Diagnostic Guidelines for Blood Pressure Screening Techniques

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Continuing Education Units: 1 hour


Disclaimer: Participants must always be aware of the hazards of using limited knowledge in integrating new techniques or procedures into their practice. Only sound evidence-based dentistry should be used in patient therapy.

About one-third of American adults have high blood pressure. Many patients see a dentist more frequently than a physician, providing the dental team an opportunity to educate their patients about blood pressure readings and how it affects their overall health. The information in this course teaches the dental professional to be aware of the causes and how to determine and assess identifiable causes of hypertension as well as providing the appropriate method of taking a blood pressure and how to determine the recommendations for follow-up and lifestyle modifications for patient treatment.

Conflict of Interest Disclosure Statement

• The author reports no conflicts of interest associated with this work.

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Overview
In a survey conducted by Malamed of over 2,700 dentists in North America, it was reported approximately 14,000 potentially life-threatening emergencies occurred while patients were in their dental practice. High blood pressure is linked to risk factors that fall into two categories: risk factors that are outside the patient’s control, such as family history, age, gender, and race and risk factors that the patient can control, such as lack of physical activity, unhealthy diet, overweight or obese, and drinking too much alcohol. Tobacco use, stress, and sleep apnea are additional risk factors that contribute to high blood pressure, but are still being researched on their correlation to high blood pressure.

Taking patients’ blood pressure during dental examinations is critical to their overall health. High blood pressure is a proven risk factor for cardiovascular disease, heart failure, stroke, and renal (kidney) disease. A baseline blood pressure reading should be established and then monitored at future dental appointments by allied dental staff. The patient should be told what their blood pressure reading is each time so that they can keep track of differences themselves. Blood pressure readings might need to be taken a few times to reflect a more accurate reading for diagnoses and when referring to medical professionals. Factors that may affect the accuracy of blood pressure readings include caffeine, recent physical activity, smoking, and stress to name a few. Screening for blood pressure by the dental professional has proven to be extremely effective since many patients with hypertension may be unaware of their condition. Establishing a baseline reading for your patient in a non-stress producing environment produces a more accurate reading if you need to make a medical referral. Screening for blood pressure by the dental professional has proven to be extremely effective since many patients with hypertension may be unaware of their condition.

Learning Objectives
Upon completion of this course, the dental professional should be able to:
• Recognize causes of hypertension.
• Determine how to assess identifiable causes of hypertension.
• Explain the terms systolic, diastolic, and pulse pressures.
• Identify the various blood pressure categories.
• List factors that influence blood pressure.
• Explain the equipment needed to determine blood pressure.
• Demonstrate how to take blood pressure.
• Discuss follow-up recommendations for patient treatment.
• Explain lifestyle modification recommendations.

Course Contents
• Glossary
• Blood Pressure
• Blood Pressure Categories
• What are the Symptoms for High Blood Pressure?
• Primary Risk Factors that Influence Blood Pressure
• Assessment for Identifiable Causes of Hypertension
• Conditions when Measuring Blood Pressure in the Dental Office
• Types of Blood Pressure Devices
• Procedure for Determining Blood Pressure with a Manual Device
Blood Pressure
One in three American adults have high blood pressure or hypertension. Having high blood pressure places your patients at risk for systemic diseases such as heart disease and stroke. Heart disease is the leading cause of death and stroke is the third-leading cause of death in the United States. Twenty-five percent of American adults have prehypertension—blood pressure that is higher than normal. Prehypertension raises your patients’ risk for high blood pressure.

Blood pressure is the force exerted by the blood on the blood vessel walls. This force makes a noise called Korotkoff sounds. When the left ventricle of the heart contracts, blood is forced out into the aorta and travels through the large arteries to the smaller arteries, arterioles, and capillaries. During the course of the cardiac cycle, blood pressure is changing constantly.

Systolic Pressure
Systolic pressure is the peak or highest pressure. It is caused when the heart muscle contracts. The normal systolic pressure is less than 120mm Hg. With patients over 50 years of age, a systolic reading higher than 140mm Hg is a greater risk factor with cardiovascular disease, than a high diastolic reading.

Diastolic Pressure
Diastolic pressure is the lowest pressure. It measures the pressure in the arteries between heartbeats (when the heart muscle is resting between beats and refilling the blood.) The normal diastolic pressure is less than 80mm Hg.

Pulse Pressure
Pulse pressure is the difference between the systolic and the diastolic pressures. The normal or safe difference is less than 45mm Hg.

Blood Pressure Categories
The American Heart Association recommends blood pressure screening occur starting at age 20, unless a medical condition would require a patient younger than 20 years of age be checked. Blood pressure readings defined by the American Heart Association include normal, prehypertension,
two stages of hypertension, and hypertensive crisis. Prehypertension is a designation meant to alert patients of a need to intervene and prevent hypertension. Patients in this designation have increasing health risks and need to make major lifestyle changes to return to a normal reading. If changes are not made, prehypertension may progress into hypertension – a serious health risk. Treatment options for hypertension usually require prescription medications and should be discussed, prescribed, and monitored by a physician.

What are the Symptoms for High Blood Pressure?
The American Heart Association continues to call high blood pressure the “silent killer.” There are no concrete symptoms for high blood pressure. Headaches, dizziness, and nosebleeds (epistaxis) are not usually caused by high blood pressure, unless the patient is in Hypertensive Crisis (systolic of 180 or higher or diastolic of 110 or higher). Facial flushing may occur with high blood pressure, but high blood pressure is not the cause of facial flushing. Factors such as spicy foods, sun exposure, cold weather, hot drinks, medical conditions, and exercise are more of the cause of facial flushing. Although dizziness is not the cause of high blood pressure, it may be a side effect of some blood pressure medications. A person in Hypertensive Crisis must receive emergency care immediately. In addition to extreme blood pressure readings, severe headaches and nosebleeds, patients may also experience severe anxiety and shortness of breath.

Primary Risk Factors that Influence Blood Pressure
Several risk factors are associated with the development of hypertension:

- Family History – parents or other immediate family members who have high blood pressure increase your patient’s risk. The American Health Association recommends monitoring blood pressure readings identifying any changes.
- Age – as Americans age, the more likely blood pressure readings can increase. Blood vessels lose elastic quality which can increase blood pressure.
- Gender-related risk patterns – until age 45, men are more likely to have high blood pressure than women. However, as women reach 65 years and older they are more likely to develop high blood pressure.
- Race – African American patients tend to develop high blood pressure at a younger age and is more severe than Caucasian dental patients.
- Overweight/obesity and lack of physical activity – weight gain places a strain in the heart and the circulatory system, increasing your patients’ risk for cardiovascular disease, diabetes, and stroke.
- Poor diet – a diet high in calories, saturated fat, carbohydrates, sodium can contribute to weight gain and an increase in sodium blood levels.
- Sleep apnea – correlated with lack of sleep and oxygen levels can contribute to high blood pressure.
- Drinking too much alcohol – regular, heavy use of alcohol can contribute to cardiovascular disease, stroke, irregular heartbeats, and cancer to name a few.
- Tobacco use – increases blood pressure temporarily and damages arteries.
- Stress – contributes to behaviors that can exacerbate blood pressure such as poor diet, lack of physical activity, and the use of tobacco and alcohol products.

Left untreated, high blood pressure increases the load of the heart and arteries causing damage to the circulatory system over time, such as
heart enlargement, atherosclerosis where the walls of the arteries become stiff and brittle as fatty deposits develop inside the artery walls. Untreated high blood pressure may lead to coronary heart disease, angina, myocardial infarction, stroke, kidney damage, peripheral artery disease, and heart failure. Recent statistics show 74% of American adults who have congestive heart failure, 77% of Americans who have had a stroke, and 69% of American adults who have had a myocardial infarction had blood pressure readings over 140/90.

**Assessment for Identifiable Causes of Hypertension**

There are also many conditions or diseases that play a role in hypertension. The medical history should include questions on:

- Medications and supplements being taken that may affect high blood pressure, such as acetaminophen, naproxen sodium, ibuprofen, antidepressants, stimulants, hormone birth control, caffeine, decongestants, herbal supplements such as ginkgo, ginseng, licorice, and St. John's wort
- Chronic kidney and renovascular diseases
- Cushing's syndrome or steroid therapy
- Coarctation of aorta (localized narrowing of the aorta)
- Thyroid/parathyroid disease
- Sleep apnea

**Conditions when Measuring Blood Pressure in the Dental Office**

*The National Heart, Lung, and Blood Institute* suggests before blood pressure readings are taken the following conditions should occur at least 30 minutes prior to measurement to provide the most accurate blood pressure reading: no smoking, no exercise, and no caffeinated beverages, as these actions may cause a short-term rise in blood pressure. They also recommend the patient go to the bathroom before the test, as having a full bladder can change their blood pressure reading. It is recommended the patient sit for at least 5 minutes before their blood pressure is taken, as movement can cause a short-term rise in blood pressure. It is also recommended you take 2-3 readings one minute apart and record all results.

**Types of Blood Pressure Devices**

Blood pressure measurement devices are categorized as: manual sphygmomanometers, digital non-portable for upper arm with automatic inflation, digital portable for upper arm with automatic inflation, digital portable for wrist with automatic inflation, and digital portable for finger with automatic inflation. In past testing by Consumer Reports, 16 brand devices were tested with trained medical personnel conducting 6,000 readings on 57 men and women. The upper arm cuff devices were found to be more accurate than wrist devices. The *American Heart Association* recommends an automatic, cuff-style, upper-arm monitor. Omron (Figure 1) continues to be rated high by Consumer Reports. Recent testing by Consumer Reports also rated Rite Aid and iHealth high for accuracy.

For manual sphygmomanometers, the sphygmomanometer (blood pressure cuff or machine) consists of an inflatable cuff and two tubes; one tube is connected to the pressure hand control bulb and the other tube to the pressure gauge (Figure 2). The size of the patient determines the size of the cuff selected. There are several cuff sizes. The cuff width should be 20% greater than the diameter of the arm. When a cuff is too narrow, the blood pressure reading is too high; when the cuff is too wide, the reading is too low.

The stethoscope, a listening aid that magnifies sound is used with manual devices and consists of two earpieces that are connected by tubes that carry the sound to the earpieces from the end piece, which is placed over the artery (Figure 3).
Procedure for Determining Blood Pressure with a Manual Device

1. Prepare the Patient
   a. Explain to your patient that you will be taking their blood pressure.
   b. Seat the patient comfortably, with the arm slightly flexed, palm up and the entire forearm supported on a level surface even with the heart. Ensure the legs aren’t crossed.
   c. Use either arm unless otherwise indicated. For example, a person who is physically disabled. Repeat blood pressure readings should be completed on the same arm as differences in each arm can be as much as 10mm Hg.
   d. Take pressure on bare arm, not over clothing.

2. Apply the Cuff
   a. Apply the completely deflated cuff to the patient’s arm, supported at the level of the heart.
   b. Place the portion of the cuff that contains the inflatable bladder directly over the brachial artery. The cuff may have an arrow to show the point that should be placed over the artery (Figure 4). The lower edge of the cuff is placed one inch above the antecubital fossa (inside crease of the elbow). The key is to fasten the cuff evenly and snugly (Figure 5).
   c. Adjust the position of the gauge for convenient reading.
   d. Palpate the area between the antecubital fossa and cuff to locate the brachial artery pulse found on the inside of the forearm. The stethoscope end piece is placed over the spot where the brachial pulse is felt (Figure 5).
   e. Position the stethoscope earpieces in the ears, with the tips directed forward.
   • The patient should be seated, with one arm resting on the table at the level of the heart.
   • Wrap the deflated cuff around the arm snugly about 3cm above the elbow.
   • Try to keep the cuff as flat as possible.

3. Locate the Radial Pulse
   a. On the same arm, feel the inside of the wrist, above the thumb with your index and middle fingers until you feel the pulse.
   b. Hold your fingers on the pulse.
4. **Inflate the Cuff**  
   a. Close the needle valve (air lock) counterclockwise attached to the hand control bulb firmly, but so it may be released readily.  
   b. Pump to inflate the cuff until the radial pulse stops. Note the mercury level at which the pulse disappears.  
   c. Look at the dial, and pump to 20 or 30mm Hg beyond where the radial pulse was no longer felt. This is the maximum inflation level (MIL). It means that the pressure of the cuff collapses the brachial artery and no blood is flowing through the artery.

5. **Position the Stethoscope End Piece**  
   a. Place the end piece over the palpated brachial artery, in the one inch space above the antecubital fossa, and slightly toward the inner side of the arm. Hold tightly in place.

6. **Deflate the Cuff Gradually**  
   a. Release the air lock slowly (2 to 3mm per second) so that the dial drops very gradually and steadily.
   b. Listen for the first sound: systole (“tap, tap”). Note the number on the dial, which is the systolic pressure. This is the beginning of the flow of blood past the cuff.
   c. Continue to release the pressure slowly. The sound will continue, first becoming louder, then diminishing and becoming muffled, until finally disappearing. Note the number on the dial where the last distinct tap was heard (not the muffled sound). This number is the diastolic pressure.
   d. Let the rest of the air out rapidly.

7. **Repeat for Confirmation When There is a Question About a Reading**  
   a. Wait 30 seconds before inflating the cuff region again. More than one reading is needed within a few minutes to determine an average and ensure a correct reading.

8. **Record**  
   a. Write the date and arm used.
   b. Record blood pressure as a fraction.
   
   **Example:** R Arm, Nov. 3, 20XX 120/80.

### Procedure for Determining Blood Pressure with an Automatic Device

Preparation of the patient is the same when using an automatic blood pressure device. However, the manufacturer’s instructions for using an automatic blood pressure device can be different. Read the manufacturer’s instructions carefully before using the device. Optimal blood pressure is less than 120/80mm Hg.

It is important that the patient always be in the same position using the same arm. Differences in body position and arm used can make a difference in the reading of 10mm Hg or more.

Hypertension should never be diagnosed with only one reading. Blood pressure reading should

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### Initial Blood Pressure

<table>
<thead>
<tr>
<th>Systolic mm Hg</th>
<th>Diastolic mm Hg</th>
<th>Follow-up Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;120</td>
<td>&lt;80</td>
<td>Recheck at future visits to verify any changes</td>
</tr>
<tr>
<td>120–139</td>
<td>80–89</td>
<td>Recheck at future visits to verify any changes</td>
</tr>
<tr>
<td>140–159</td>
<td>90–99</td>
<td>Refer to source of care</td>
</tr>
<tr>
<td>&gt;160</td>
<td>&gt;100</td>
<td>Emergency care needed</td>
</tr>
</tbody>
</table>

*If the systolic and diastolic categories are different, follow recommendations for the shorter time follow-up*
be taken in a variety of different situations. As we know, some patients will experience hypertension from being in our dental office.

In January, 2012 a study was released in *Lancet* regarding the accuracy of blood pressure readings in both arms. The British researchers indicated a systolic number difference of 10-15mm Hg or more could be an indication of a more serious problem, such as narrowing arteries, decreased blood flow to the brain, and a significantly increased chance of heart attack and stroke. Should the dental professional receive such readings, they should take the blood pressure readings again after approximately 5-10 minutes. If the readings received are still inconsistent between the patient’s arms, the patient should be referred to their healthcare provider.

**Lifestyle Modification Recommendations for Patients**

Time restraints at dental appointments prevent in-depth counseling for patients with high blood pressure readings. Instead, it is recommended that you provide information from professional websites, such as the *American Heart Association*. Their *Nutrition Center* link provides healthy goals such as: not smoking, maintaining a healthy weight, engaging in regular physical activity, eating a healthy diet, managing blood pressure, monitoring cholesterol, and keeping blood sugar (glucose) at healthy levels.

**Summary**

According to the *Centers for Disease Control (CDC)*, hypertension affects approximately one in three Americans. Research studies have shown that people with normal blood pressure readings between the ages of 55 and 65 still have an 80-90% risk of developing hypertension by the age of 80. With patients living longer, blood pressure should be monitored and recorded on a regular basis in the dental practice. The information in this course teaches the dental professional to be aware of the causes of hypertension and how to determine and assess identifiable causes. This course provides you with the appropriate method of taking a blood pressure and how to determine the recommendations for follow-up and lifestyle modifications for patient treatment.
Course Test Preview
To receive Continuing Education credit for this course, you must complete the online test. Please go to: www.dentalcare.com/en-US/dental-education/continuing-education/ce490/ce490-test.aspx

1. When looking at the patient’s blood pressure in their chart the ______________ is the lower number.
   a. diastolic
   b. systolic
   c. pulse

2. If a patient’s systolic blood pressure is 150–159 after repeated attempts, the dental professional will ________________.
   a. recheck in 1 year
   b. confirm within 2 months
   c. refer to source of care
   d. refer to source of care immediately

3. Before blood pressures is taken, the National Heart, Lung, and Blood Institute suggests ________________ at least 30 minutes prior to measurement.
   a. no smoking
   b. no exercise
   c. no caffeine
   d. All of the above.

4. The ______________ pressure reading is the highest pressure and is the effect of ventricular contraction.
   a. diastolic
   b. systolic
   c. pulse

5. A blood pressure reading of 140-159 Systolic/90-99 Diastolic is considered to be ________________.
   a. normal
   b. prehypertension
   c. hypertension stage 1
   d. hypertension stage 2

6. For a patient with a blood pressure reading of 120/88, the dental professional will recommend to ________________.
   a. recheck in a year
   b. refer to source of care
   c. refer to source of care immediately
   d. None of the above.

7. The diastolic pressure is the ________________.
   a. first sound you hear
   b. last distinct sound you hear
   c. very last sound you hear
   d. muffled sound you hear
8. Hypertension should never be diagnosed with only one reading. Blood pressure reading should be taken in a variety of different situations as some patients experience hypertension in the dental office.
   a. Both statements are true.
   b. The first statement is true. The second statement is false.
   c. The first statement is false. The second statement is true.
   d. Both statements are false.

9. A higher percentage of men than women have high blood pressure until 54 years of age. After 64 years of age, a much higher percentage of women have high blood pressure than men.
   a. Both statements are true.
   b. The first statement is true. The second statement is false.
   c. The first statement is false. The second statement is true.
   d. Both statements are false.

10. When taking a blood pressure the inflatable bladder of the cuff is placed directly over the ___________ artery.
    a. radial
    b. carotid
    c. brachial
    d. femoral

11. There are no concrete symptoms for high blood pressure. A flushed face, headache, and nose-bleeds may not be symptoms of high blood pressure.
    a. Both statements are true.
    b. The first statement is true. The second statement is false.
    c. The first statement is false. The second statement is true.
    d. Both statements are false.

12. To verify you have a more accurate blood pressure reading, how many times should you take your patient's blood pressure at their appointment?
    a. 1 time
    b. 2-3 times with at least 1 minute between readings
    c. 2-3 times immediately without waiting
    d. 8-10 times with 1 minute between readings

13. Stress contributes to behaviors that can exacerbate (worsen) blood pressure. Poor diet, lack of physical activity, and the use of tobacco and alcohol products are behaviors that may occur when our patient is stressed.
    a. Both statements are true.
    b. The first statement is true. The second statement is false.
    c. The first statement is false. The second statement is true.
    d. Both statements are false.

14. Patients in Hypertensive Crisis should receive immediate emergency treatment. What is the blood pressure reading for a patient considered to be in Hypertensive Crises?
    a. 140/70mm Hg
    b. 150/80mm Hg
    c. 160/90mm Hg
    d. 180/110mm Hg
References

Sources for Educational Materials
• U.S. Department of Health and Human Services
  National Institutes of Health
  National Heart, Blood, and Lung Institute
  Public - Education and Awareness, Resources

  NHLBI Health Information Center
  P.O. Box 30105
  Bethesda, MD 20824-0105
  www.nhlbi.nih.gov/health/educational

• American Heart Association
  320 Greenville Avenue
  Dallas, TX 75231
  www.americanheart.org

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