Blood Pressure Guidelines and Screening Techniques
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Continuing Education Units: 1 hour

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. Many patients see a dentist more frequently than a physician, giving the dental team the responsibility to inform their patients of their blood pressure reading and how it may affect their overall health. Blood pressure should be taken at each recare dental examination, before any procedure on patients with a history of high blood pressure, and before procedures that cause apprehension, such as oral surgery. The patient should always be told what their blood pressure reading is so that they can keep track of differences themselves. 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.

Conflict of Interest Disclosure Statement
• The author reports no conflicts of interest associated with this work.

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Overview
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to inform their patients of their blood pressure reading and how it may affect their overall health. Blood pressure should be taken at each recare dental examination, before any procedure on patients with a history of high blood pressure, and before procedures that cause apprehension, such as oral surgery. The patient should always be told what their blood pressure reading is so that they can keep track of differences themselves. 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
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• Blood Pressure
• Blood Pressure Categories
• Primary Risk Factors that Influence Blood Pressure
• Assessment for Identifiable Causes of Hypertension
• Conditions when Measuring Blood Pressure in the Dental Office
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• Procedure for Determining Blood Pressure with a Manual Device
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Glossary
antecubital fossa – the inside crease of the elbow
brachial artery – main artery of the arm
blood pressure – the force exerted by the blood on the blood vessel walls
Cushing’s Syndrome – abnormal bodily condition that is caused by excess corticosteroids
coarctation – a narrowing or constricting, especially of the aorta or a blood vessel
diastolic pressure – the lowest pressure; it is the effect of ventricular relaxation
hypertension – abnormally high arterial blood pressure
Korotkoff sounds – arterial sounds heard through a stethoscope that change with varying cuff pressure and that are used to determine systolic and diastolic blood pressure
mm Hg – millimeters of mercury
pulse pressure – the difference between the systolic and diastolic pressure
renovascular disease – a progressive condition that causes narrowing or blockage of the renal arteries or veins
sleep apnea – brief periods of recurrent cessation of breathing during sleep
systolic pressure – the peak or highest pressure, it is caused by ventricular contraction

sphygmomanometer – the blood pressure cuff or machine

stethoscope – a listening aid that magnifies sound

**Blood Pressure**

One in three Americans has high blood pressure or hypertension. Having high blood pressure places your patients at risk for 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 120 mm Hg. In patients over 50 years of age, a systolic reading higher than 140 mm Hg is more important as a cardiovascular risk factor 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 80 mmHg.

**Pulse Pressure**

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

**Blood Pressure Categories**

The American Heart Association recommends blood pressure screening occur starting at age 20. 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 will 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.

**Primary Risk Factors that Influence Blood Pressure**

Several risk factors are associated with the development of hypertension. Family history, advanced age, gender-related risk patterns, lack of physical activity, poor diet—especially one that includes too much salt, overweight and obesity, and drinking too much alcohol are all considered risk factors. In regards to gender-related risks, a higher percentage of men than women have high blood pressure until 45 years of age. After 64 years of age, a much higher percentage of women have high blood pressure than men.
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:

- Sleep apnea
- Drugs being taken that may induce or affect high blood pressure
- Chronic kidney disease
- Renovascular disease
- Cushing’s syndrome or steroid therapy
- Coarctation of aorta (localized narrowing of the aorta)
- Thyroid/parathyroid disease

Conditions when Measuring Blood Pressure in the Dental Office

The National Heart, Lung, and Blood Institute suggests before blood pressures is 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 coffee or other caffeine.

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 a recent Consumer Reports testing (Sept 2008; 47-49) 16 devices were tested with trained medical personnel conducting 6,000 readings on 57 men and women. The upper arm cuff devices were more accurate than wrist devices. The three highest rated upper arm cuff devices were: Omron Women’s Advanced Elite 7300W (Figure 1), Microlife Deluxe Advanced Automatic #BP3MC1-PC, and Omron Automatic with IntelliSense HEM-711AC.

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. Tell the patient briefly what is to be done.
   b. Seat the patient comfortably, with the arm slightly flexed, palm up and the whole forearm supported on a level surface even with the heart.
   c. Use either arm unless otherwise indicated, for example for 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 10 mm 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). 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.

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) 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 30 mm 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 3 mm 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. 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.

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- The subject 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 3 cm above the elbow.
- Try to keep the cuff as flat as possible.
**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.

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 be taken in a variety of different situations. Some patients will experience “white coat” hypertension.

In January of 2012, a study was released in *Lancet* regarding the recommendation for taking blood pressure readings in both arms. The study indicated that a systolic number difference of 10-15 mm 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 physician for a blood pressure work up.

**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 health 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 health professional to be aware of the causes of hypertension and how to determine and assess identifiable causes. A good understanding of the terms systolic, diastolic and pulse pressure along with knowledge of the various blood pressure categories and the factors that influence blood pressure are important. 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 and find this course in the Continuing Education section.

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 initial systolic blood pressure is 150–159, 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 coffee or other 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 “white coat” hypertension.**
   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 45 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
References

Sources for Educational Materials
• National High Blood Pressure Education Program
  High Blood Pressure Information Center
  120/80 National Institutes of Health
  Bethesda, MD 20205
  www.nhlbi.nih.gov
• American Heart Association
  320 Greenville Avenue
  Dallas, TX 75231
  www.americanheart.org

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Connie Myers Kracher is Associate Professor of Dental Education, Director of the Dental Assisting Program, and the Chair of the Department of Dental Education at Indiana University–Purdue University, Fort Wayne. She holds a PhD from Lynn University in Boca Raton, Florida, a Master of Science in Dentistry from the Indiana University School of Dentistry in Oral Biology, and a Bachelor of Science from Indiana University–Purdue University Indianapolis. In addition to her CDA, she holds a Certificate in Expanded Restorative Procedures (EFDA). Dr. Kracher is a frequent contributor to the Dental Assistant Journal and is the author of four ADAA courses: Sports Related Dental Injuries & Sports Dentistry, Oral Health Maintenance of Dental Implants, and Current Concepts in Preventive Dentistry.

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