

Nutrition Recommendations for the Prevention and Treatment of Hypertension

Carol Lapin, MS, RD, CSSD, LD
Owner: CSL Nutritional Services,
Houston, TX
Co-Director: Wellness CV/RD

Clinical studies show that the blood pressure lowering effects of lifestyle modifications, including proper nutrition, can be equivalent to drug monotherapy.¹ Lifestyle modification is best initiated and sustained through the coordinated efforts of health care professionals. The registered dietitian is the most qualified member of the health care team to make the appropriate nutrition recommendations that fit into the patient's lifestyle for long-term, meaningful changes. The following will review the definition of hypertension; present expert guidelines for prevention and treatment of primary hypertension; and summarize the results of the DASH diet.

Hypertension in Review

According to the American Heart Association, in 90–95% of cases, scientists don't know what causes high blood pressure. When the cause of hypertension is not well understood, this is called essential hypertension. In those with essential hypertension, other secondary causes of blood pressure, such as renovascular disease or renal failure, are not present. Instead, there may be other factors present, such as a genetic predisposition for hypertension; high sodium intake; and/or obesity. In the remaining cases, high blood pressure results from a recognizable underlying problem. This is called secondary hypertension. Some possible causes are a kidney abnormality, tumor of the adrenal gland, or congenital defect of the aorta. When the root cause is corrected, blood pressure usually returns to normal.²

Fortunately, although scientists do not fully understand the causes of this disease, they have developed both non-drug and drug treatments that treat hypertension effectively. Individuals with pre-hypertension have twice the risk of developing hypertension compared to those with normal values; therefore, lifestyle and pharmacological therapies to lower blood pressure before the development of cardiovascular complications are essential.³

The Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC)

The Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC) provides an evidence-based approach to the prevention and management of hypertension. The JNC guidelines are typically revised every 4–5 years; however, the latest report, *JNC 7*, was published in 2003. The next hypertension guideline update, *JNC 8*, is expected to be available for public review and comment in fall 2011, with expected release in spring, 2012.

The *JNC 7* report refined the classification of hypertension to

emphasize that the relationship between blood pressure and risk of cardiovascular disease (CVD) events is continuous, consistent, and independent of other CVD risk factors. Compared to a blood pressure of 115/75 mmHg, the risk of developing CVD doubles with each incremental increase of 20 mmHg in systolic blood pressure or 10 mmHg in diastolic blood pressure.¹

The *JNC 7* defines "Stage 1 Hypertension" as a systolic blood pressure of 140 to 159 mmHg or a diastolic blood pressure of 90 to 99 mmHg. "Stage 2 Hypertension" includes a systolic blood pressure of 160 mmHg or higher, and a diastolic blood pressure of 100 mmHg or higher. Systolic blood pressure higher than 140 mmHg is a more important CVD risk factor than diastolic blood pressure in patients older than 50 years.² To simplify blood pressure classification, Stages 2 and 3 of the 1997 guidelines were combined as Stage 2 hypertension in the *JNC 7* report.¹

Reducing blood pressure has dramatic results.² Antihypertensive therapy reduces cardiovascular and renal morbidity and mortality. In clinical trials, antihypertensive therapy has reduced the incidence of stroke by 35%

Nutrition Recommendations continued on page 6

Guest Contributors

Jessica Lee Levings, MS, RD, LD, and Carol Lapin, MS, RD, CSSD, LD, are members of the Sports, Cardiovascular and Wellness Nutrition (SCAN) Dietetic Practice Group. PHCNPG is sharing this edition with SCAN members.

**Sports,
Cardiovascular,
and Wellness
Nutritionists**

a dietetic practice group of the
 American Dietetic
Association

to 40%, myocardial infarction by 20 to 25%, and heart failure by 50%. The target blood pressures are less than 140/90 mmHg for individuals with uncomplicated hypertension, and less than 130/80 mmHg for those with diabetes or chronic kidney disease. It has been estimated that just a 3 mmHg reduction in systolic blood pressure could lead to an 8% reduction in stroke mortality and a 5% reduction in mortality from coronary heart disease.⁵ Lifestyle changes, including diet, exercise, stress management, and smoking cessation, should be used as the initial therapy in patients with hypertension. When medication is necessary, thiazide-type diuretics should be used as the initial pharmacologic for most patients with hypertension, either alone or combined with drugs from other classes. The majority of patients will require two or more antihypertensive medications to achieve the target blood pressure. Certain high-risk of myocardial infarction, high coronary

disease risk, chronic kidney disease, and recurrent stroke are compelling indications for the initial use of other antihypertensive drug classes.⁵

Table 1 is taken from the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Hypertension* 2003;42:1206-52.

Dietary Intervention: The Dietary Approaches to Stop Hypertension Eating Plan (DASH)

The National Heart, Lung, and Blood Institute (NHLBI) has led in the development of an integrated set of cardiovascular guidelines supported by decades of research published in peer-reviewed journals establishing high sodium intake as an important cause of high blood pressure. The research has clearly demonstrated that reducing the amount of sodium in one's diet can significantly lower blood pressure and can help safely prevent or control high blood pressure.⁵ The Dietary

Approaches to Stop Hypertension (DASH) eating plan, combined with reduced sodium intake, may help individuals prevent the development of high blood pressure, as well as, benefit those with prehypertension and hypertension.^{6,7}

The DASH Clinical Study

Note: The definitions for hypertension used in the Dash Clinical Study and the Dash-Sodium Clinical Study (cited below) are based on *The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure* (JNC VI).

The initial DASH clinical study was funded by the NHLBI and published in 1997. The study involved 459 adults with systolic blood pressures of less than 160 mmHg and diastolic pressures of 80-95 mmHg. About 27% of the participants had high blood pressure; 50% of the participants were women; and 60% were African Americans.⁷

Table 1.

Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC) Classification of Blood Pressure for Adults Aged 18 Years and Older*

Blood Pressure, mmHg.			
Category	Systolic (mmHg)		Diastolic (mmHg)
Normal**	Less than 120	And	Less than 80
Prehypertension	120-139	Or	80-89
Hypertension**			
Stage 1	149-159	Or	90-99
Stage 2	Greater than or equal to 160		Greater than 100

*Not taking antihypertensive drugs and not acutely ill. When systolic and diastolic pressure fall into different categories, the higher category should be selected to classify the individual's blood pressure status. (Isolated systolic hypertension [ISH] is defined as SBP greater than or equal to 140 mmHg and DBP less than 90 mmHg and staged appropriately [e.g., 170/82 mmHg is defined as Stage 2 ISH].) In addition to classifying stages of hypertension on the basis of average blood pressure levels, clinicians should specify presence or absence of target organ disease and additional risk factors. This information is important for risk assessment and treatment.

**Optimal blood pressure with respect to cardiovascular risk is SBP less than 120 mmHg and DBP less than 80 mmHg. However, unusually low readings should be evaluated for clinical significance.

*** Based on the average of two or more readings taken at each of two or more visits after an initial screening.

The study compared three eating plans:

- ◆ A plan that included foods similar to what many Americans regularly eat;
- ◆ A plan that included foods similar to what many Americans regularly eat plus more fruits and vegetables;
- ◆ The DASH eating plan, which emphasizes fruits, vegetables, and low fat dairy foods, and is low in saturated fat, total fat, and cholesterol.

All three plans included about 3,000 milligrams of sodium daily. None of the plans were vegetarian or used specialty foods. Participants who followed both the plan that included more fruits and vegetables, and the DASH eating plan had reduced blood pressure. The DASH eating plan had the greatest effect, especially for those with high blood pressure. Furthermore, the blood pressure reductions occurred within two weeks of starting the plan.⁵

The DASH-Sodium Clinical Study

A subsequent study, conducted from 1997 through 1999, looked at the effects of the DASH diet and a reduced dietary sodium intake on blood pressure. The research involved 412 participants, aged 22 and older, with systolic blood pressures of 120-159 mmHg, and diastolic blood pressures of 80-95 mmHg. About 41% of the participants had high blood pressure; 57% of the participants were women; and 57% were African Americans.⁶ The servings for each food group in the DASH diet and the 9 nutrients focused on are shown in Table 2.

Participants were randomly assigned to follow either the DASH eating plan or a typical American diet for three months. During the study period, each group followed three different intakes of dietary sodium for one month each, in random order:

- ◆ 3,300 mg a day (the average level consumed by Americans)
- ◆ 2,400 mg a day (the upper limit recommended by the Joint National

Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure)

- ◆ 1,500 mg a day

Lower sodium intake resulted in lower blood pressures for all participants on both the DASH eating plan and the typical American diet, including those without high blood pressure. The greatest blood pressure reductions were for the DASH eating plan at the sodium intake of 1,500 mg per day.⁷ Individuals with the highest blood pressure levels had the greatest reductions; pre-hypertensive participants also had large decreases. The trial showed that weight reduction in overweight or obese individuals can reduce systolic blood pressure by 5 to 20 millimeters (mm) of mercury for every 10 kilograms of weight lost.⁸ Individuals following the DASH eating pattern can decrease systolic blood pressure by 8 to 14 mm of mercury. Restricting dietary sodium intake to no more than 2.4 grams (2,400 mg) of sodium per day can lower systolic blood pressure by 2 to 8 mm of mercury.⁸ Lifestyle recommendations to further reduce risk are shown in Table 3 on page 8.

DASH Dietary Plan in 2011

The DASH eating plan provides recommendations, menus, recipes and tips for two levels of daily sodium consumption—2,300 and 1,500 mg per day. The plan:

- ◆ Follows heart-healthy guidelines to limit saturated fat, cholesterol and total fat.
- ◆ Emphasizes fruits, vegetables, and fat-free or low-fat milk and milk products.
- ◆ Includes whole grain products, fish, poultry, and nuts.
- ◆ Is reduced in lean red meats, sweets, added sugars, and sugar-containing beverages.
- ◆ Is rich in potassium, magnesium, and calcium, as well as protein and fiber.

According to the American Heart Association (AHA), the current Dietary Guidelines' recommendation that individuals consume less than 2,300 mg of sodium per day is too high.⁹

Nutrition Recommendations continued on page 8

Table 2.

Components of DASH Diet	
Grains	7-8 Servings
Vegetables	4-5 Servings
Fruits	4-5 Servings
Low-fat or Fat-free Dairy	2-3 Servings
Meats, poultry & fish	2 or Less Servings
Nuts, seeds & dry beans	4-5 Servings
Fats & oils	2-3 Servings
Sweets	7-8 Servings

The DASH diet consists of recommendations for nine nutrients in a 2100 calorie diet—total fat (27% of the calories), saturated fat (6% of the calories), protein (18% of the calories), carbohydrates (55% of the calories), cholesterol (150 mg), sodium (2300 mg), potassium (4700 mg), calcium (1250 mg), magnesium (500 mg) and fiber (30 g).

The amount should be changed to the amount recommended in the 2005 DGA Guidelines for specific populations vulnerable to hypertension, which is no more than 1,500mg of sodium per day. Because these vulnerable groups now constitute 70% of the total population, the 1,500mg should apply to all populations.⁹

In response to the concern by AHA and other health organizations, Dietary Guidelines Advisory Committee Member Xavier Pi-Sunyer, MD, MPH, defended the committee at the Dietary Guidelines Advisory Committee Meeting, January 29-30, 2009.¹⁰ Dr. Pi-Sunyer responded that Americans today are eating an average of 3,400 mg of sodium a day. The 2005 Dietary Guidelines Advisory Committee

suggested 2,300 mg as a tolerable level of sodium, since greater than 85% of Americans actually consume more. The issue, according to Dr. Pi-Sunyer, is how can health professionals get Americans down to what would be a tolerable level of sodium consumption.

The USDA's assertion that Americans have a difficult time decreasing sodium intake may be justified.¹¹ Americans

Table 3.

Lifestyle Modifications to Prevent and Manage Hypertension*		
Modification	Recommendation	Appropriate Systolic Blood Pressure Reduction (Range)**
Weight Reduction	Maintain normal body weight (body mass index 18.5-24.9 kg/m ²).	5-20 mmHg/10 kg
Adopt DASH** eating plan	Consume a diet rich in fruits, vegetables and low-fat dairy products, with a reduced content of saturated and total fat.	8-14 mmHg
Dietary sodium reduction	Reduce dietary sodium intake to no more than 100 mmol per day (2.4 g sodium or 6 g sodium chloride).	2-8 mmHg
Physical Activity	Engage in regular aerobic physical activity such as brisk walking (at least 30-45 minutes per day, most days of the week).	4-9 mmHg
Moderation of Alcohol Consumption	Limit consumption to no more than two drinks (e.g., 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 persons.	4-9 mmHg
Increase Dietary Potassium Intake	Increase dietary potassium intake to 4.7 gm per day (this is the amount provided in the DASH diet).	2-4 mm Hg

*For overall cardiovascular risk reduction, stop smoking.
 **DASH indicates Dietary Approaches to Stop Hypertension.
 ***The effects of implementing these modifications are dose- and time-dependent and could be greater for some individuals.
 Taken from the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Hypertension*. 2003;42:1206-52.
 Appel LJ. ASH Position paper: dietary approaches to lower blood pressure. *J Clin Hypertens*. 2009;11:358-68.

have found it hard to follow any healthy eating plan for an extended period as exemplified in a study by Researcher Philip B. Mellen, MD, MS, and colleagues from the Hypertension Center, Hattiesburg Clinic, Hattiesburg, Mississippi. Very few hypertensive patients follow the recommended DASH diet, as revealed by an analysis of data from the National Health and Nutrition Examination Survey (NHANES) during the 1988-1994 and 1999-2004 periods. These findings were reported in the February 2008 issue of the *Archives of Internal Medicine*.¹¹ It should also be noted that the amount of sodium found in our food supply largely impacts Americans' ability to lower sodium content in their individual diets (see below under "Reducing Sodium in the Diet Long-Term").

It was noted that after appropriate adjustments for age and energy intake, only 19.4% of the subjects in 1999-2004 were in compliance with the DASH recommendations, compared to 26.7% during the 1988-1994 period. Several factors were related to adherence, including: older age, higher education, nonblack ethnicity, and history of coexisting diabetes.¹¹

Reducing Sodium in the Diet Long Term

Current guidelines on the prevention and treatment of hypertension prominently emphasize lifestyle modifications in addition to pharmacologic therapy.⁴ In particular, the National High Blood Pressure Education Program and the AHA have broadly recommended the DASH Diet, plus sodium reduction, to reduce high blood pressure.⁶

In addition to modifiable lifestyle changes, we know that the food and restaurant industries play an important role in the amount of sodium consumed by Americans. The National Salt Reduction Initiative (NSRI) is being led by the New York City Department of Health and Mental Hygiene in partnership with 19 national health organizations, 9 national and regional health associations, and 44 cities,

states and related entities.¹² With funding from the federal Communities Putting Prevention to Work (CPPW) initiative, the NSRI has set salt-reduction targets for 62 packaged food and 25 restaurant food categories, with the overall goal of lowering Americans' salt intake by 20% over five years. As of March 2011, 28 companies volunteered to lower salt in many of their products. Some of these salt-reduction targets will be met by 2012, while others will be fulfilled by 2014.¹²

A full listing of the food companies working with the NSRI is available at www.nyc.gov. Many of these companies' products are highly utilized among Americans, including: Au Bon Pain, Kraft, Heinz, Campbell's, Starbucks, Hostess and Butterball.¹²

Environmental change efforts related to the food industry stand to create huge impacts on Americans' sodium intake; however, the risks for hypertension and the need for dietary and medical intervention will persist into the future. Registered Dietitians continue to have a vital role in education about sodium risks and the prevention of hypertension.

References

1. Elmer P, et al. Effects of comprehensive lifestyle modification on diet, weight, physical fitness, and blood pressure control: 18-month results of a randomized trial. *Ann Intern Med*. 2006; April 4;144 (7):485-495.
2. American Heart Association Scientific Statement. Dietary approaches to prevent and treat hypertension. *Hypertension*. 2006;47:296.
3. DASH Collaborative Research Group. Appel, LJ, et al. *N Engl J Med*. 1997;336(16):1117-24.
4. Institute for Clinical Systems Improvement. *Health Care Guidelines. Hypertension diagnosis and treatment*, thirteenth edition, November 2010.
5. Appel LJ, Brands MW, Daniels SR, Karanja N, Elmer PJ, Sacks FM.

American Heart Association. Dietary approaches to prevent and treat hypertension: a scientific statement from the American Heart Association. *Hypertension*. 2006;47:296-308.

6. Chobanian AV, Bakris GL, Black HR, et al. National Heart, Lung, and Blood Institute Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure; National High Blood Pressure Education Program Coordinating Committee. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *JNC 7*.

7. Sacks FM, et al. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. DASH-Sodium Collaborative Research Group. *N Engl J of Med*. 2001;344(1):3-10.

8. Bray GA, et al. A further subgroup analysis of the effects of the DASH diet and three dietary sodium levels on blood pressure: results of the DASH-Sodium Trial. *Am J Cardiol*. 2004;94(2):222-7.

9. Letter to the American Dietary Advisory Committee by the American Heart Association Advocacy Dept., July 15, 2010. http://www.heart.org/idc/groups/heart-public/@wcm/@adv/documents/downloadable/ucm_312253.pdf.

10. Dietary Guidelines Advisory Committee Meeting, January 29-30, 2009. <http://www.cnpp.usda.gov/Publications/DietaryGuidelines/2010/Meeting2/FinalMeetingMinutesDGAC-Mtg2--April102009.txt>

11. Mellen P, Gao S, Vitolins M, Goff Jr D. Deteriorating Dietary Habits Among Adults With Hypertension: DASH Dietary Accordance, NHANES 1988-1994 and 1999-2004. *Arch Intern Med*, Feb 2008; 168:308-314.

12. New York City Department of Health and Mental Hygiene: National Salt Reduction Initiative (2011) fact sheet: <http://www.nyc.gov/html/doh/downloads/pdf/cardio/cardio-salt-health-faq.pdf>.