral health but also in supporting their overall health.

A template referral form that can be used by dental offices to refer patients with hypertension is attached in Appendix B.

APPENDIX A: **List of anti-hypertensive medications**

BRAND NAME	OTHER NAMES
ACE INHIBITORS	
Aceon	Perindopril
Accupril	Quinapril
Altace	Ramipril
Capoten	Captopril
Lotensin	Benazepril
Mavik	Trandolapril
Monopril	Fosinopril
Prinivil Zestril	Lisinopril
Univasc	Moexipril
Vasotec	Enalapril
No brand name	Enalaprilat
ANGIOTENSIN II ANTAGONISTS	
Atacand	Candesartan
Avapro	Irbesartan
Benicar	Olmesartan
Cozaar	Losartan
Diovan	Valsartan
Edarbi	Azilsartan
Micardis	Telmisartan
Teveten	Eprosartan

BRAND NAME	OTHER NAMES
CALCIUM CHANNEL BLOCKERS	
Norvasc	Amlodipine
Cleviprex	Clevidipine
Cardizem Dilacor XR Tiazac	Diltiazem
Plendil	Felodipine
DynaCirc CR	Isradipine
Cardene	Nicardipine
Adalat CC Procardia	Nifedipine
No brand name	Nimodipine
Sular	Nisoldipine
Calan Covera HS Isoptin SR Verelan	Verapamil
BETA BLOCKERS	
Bystolic	Nebivolol
No brand name	Timolol
Coreg	Carvedilol
Corgard	Nadolol
Inderal, Inderal LA	Propranolol
No brand name	Betaxolol
Levatol	Penbutolol
Lopressor, Toprol XL	Metoprolol
Sectral	Acebutolol
Tenormin	Atenolol
Trandate	Labetalol
No brand name	Pindolol
Zebeta	Bisoprolol

BRAND NAME	OTHER NAMES
DIURETICS	
Aldactazide Aldactone	Spironolactone
Demadex	Torsemide
Diuril	Chlorothiazide
Enduron	Methyclothiazide
Microzide Oretic	Hydrochlorothiazide
Lasix	Furosemide
No brand name	Indapamide
Saluron	Hydroflumethiazide
Thalitone	Chlorthalidone
Zaroxolyn	Metolazone
PERIPHERALLY ACTING ALPHA-ADRENERGIC BLOCKERS	
Cardura	Doxazosin
Dibenzyline	Phenoxybenzamine
Minipress	Prazosin
Hytrin	Terazosin
CENTRALLY ACTING ALPHA-ADRENERGICS	
Catapres	Clonidine
Tenex	Guanfacine

BRAND NAME	OTHER NAMES
VASODILATORS	
No brand name	Hydralazine
No brand name	Minoxidil
RENIN INHIBITORS	
Tekturna	Aliskiren
COMBINATION DRUGS	
Diovan HCT	Valsartan and Hydrochlorothiazide
Exforge	Amlodipine and Valsartan
Exforge HCT	Amlodipine, Valsartan, and Hydrochlorothiazide
Hyzaar	Hydrochlorothiazide and Losartan
Lotrel	Benazepril and Amlodipine
Tarka	Verapamil and Trandolapril
Tribenzor	Olmesartan, Amlodipine and Hydrochlorothiazide
Vaseretic	Enalapril Maleate and Hydrochlorothiazide
Caduet	Amlodipine and Atorvastatin

APPENDIX B: **Template referral form to primary care provider**

February 2, 2016

(Physician name)
(Physician address)
(Physician phone)
(Physician fax)

RE: _____(patient name)_____ DOB _____(patient DOB)_____

Dear Partner in Health:

Today, (patient name) was seen in our office for ☐ routine ☐ urgent/emergency dental care. During the visit, we noted (his/her) blood pressure was elevated:

Reading #1 _____ (sys/dia) #2 _____ (if necessary) #3 _____ (if necessary)

While we are committed to providing timely dental care to our patients, we realize oral health is intimately related to overall health. ***Please evaluate (Mr./Mrs./Ms. patient last name)'s blood pressure and treat as deemed necessary.*** A summary of your findings and recommendations can be faxed or mailed back to our office. If you have additional questions, feel free to contact our office. Thank you for collaborating with our dental practice to meet the needs of our mutual patient.

PATIENT SELF-REPORTED MEDICAL HISTORY:

- ☐ Hypertension and taking prescribed medication
- ☐ Hypertension but not taking prescribed medication
- ☐ Hypertension, no medication prescribed
- ☐ No hypertension or unsure

PHYSICIAN REMARKS:
(Attach additional remarks, if needed.)

_____
_____
_____
_____
_____
_____
_____
_____

Physician Name (printed) Physician Signature Date

REFERENCES

1. Piper MA, Evans CV, Burda BU, et al. U.S. Preventive Services Task Force Evidence Syntheses, formerly Systematic Evidence Reviews. *Screening for High Blood Pressure in Adults: A Systematic Evidence Review for the U.S. Preventive Services Task Force*. Rockville (MD): Agency for Healthcare Research and Quality (US); 2014.

2. Community and Clinical Connections for Prevention and Health NCDPH. High Blood Pressure (Hypertension) In North Carolina. 2018; www.communityclinicalconnections.com/_downloads/CCCPH_FactSheet_HighBloodPressure_FINAL_March2018.pdf, 2018.

3. Razak PA, Richard KMJ, Thankachan RP, Hafiz KAA, Kumar KN, Sameer KM. Geriatric Oral Health: A Review Article. *Journal of International Oral Health: JIOH*. 2014;6(6):110-116.

4. Malhotra R, Kapoor A, Grover V, Kaushal S. Nicotine and periodontal tissues. *Journal of Indian Society of Periodontology*. 2010;14(1):72-79.

5. Chobanian AV, Bakris GL, Black HR, et al. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report. *Jama*. 2003;289(19):2560-2572.

6. Strauss SM, Alfano MC, Shelley D, Fulmer T. Identifying unaddressed systemic health conditions at dental visits: patients who visited dental practices but not general health care providers in 2008. *American journal of public health*. 2012;102(2):253-255.

7. Engström S, Berne C, Gahnberg L, Svärdsudd K. Efficacy of screening for high blood pressure in dental health care. *BMC Public Health*. 2011;11(1):1-7.

8. Herman WW, Konzelman JL, Jr., Prisant LM. New national guidelines on hypertension: a summary for dentistry. *Journal of the American Dental Association (1939)*. 2004;135(5):576-584; quiz 653-574.

9. Popescu SM, Scrieciu M, Mercu, et al. Hypertensive Patients and Their Management in Dentistry. *ISRN Hypertension*. 2013;2013:8.

10. Hogan J, Radhakrishnan J. The assessment and importance of hypertension in the dental setting. *Dental Clinics of North America*. 2012;56(4):731-745.

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