New national guidelines on hypertension
A summary for dentistry


New guidelines for the evaluation and management of hypertension now are available from the National Heart, Lung, and Blood Institute. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, or JNC 7, substantially revises previous recommendations. These updated guidelines were necessitated by the findings of many recent observational studies and clinical trials dealing with hypertension; the need for useful, clear and concise clinical guidelines; the JNC's consensus that a simplified classification of blood pressure, or BP, was necessary; and a realization that practicing physicians were not using previous guidelines to maximum benefit. The JNC 7 report represents the consensus opinion of a coalition of 39 major professional, public and voluntary organizations and seven federal agencies. Every health care professional, including dentists and members of the dental team, should be aware of these important changes.

Hypertension is the most common primary diagnosis in the United States, affecting 50 million Americans. The condition's prevalence is likely to increase with the demographic shift to an older population. Importantly, data from the Framingham Heart Study indicate that people who are normotensive at age 55 years have a 90 percent lifetime risk of developing hypertension.

To appropriately manage their patients' care, dentists and members of the dental team must be knowledgeable about hypertension, particularly its detection and treat-
ment. Measurement of BP and review of all medications, including herbal remedies and other over-the-counter medications, should be an integral part of the examination procedure. Dentists are encouraged to help the medical profession identify people who have elevated BP so that these patients can be treated appropriately. The care of a patient with undetected or poorly controlled hypertension requires consultation with the patient’s physician. Also, a significant number of antihypertensive medications have undesired oral side effects that require assessment and potential intervention by dentists.

**HIGHLIGHTS OF THE JNC 7 REPORT**

**Increased importance of elevations of systolic blood pressure.** For people older than 50 years of age, systolic blood pressure, or SBP, greater than 140 millimeters of mercury is considered a much more important risk factor for cardiovascular disease, or CVD, than is elevated diastolic blood pressure, or DBP. This focus on SBP is a substantial change from recommendations as recent as 15 years ago when, in JNC IV, hypertension was defined solely as a DBP 90 mm Hg or higher. The recognition of the importance of the SBP gradually has evolved through JNC V and VI, and recent clinical trials have convincingly demonstrated the benefits of treating isolated systolic hypertension.

**Prehypertension.** JNC 7 introduces a category called “prehypertensive” to describe people with SBP of 120 to 139 mm Hg or a DBP of 80 to 89 mm Hg. People with prehypertension are at increased risk of progressing to hypertension and require health-promoting lifestyle modifications to prevent CVD. The term “prehypertension” replaces and expands the previously used terminology of “high normal” (130-139/85-89 mm Hg). People with BP in the range of 130 to 139/85 to 89 mm Hg are twice as likely to develop hypertension than those with lower values. The risk of a stroke or heart attack doubles for each increase in BP, in 20/10-mm Hg increments, from 115/75 mm Hg.

**Revised and simplified classification of BP.** The JNC 7 report reduces the number of categories of hypertension to only two (Table 1). Stage 1 hypertension is defined as SBP of 140 to 159 mm Hg or DBP of 90 to 99 mm Hg. Stage 2 hypertension is SBP of 160 or higher or DBP of 100 or higher. Further staging was eliminated in JNC 7 to simplify classification and because having a stage higher than Stage 2 would not change the need for treatment.

**Lifestyle modifications.** One of the reasons that the concept of prehypertension was developed is to provide a wake-up call for affected people to encourage them to make appropriate lifestyle choices.

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**TABLE 1**

**BLOOD PRESSURE CLASSIFICATION FOR ADULTS.**

<table>
<thead>
<tr>
<th>BLOOD PRESSURE CLASSIFICATION</th>
<th>SBP (mm Hg)</th>
<th>DBP (mm Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt; 120</td>
<td>and &lt; 80</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120-139</td>
<td>or 80-89</td>
</tr>
<tr>
<td>Stage 1 Hypertension</td>
<td>140-159</td>
<td>or 90-99</td>
</tr>
<tr>
<td>Stage 2 Hypertension</td>
<td>≥ 160</td>
<td>or ≥ 100</td>
</tr>
</tbody>
</table>

* Adapted from U.S. Department of Health and Human Services; National Institutes of Health; National Heart, Lung, and Blood Institute; National High Blood Pressure Education Program.† Treatment determined by highest blood pressure category.‡ SBP: Systolic blood pressure.§ mm Hg: Millimeters of mercury.¶ DBP: Diastolic blood pressure.

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One of the reasons that the concept of prehypertension was developed is to provide a wake-up call for affected people to encourage them to make appropriate lifestyle choices.
advised. Table 2 demonstrates that lifestyle changes can have a substantial impact on BP and, in some instances, can produce equivalent effects to use of single-drug therapy and may prevent the development of hypertension in patients who have prehypertension.

**Importance of thiazide diuretics.** JNC 7 emphasizes that thiazide-type diuretics should be used in the treatment of most patients with uncomplicated hypertension, either alone or combined with other classes of antihypertensive drugs. However, the report recognizes that certain high-risk conditions (heart failure, postmyocardial infarction, high coronary disease risk, diabetes, chronic kidney disease and potential for recurrent stroke) have indications for the initial use of other classes of antihypertensive medications. Importantly, while recent clinical trials demonstrate that effective control of BP is achievable in most patients, the majority of patients will require two or more antihypertensive agents. The figure presents an algorithm for treating hypertension.

**Goals of therapy.** The primary focus of therapy for those 50 years of age or older has become the reduction of elevated SBP to goal SBP. By achieving the SBP goal, most patients will attain the DBP goal. Treatment for people aged 50 years or younger will continue to focus on the DBP. For most people, the current treatment target is a BP of less than 140/90 mm Hg; however, for patients with diabetes mellitus or chronic kidney disease, the goal is a BP of less than 130/80 mm Hg.

**Benefits of lowering BP.** The benefits of effective treatment of hypertension have been demonstrated convincingly in clinical trials. Effective antihypertensive therapy reduces the incidence of stroke by 35 to 40 percent, myocardial infarction by 20 to 25 percent and heart failure by more than 50 percent. A sustained

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**TABLE 2**

**LIFESTYLE MODIFICATIONS TO MANAGE HYPERTENSION.**

<table>
<thead>
<tr>
<th>MODIFICATION</th>
<th>RECOMMENDATION</th>
<th>APPROXIMATE SBP REDUCTION (RANGE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Reduction</td>
<td>Maintain normal body weight (body mass index 18.5-24.9 kilograms per square meter)</td>
<td>5-20 millimeters of mercury/10 kg weight loss^3</td>
</tr>
<tr>
<td>Adopt DASH™ Eating Plan</td>
<td>Consume a diet rich in fruits, vegetables and low-fat dairy products with a reduced content of saturated and total fat</td>
<td></td>
</tr>
<tr>
<td>Dietary Sodium Reduction</td>
<td>Reduce dietary sodium intake to no more than 100 millimoles per day (2.4 grams sodium or 6 g sodium chloride)</td>
<td>2-8 mm Hg''</td>
</tr>
<tr>
<td>Physical Activity</td>
<td>Engage in regular aerobic physical activity such as brisk walking (at least 30 minutes per day, most days of the week)</td>
<td>4-9 mm Hg''</td>
</tr>
<tr>
<td>Moderation of Alcohol Consumption</td>
<td>Limit consumption to no more than two drinks (1 ounce or 30 milliliters ethanol; for example, 24 oz beer, 10 oz wine, or 3 oz 80-proof whiskey) per day in most men and to no more than one drink per day in women and lighter-weight people</td>
<td>2-4 mm Hg''</td>
</tr>
</tbody>
</table>

* Adapted from U.S. Department of Health and Human Services; National Institutes of Health; National Heart, Lung, and Blood Institute; National High Blood Pressure Education Program.1
† Overall cardiovascular risk reduction can be achieved by cessation of smoking.
‡ The effects of implementing these modifications are dose- and time-dependent and could be greater for some people.
§ SBP: Systolic blood pressure.
¶ The Trials of Hypertension Prevention Collaborative Research Group; He and colleagues.17
# DASH: Dietary Approaches to Stop Hypertension.
** Sacks and colleagues; Vollmer and colleagues.20
†† Sacks and colleagues; Vollmer and colleagues; Chobanian and Hill.21
‡‡ Kelley and Kelley; Whelton and colleagues.23
§§ Xin and colleagues.24

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**Lifestyle changes can produce equivalent effects to use of single-drug therapy and may prevent the development of hypertension in patients who have prehypertension.**
reduction of 12 mm Hg in SBP for people with Stage 1 hypertension is estimated to result over a 10-year period in prevention of one death for every 11 patients treated. Even greater benefit is obtainable with the presence of CVD or target-organ damage.31

**SIGNIFICANCE OF HYPERTENSION IN DENTAL CARE**

Dentists can perform a valuable patient service by identifying undetected hypertension or hypertension that is controlled inadequately and by recommending evaluation or treatment by physicians.8 Undetected and insufficiently treated hypertension is a problem in a dental environment.6 Elevated BP, especially markedly elevated BP, increases a patient’s risk of experiencing cardiovascular conditions such as angina, myocardial infarction and cerebrovascular accident while undergoing dental care. The JNC 7 urges all health care professionals, including dentists, to become actively involved in this effort.

Hypertension underlies most CVD. Hypertension is a substantial risk factor for CVD and resultant organ damage (Box). Among organ systems associated with hypertensive damage are the vascular system itself, in which hypertension can produce atherosclerosis and contribute to atherosclerosis; the kidneys, in which hypertensive nephrosclerosis can lead to end-stage renal disease; the heart, in which hypertension can result in myocardial infarction and left ventricular hypertrophy that progress to cardiac failure; and the brain, in which hypertension can lead to all forms of stroke.32

Undetected or inadequately controlled hypertension. Hypertension is the most common primary diagnosis in the United States, accounting for 35 million health care visits per year.1-3 Additionally, 30 percent of people with hypertension are unaware that they have the condition.1-3 Only 59 percent of patients with hypertension are being treated for their condition, and 34 percent have their BP controlled at levels consistent with JNC 7 guidelines.1-3 This makes it obvious that practicing dentists encounter many patients with undetected or poorly controlled hypertension, requiring medical consultation and intervention. Failure to detect severe elevations of BP can result in stroke or myocardial infarction.

**Office monitoring of BP.** BP readings should be taken for all new patients and for recall.
patients on at least an annual basis. People who have hypertension should have BP assessed at each visit in which significant dental procedures are accomplished. The procedure is simple and can be accomplished by office staff. Patients should be allowed to sit quietly in an upright position with the arms supported at the heart level for at least five minutes before BP is taken. JNC 7 recommends averaging two measurements. The mercury sphygmomanometer is the most accurate device for detecting BP. Aneroid sphygmomanometers require calibration every six months. While electronic BP measuring devices are used with increasing frequency because of their ease of use and concerns about the toxic nature of mercury, the American Heart Association Council for High Blood Pressure Research maintains that mercury sphygmomanometers should not be abandoned.

It is important to select a well-fitting cuff. The bladder of the cuff should cover about 80 percent of the upper arm, be centered over the brachial artery and be applied snugly. Some larger patients require a large adult-sized or thigh cuff to obtain a good fit. Inappropriate size of the cuff will give false readings. Gentle placement of the bell of the stethoscope in the antecubital fossa is necessary to auscultate Korotkoff’s sounds optimally.

Managing the care of patients with hypertension. As emphasized previously, measurement of BP and review of the health status should be conducted routinely for all patients, but particularly for people with known hypertension. Patients with well-controlled hypertension or with Stage 1 hypertension are good candidates for all dental procedures. Several studies have demonstrated that mild- to-moderate hypertension (SBP ≥ 140 and ≤ 180 mm Hg ; DBP ≥ 90 and ≤ 110 mm Hg) is not an independent risk factor for perioperative cardiovascular complications. However, risk assessment is essential for all patients, especially those for whom the need of complex or surgical procedures is anticipated. Particular care should be taken to identify risk factors for hypertension and target organ damage and CVDs that indicate increased risk. Sedation with nitrous oxide or an anxiolytic agent may be indicated for anxious patients.

Limits on epinephrine. Use of a vasoconstrictor in local anesthetic for patients with CVD is a matter of some debate and was addressed directly as a dental issue by JNC 7. Among the rationale for limiting epinephrine use with patients with hypertension is that hypertensive disease usually is found in middle-aged and older patients who are more likely to have other CVDs and reduced resiliency of the cardiovascular system. Bader and colleagues, in an extensive review of the cardiovascular effects of epinephrine on dental patients with hypertension, concluded that use of epinephrine in local anesthetic solutions resulted in infrequent adverse outcomes. However, it is widely recommended that vasoconstrictor usage should be minimized in patients with increased risk of developing CVD. While there is no official maximum dose for vasoconstrictors when administered with local anesthetic, two to three cartridges of lidocaine with 1:100,000 epinephrine (approximately 0.036-0.054 mg epinephrine) is considered safe in ambulatory patients with all but the most severe CVD. Dentists’ years of experience in dealing with countless patients support this conclusion. There also is general agreement that use of retraction cords containing epinephrine should be avoided. Sufficient alternatives for hemostasis are available that the use of epinephrine-impregnated cords is not warranted.

People with BP consistent with Stage 2 hypertension should have repeat BP determinations to confirm the initial findings. Referral of patients with significantly increased BP to their physicians is appropriate, particularly if the elevation is more than 20 mm Hg higher than the goal BP.
Patients with markedly elevated BP (defined in JNC V† as SBP 180-209 mm Hg or DBP 110-119 mm Hg) and acute target-organ damage such as prior myocardial infarction and unstable angina require hospitalization. The condition of patients who have marked BP elevation but not acute target-organ damage usually can be managed by immediate combination oral antihypertensive therapy. Any dental patients whose BP is higher than 210/120 mm Hg should be referred for immediate medical evaluation.

**Urgent dental care.** It is not uncommon for patients seeking urgent dental care to have elevated BP. The possible causes of this are multiple and include undetected hypertension, inadequate treatment, poor patient compliance with physicians’ recommendations, expense of medical care and medications, and avoidance of medication use due to complications such as decreased sexual function. Additionally, people with toothache pain often are poorly rested and experiencing anxiety. Such situational factors can result in increased SBP.

From a dental treatment perspective, there is no simple answer to the problem posed by people with elevated BP needing urgent dental care, such as an extraction. There are no professionally recognized criteria based on BP values to indicate when it is safe to proceed. In JNC VI, Stage 3 hypertension was defined as SBP higher than 180 mm Hg or DBP higher than 110 mm Hg.‡ Elevation of SBP higher than 180 mm Hg or DBP higher than 110 mm Hg is used by many dental clinicians as a cutoff point for offering urgent treatment without medical consultation and referral. Pending clear guidelines from research or professional consensus, this appears to be sound advice.

**Complications of hypertensive treatment.**

**Orthostatic hypotension.** Any patient, especially an older patient who is taking multiple medications for hypertension, is at risk of developing orthostatic hypotension if he or she attempts to stand upright immediately after being in a reclining or supine position for a prolonged period.§ Orthostatic hypotension can result in syncope and falling with associated injury. This hazard usually is avoidable by allowing patients to sit upright for a few minutes after completion of the dental procedure. People at most risk are those who are older, those who are taking multiple cardiovascular medications and those who are undergoing lengthy dental procedures.

**Xerostomia.** Many antihypertensive medications—including central α2-agonists and other centrally acting drugs; α1-adrenergic-blocking agents; β-adrenergic blocking agents; diuretics; angiotensin-converting enzyme, or ACE, inhibitors; and calcium channel blockers—are associated with xerostomia.‖ The likelihood of xerostomia grows as the number of medications with xerostomic potential increases. Xerostomia—with its resultant potential for caries (especially root caries); difficulties with mastication, swallowing and speech; candidiasis; and oral burning—is a frequently underdiagnosed condition.¶ Sometimes the sensation of xerostomia is transitory, and the patient’s salivary function will adjust without any action on the part of the dentist or physician. In other instances, the physician can alter the patient’s medications to avoid this potential complication. However, it often is necessary to treat xerostomia directly with parasympathomimetic agents such as pilocarpine (5 mg three or four times a day) or cevimeline (30 mg three times a day). Additional strategies to deal with xerostomia include taking frequent sips of water, using moisturizing gels, sucking on sugarless hard candy, using sugarless mints or gums, minimizing caffeine intake and avoiding the use of alcohol-containing mouthrinses. Of particular concern to dentists is the increased potential for development of caries, which can be addressed by increased application of fluoride, especially high-potency fluoride delivered either on a toothbrush or in a custom carrier.

**Gingival overgrowth.** Calcium channel blockers can cause gingival overgrowth. The incidence of this is not firmly established but ranges from 1.7 to 38 percent.‖‖ Enlargement of the gingiva is possible with most of the calcium channel blockers, but the majority of case reports are associated with use of nifedipine.‖§ Gingival overgrowth can result in pain, gingival bleeding and difficulty with mastication. The likelihood of development of gingival overgrowth is reduced by excellent oral hygiene. The process of gingival overgrowth often can be reversed by having the
physician change the patient’s medication to an alternative antihypertensive agent. Extensive overgrowth may require gingivectomy, gingivoplasty or both.

Lichenoid reactions. Several cardiovascular medications (thiazides, methyldopa,\(^{59}\) propranolol, ACE inhibitors,\(^{60}\) furosemide, spironolactone and labetalol)\(^{31,67,68}\) have the potential to result in lichen planus-like lesions in the mouth termed “lichenoid reactions.” The clinical appearance of lichenoid lesions is indistinguishable from oral lichen planus. The best and simplest method of dealing with this complication is to ask the physician to substitute an alternative therapeutic agent. The lichenoid lesions, if associated with the antihypertensive drug, will resolve after the patient ceases taking the medication. When this is not feasible, lichenoid reactions can be treated as necessary with topical corticosteroids.

Other potential adverse reactions. ACE inhibitors are well-recognized for their association with an increased incidence of cough and potential loss of taste. ACE inhibitors also are reported to be associated with a burning sensation described as “scalded mouth” syndrome.\(^{62}\)

Potential drug interactions. The interaction of antihypertensive agents with therapeutic agents commonly used in dentistry may result in adverse outcomes. The interaction of nonselective \(\beta\)-blockers with epinephrine in local anesthetics can result in a reduction in cardiac output through an \(\alpha\)-receptor–induced increase in BP and a concomitant compensatory vagal reflex-mediated reduction in heart rate.\(^{46,63,64}\) However, with careful administration, frequent aspiration and monitoring of vital signs, patients treated with nonselective \(\beta\)-blockers can safely receive two or three cartridges of anesthetic with 1:100,000 epinephrine.\(^{65,66}\)

When epinephrine is used in patients receiving non–potassium-sparing diuretics, potassium levels can decrease resulting in dysrhythmias.\(^{46,67}\) Clinicians should be aware of this potential adverse reaction and identify patients’ use of non–potassium-sparing diuretics.

Prolonged use of nonsteroidal anti-inflammatory agents, or NSAIDs, can lessen the anti-hypertensive effectiveness of diuretics, \(\beta\)-blockers, \(\alpha\)-blockers, vasodilators, ACE inhibitors and central agonists.\(^{68}\) Clinicians can substitute alternative analgesics to avoid this interaction; however, short-term usage of NSAIDs is unlikely to produce a clinically significant effect.

A NEED FOR PHYSICIAN-DENTIST INTERACTION

Dentists and physicians often consult concerning patient care management. A particularly relevant example is treatment of obstructive sleep apnea, or OSA. Treatment of OSA increasingly involves dentists’ fabricating intraoral devices.\(^{59,70}\) OSA is associated with a wide variety of CVDs, including dysrhythmias, myocardial infarction and stroke.\(^{71,72}\) More than 50 percent of people with OSA have hypertension, and management of OSA often involves weight reduction necessitated by obesity.\(^{72,74}\) Treatment of OSA illustrates the need for a holistic approach to the practice of dentistry and emphasizes the need for communication between treating physicians and dentists.

SUMMARY AND CONCLUSIONS

This article summarizes the recently released JNC 7 report dealing with the prevention, detection, evaluation and treatment of high BP. Antihypertensive therapy has as its ultimate goal reduction of cardiovascular and renal morbidity and mortality. A more aggressive prevention-oriented approach to the treatment of hypertension is currently recommended.

While no major changes in dental patient care management are suggested by JNC 7, it is likely that dentists will encounter more complications of hypertensive therapy among their patients and will require greater interaction and consultation with medical colleagues.

In JNC 7, the medical profession has set high goals for itself to accomplish. Physicians want the help of the entire team of health professions to reach these objectives. Dentists and members of the dental team can and should play an important role through monitoring BP, detecting hyper-
tension, reinforcing compliance with physician-recommended therapies and encouraging patients to adopt healthy lifestyles. ■


50. Navazesh M. How can oral health care providers determine if patients have dry mouth? JADA 2003;134:613-20.