



# Stalking the “Silent Killer”

2010 Edition

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## Learning Objectives

After reading this module, the participant will be able to:

1. List three lifestyle modifications that have a favorable effect on blood pressure.
2. Describe the systolic and diastolic values for prehypertension, stage 1 hypertension and stage 2 hypertension.
3. Describe the DASH eating pattern.

**They call it the “silent killer.” Essentially asymptomatic, hypertension affects approximately 73.6 million (one in three) adult Americans and is a major risk factor for cardiovascular disease (AHA, 2008). Hypertension can develop late in life — individuals with normal blood pressure at age 55 have a 90 percent lifetime risk for developing hypertension (Chobanian, *et al.*, 2003) — and 21.3 percent of Americans are unaware that they have hypertension (AHA, 2009).**

Hypertension is a key risk factor for severe or catastrophic cardiovascular disease events (myocardial infarction, heart failure, stroke, and kidney disease<sup>5</sup>) — a ticking time bomb!

In May 2003, the Joint National Committee released the *Seventh Report on the Prevention, Detection, Evaluation and Treatment of High Blood Pressure* (also known by its acronym: *JNC 7*). Subsequently, the National High Blood Pressure Education Program (NHBPEP) Coordinating Committee of the National Heart, Lung, and Blood Institute (NHLBI) decided to provide new guidelines. This was in response to the publication of many large-scale clinical trials and observational studies since the release of the previous guidelines in 1997. In addition, the NHBPEP wanted to simplify the classification of blood pressure and provide a concise, clinically useful guideline for clinicians (Chobanian, *et al.*, 2003).

The new guidelines make it easier to classify and define hypertension, and should help nutrition counselors and fitness professionals counsel their clients and design appropriate fitness programs.

A significant feature of the *JNC 7* report is a revision in blood pressure classifications for persons aged 18 or older. For them, recognizing the potential for late-onset of hypertension, the report added a new classification — “prehypertension.” Adults with a systolic blood pressure of 120 to 139 mmHg (millimeters of mercury) or a diastolic blood pressure of 80 to 89 mmHg fall into this new category.

Individuals with prehypertension have twice the risk of developing hypertension compared to those with lower values. This emphasizes the importance of lifestyle and pharmacological therapies to lower blood pressure before the development of cardiovascular complications (Cobanian, *et al.*, 2003). This preventive approach is especially valuable for young adults who seldom give a thought to their blood pressure — or who, for that matter, may go years without having it measured.

The *JNC 7* report further refines 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 (Chobanian, *et al.*, 2003).

Accordingly, *JNC 7* defines “Stage 1 Hypertension” as a systolic blood pressure of 140 to 159 mmHg or diastolic blood pressure of 90 to 99 mmHg. “Stage 2 hypertension” includes a systolic blood pressure of 160 mmHg or higher, and 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. To simplify blood pressure classification, Stages 2 and 3 of the 1997 guidelines were combined as Stage 2 hypertension in the *JNC 7* report (Chobanian, *et al.*, 2003).

Evidence continues to mount to confirm the value of early detection and intervention. In that light, persons with the new classification of prehypertension should seek counseling and evaluation of lifestyle and diet and establish closer monitoring patterns.

Reducing blood pressure has dramatic results. Antihypertensive therapy reduces cardiovascular and renal morbidity and mortality. In clinical trials, antihypertensive therapy has reduced the incidence of stroke by 35 to 40 percent, myocardial infarction by 20 to 25 percent, and heart failure by 50 percent. The goal 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 (Chobanian, *et al.*, 2003).

It has been estimated that just a 3 mmHg reduction in systolic BP could lead to an 8 percent reduction in stroke mortality and a 5 percent reduction in mortality from coronary heart disease (Appel, *et al.*, 2006).

## Lifestyle Modifications

Adopting a healthy lifestyle is essential to prevent hypertension and an indispensable component of the treatment of hypertension. Weight reduction in overweight or obese individuals (Body Mass Index 25 or above) can reduce systolic blood pressure by 5 to 20 mmHg for every 10 kg of weight lost. Implementing the *Dietary Approaches to Stop Hypertension* (DASH) eating pattern — a diet rich in fruits, vegetables and low-fat dairy products, and low in total and saturated fat — can decrease systolic blood pressure by 8 to 14 mmHg. Restricting dietary sodium intake to no more than 2.4 gm sodium (6 gm sodium chloride) per day can lower systolic blood pressure by 2 to 8 mmHg (Chobanian, *et al.*, 2003). (The DASH diet is discussed in greater detail below.)

Other simple modifications can further reduce risk. Limiting alcohol consumption to no more than two drinks per day (for men) and one drink per day (for women) can drop systolic blood pressure by 2 to 4 mmHg. (A drink is defined as 12 oz of beer, 5 oz of wine or 1 oz of 80 proof liquor.) Engaging in regular aerobic physical activity (*e.g.* brisk walking) for at least 30 minutes per day on most days of the week can reduce systolic blood pressure by 4 to 9 mmHg (Chobanian, *et al.*, 2003).

Lifestyle modifications lower blood pressure, improve the effectiveness of antihypertensive drugs, and reduce CVD risk. For example, a 1500 mg sodium DASH eating plan has effects comparable to single drug therapy — at no cost! Combining two or more lifestyle modifications can accomplish even greater results (Chobanian, *et al.*, 2003).

In uncomplicated stage I hypertension (systolic BP of 140 to 159 mmHg or diastolic BP of 90 to 99 mmHg), dietary changes can serve as initial treatment before the start of drug therapy. Among hypertensive

individuals who are already on drug therapy, dietary changes (particularly a reduced salt intake) can further lower blood pressure and facilitate medication reduction. The extent of blood pressure reduction from dietary change is greater in hypertensive than non-hypertensive individuals (Appel, *et al.*, 2006).

The NHBLI publication *Your Guide to Lowering Blood Pressure* provides practical information to help consumers adopt a healthier lifestyle and take prescribed drugs as recommended. The brochure is also available on-line: [http://www.nhlbi.nih.gov/health/public/heart/hbp/hbp\\_low/Hbp\\_low.pdf](http://www.nhlbi.nih.gov/health/public/heart/hbp/hbp_low/Hbp_low.pdf)

In 2006, the American Heart Association (AHA) released a scientific statement on dietary approaches to prevent and treat hypertension (Appel, *et al.*, 2006). Evidence strongly supports the concept that multiple dietary factors affect blood pressure. Dietary modifications that effectively lower blood pressure are: weight loss, reduced salt intake, increased potassium intake, moderation of alcohol consumption (among those who drink), and consumption of an overall healthy dietary pattern (*e.g.* the DASH diet).

The AHA dietary recommendations are consistent with those expressed in the *JNC 7* report and are discussed below.

## Weight Reduction

Body Mass Index and other correlates of obesity have been found to be significantly and positively associated with blood pressure. Hypertension is approximately three times more common in obese than normal weight persons and the risk increases proportionately with increases in body weight (Eckel, 1997).

Body fat distribution has also been shown to correlate with hypertension. Truncal or android obesity (excess fat distributed in the abdomen and upper body) is a stronger risk factor for hypertension than gynoid obesity (excess fat distributed in the hips and thighs) (National Heart, Lung and Blood Institute, 1998).

Clinical trials with hypertensive people have demonstrated that loss of excess body weight reduces both systolic and diastolic blood pressure. Even relatively modest reductions in body weight can promote a favorable blood pressure response and reduce the need for blood pressure medication (He, *et al.*, 2000). A meta-analysis by Neter and colleagues found that an average weight loss of 5.1 kg reduced mean systolic BP by 4.4 mmHg and diastolic BP by 3.6 mmHg (Neter, *et al.*, 2003). In the Framingham study, Moore and associates found that a weight loss of 6.8 kg or more over four years led to a 21 to 29 percent reduction in long-term risk of developing hypertension (Moore, *et al.*, 2005).

The AHA and *JNC 7* emphasize that weight reduction — ideally to achieve a BMI of  $<25 \text{ kg/m}^2$  — is an effective way to prevent and treat hypertension. In view of the well-recognized difficulties of sustaining weight loss, it is vitally important to prevent weight gain among those who have normal body weight (Chobanian, *et al.*, 2003; Appel, *et al.*, 2006).

## The DASH Diet

The DASH study has tested the effect of dietary patterns (*e.g.* whole foods rather than isolated components) on blood pressure. The DASH group followed an eating plan that included nearly 10 servings of fruit and vegetables each day and low-fat dairy foods. This diet was low in total fat, saturated fat, and high in calcium, potassium, and magnesium. The fruit/vegetable group consumed about eight servings of fruit and vegetables per day. The control group (US diet) consumed fewer than four servings of fruits and vegetables daily. Each group consumed about 3000 mg of sodium, alcohol intake did not change during the trial, and body weight was kept constant (Appel, *et al.*, 1997).

The DASH diet significantly lowered systolic blood pressure by 5.5 mmHg and diastolic blood pressure by 3.0 mmHg compared to the control diet. The reductions in blood pressure were greatest in those with hypertension. The fruit/vegetable diet exhibited about half the blood pressure effect of the DASH diet. The authors

estimated that the incidence of coronary heart disease would be reduced by 15 percent and the incidence of stroke by 27 percent. Americans followed the DASH diet and experienced similar results (Appel, *et al.*, 1997).

The DASH-Sodium study evaluated the effect of different levels of dietary sodium intake while on the DASH diet or a control diet. The sodium levels were 3300 mg/day (US diet), 2400 mg or 100 mmol/day and 1500 mg or 65 mmol/day. Reducing the sodium intake from the high to the intermediate level reduced the systolic blood pressure by 2.1 mmHg during the control diet and by 1.3 mmHg during the DASH diet. Reducing the sodium intake from the 2400 to 1500 mg caused additional reductions of 4.6 mmHg during the control diet and 1.7 mmHg during the DASH diet (Sacks, *et al.*, 2001).

The DASH diet was associated with a significantly lower systolic blood pressure at each sodium level. The DASH diet and 1500 mg sodium produced the greatest reductions in blood pressure. Compared with the control diet with 3300 sodium, the DASH diet with 1500 mg sodium led to a mean systolic blood pressure that was 11.5 mmHg lower in participants with hypertension. The reduction of sodium intake to below 2400 mg/day and the DASH diet both substantially lowered blood pressure and the combination was more effective than either dietary modification alone (Sacks, *et al.*, 2001).

The NHBLI publication *Facts about the DASH Eating Plan* provides sensible tips for consumers to start and stay on the DASH eating plan, as well as a week of menus and several recipes. The brochure is also available on-line (National Heart, Lung and Blood Institute, 2003b).

## Restricting Dietary Sodium

Epidemiological data demonstrate a positive association between sodium intake and level of blood pressure — as dietary salt intake increases, blood pressure rises (Appel, *et al.*, 2006). The rise in blood pressure for a given increase in sodium intake is reduced in individuals who consume the DASH diet. As noted in the DASH-sodium study, the DASH diet with a low sodium level (1500 mg) produced the greatest reductions in blood pressure (Sacks, *et al.*, 2001).

The individual response of blood pressure to variations in sodium intake differs widely. African-Americans, older people, and patients with hypertension or diabetes are more sensitive to changes in dietary sodium chloride than are others in the general population (Chobanian, *et al.*, 2003).

A moderate sodium restriction may reduce the need for antihypertensive medication (thus decreasing dose-related side effects), lessen diuretic-induced potassium loss, and protect against osteoporosis and renal stones by decreasing urinary calcium excretion. Such a diet may also protect against the development of left ventricular hypertrophy (Chobanian, *et al.*, 2003).

A reduced sodium intake can also reduce the risk of developing hypertension by 20 percent and facilitate control of hypertension. In observational studies, sodium restriction is associated with a diminished age-related rise in systolic BP, a reduced risk of atherosclerotic cardiovascular events, and a lower risk of congestive heart failure (Appel, *et al.*, 2006; Cook, *et al.*, 2007).

A meta-analysis by He and MacGregor found that a modest reduction in salt intake for four weeks or more had a significant and important effect on blood pressure (from a population viewpoint) in both individuals with normal and elevated blood pressure. Their results supported other evidence suggesting that a modest and long-term reduction in population salt intake could reduce strokes, heart attacks, and heart failure (He and MacGregor, 2004).

The AHA and JNC 7 recommend an upper limit of 2400 mg of sodium (6 gm of salt) per day. The scientific evidence strongly supports population-wide recommendations to lower salt intake (Chobanian, *et al.*, 2003; Appel, *et al.*, 2006).

## Increased Potassium Intake

Numerous studies have documented a significant inverse relationship between potassium intake and blood pressure. The effects of potassium on blood pressure depend on the concomitant intake of salt and vice versa. In particular, a high potassium intake lowers blood pressure more when salt intake is high and lowers blood pressure less when salt intake is low (Appel, *et al.*, 2006).

The AHA notes that although absence of dose-response trials prevent a concrete recommendation for a specific level of potassium intake to lower blood pressure, it's reasonable to recommend an intake of 4.7 gm/day. This level corresponds to the average total potassium intake in clinical trials, the highest dose in the one available dose-response trial, and the potassium content of the DASH diet (Appel, *et al.*, 2006). It is also the Adequate Intake level established by the Institute of Medicine (IOM, 2004).

The AHA recommends increasing potassium intake by consuming foods rich in potassium (fruits and vegetables) rather than by taking potassium supplements. A high potassium intake can be readily achieved through diet. Potassium-rich foods also contain a variety of other beneficial nutrients (Appel, *et al.*, 2006).

## Limiting Alcohol Consumption

Observational studies and clinical trials have documented a direct, dose-dependent relationship between alcohol intake and blood pressure, especially as alcohol intake exceeds two drinks per day (Appel, *et al.*, 2006). Excessive alcohol intake is a risk factor for hypertension, can cause resistance to antihypertensive therapy, and is a risk factor for stroke (Xin, *et al.*, 2001).

The relationship between alcohol intake and blood pressure follows a “J-shaped” pattern, with higher mortality found at extreme intakes (Klatsky, *et al.*, 1990). In population studies, consuming more than two alcoholic drinks per day (30 mL or 1 oz of pure alcohol) is associated with higher mean blood pressure and hypertension prevalence (Criqui, 1987).

A meta-analysis by Xin and associates found that decreased consumption of alcohol (mean reduction in alcohol consumption was 76 percent) reduced systolic BP by 3.3 mm Hg and diastolic BP by 2.0 mm Hg (Xin, *et al.*, 2001).

Alcoholic beverages should be limited to two drinks a day for most men and one drink per day for women and lighter-weight men (Chobanian, *et al.*, 2003; Appel, *et al.*, 2006). One drink equals 12 oz of beer, 5 oz of wine, or 1.5 oz of 80 proof liquor.

## Other Dietary Factors

These dietary factors have a small and/or uncertain effect on blood pressure:

**Vegetable Protein.** Preliminary evidence suggests that substituting vegetable protein for carbohydrate or animal protein may lower blood pressure. Two major observational studies (International Study on Macronutrients and Blood Pressure or INTERMAP and the Chicago Western Electric Study) have documented significant inverse relationships between vegetable protein intake and blood pressure (Elliot, *et al.*, 2006; Stamler, *et al.*, 2002).

Alonso and colleagues found that individuals with the highest vegetable protein intake had a 50 percent lower risk of developing hypertension compared to individuals with the lowest intake of vegetable protein (Alonso, *et al.*, 2006). The OmniHeart study also found that partial substitution of carbohydrate with protein (about half from plant sources) lowered blood pressure (Appel, *et al.*, 2005).

Several studies have found that substitution of carbohydrate with soy protein reduced blood pressure. He and colleagues found that 40 gm of soy protein per day lowered systolic BP by 4.3 mm Hg and diastolic BP by 2.6 compared to an isocaloric carbohydrate supplement (He, *et al.*, 2005). Welty and associates found that a Total Lifestyle Changes (TLC) diet that substituted one-half cup soy nuts (25 gm protein) for non-soy protein significantly lowered systolic and diastolic BP in women compared to the TLC diet alone (Welty, *et al.*, 2007).

**Carbohydrate.** Emerging evidence suggests that the amount and type of carbohydrate may influence blood pressure. Populations that consume carbohydrate-rich, low fat diets have lower blood pressures compared to Western countries. The results of observational studies that specifically examined the effect of carbohydrate on blood pressure have been contradictory (Appel, *et al.*, 2006).

The OmniHeart study found that partially replacing carbohydrate with protein or monounsaturated fat lowered blood pressure (Appel, *et al.*, 2005). However, although the protein and monounsaturated diets caused an additional reduction in blood pressure compared to the carbohydrate diet, this effect was modest compared with the large blood pressure lowering effect of the carbohydrate diet (Appel, *et al.*, 2005).

There is a lack of data on the effect of glycemic load on blood pressure. In theory, a low glycemic load diet would decrease insulin resistance, thereby reducing blood pressure. Pereira and colleagues found that a low glycemic load diet reduced blood pressure to a greater extent than a standard high glycemic load diet, but this result was not statistically significant (Pereira, *et al.*, 2004). Additional research is warranted before specific recommendations can be made about the amount and type of carbohydrate (Appel, *et al.*, 2006).

**Fiber.** Evidence from observational and interventional studies suggests that increased fiber intake may reduce blood pressure. In a 2005 meta-analysis, Whelton and associates found that an increased fiber intake may significantly reduce blood pressure in individuals with hypertension (Pereira, *et al.*, 2004).

Alonso and colleagues found that individuals with the highest fiber intake from cereals had a 40 percent lower risk of developing hypertension compared to individuals with the lowest intake of cereal fiber (Alonso, *et al.*, 2006). Behall and associates found that consumption of a healthful diet high in fiber from wholegrain foods (barley, brown rice, whole wheat, or combination) significantly reduced systolic and diastolic blood pressure (Behall, *et al.*, 2006).

The data are inadequate to recommend an increased intake of fiber, by itself, as a strategy to reduce blood pressure (Appel, *et al.*, 2006). However, fiber-rich foods such as whole grains, fruits, vegetables, and legumes contain a variety of favorable nutrients.

**Fat.** High dose omega-3 fatty acids from fish oil supplements can lower blood pressure in hypertensive individuals. High doses (average of 3.7 gm/day) lowered systolic and diastolic BP by an average of 2.1 and 1.6 mmHg, respectively (Geleijnse, *et al.*, 2002). Due to the high dose required, small blood pressure reductions, and side effects (belching and fishy after-taste), fish oil supplements are not routinely recommended (Appel, *et al.*, 2006).

Saturated fat and polyunsaturated fat do not appear to have an effect on blood pressure (Appel, *et al.*, 2006).

Several studies suggest that diets rich in monounsaturated fat from olive oil, such as the Mediterranean diet, lower blood pressure (Appel, *et al.*, 2006; Psaltopoulou, *et al.*, 2004; Alonso and Martinez-Gonzales, 2004). It has been suggested that the high content of phenolic compounds in olive oil reduce blood pressure by promoting vasodilation (Psaltopoulou, *et al.*, 2004).

Although increased monounsaturated fat appears to lower blood pressure as in the OmniHeart study, this relationship is often muddled by an associated reduction in carbohydrate intake (Appel, *et al.*, 2005). Thus, the effect of monounsaturated fat (by itself) on blood pressure is uncertain (Appel, *et al.*, 2006).

## Regular Aerobic Physical Activity

The incidence of hypertension has been associated with low levels of regular exercise in epidemiological studies. Harvard alumni who did not engage in vigorous sports or other activity had a 35 percent greater risk of developing hypertension during a six-to-10-year follow-up than those who did (Paffenbarger, *et al.*, 1983). At the Institute for Aerobics Research in Dallas, unfit individuals (as assessed by treadmill stress tests) were 52 percent more likely than fit individuals to develop hypertension during a four-year follow-up period (Blair, *et al.*, 1984).

Exercise also appears to reduce all-cause mortality in hypertensive individuals. Hypertensive University of Pennsylvania alumni who engaged in vigorous sports had a 37 percent lower age-adjusted, all-cause, death rate

than sedentary hypertensives (Paffenbarger, *et al.*, 1991). In one study, fit hypertensive individuals were shown to have a 60 percent lower mortality rate than their unfit hypertensive peers, and the increased mortality associated with hypertension was completely eliminated by fitness (Blair, *et al.*, 1991).

At least 44 randomized controlled trials including 2,674 participants have studied the effect of exercise training on resting blood pressure (Fagard, 2001). The average reduction in systolic and diastolic blood pressure was 3.4 and 2.4 mmHg, respectively. Baseline blood pressure was an important determinant of the exercise effect. Average systolic and diastolic blood pressures decreased 2.6 and 1.8 mmHg in normotensive subjects and 7.4 and 5.8 mmHg in hypertensive subjects, respectively, suggesting that exercise may serve as the only therapy required in some mildly hypertensive subjects.

The blood pressure lowering effects of exercise are most pronounced in people with hypertension who engage in endurance exercise. Blood pressure decreases about 5 to 7 mmHg after an isolated exercise session (acute) or following exercise training (chronic). Moreover, blood pressure is reduced for up to 22 hours after an endurance exercise bout (*e.g.*, postexercise hypotension), with the greatest decreases among those with the highest baseline blood pressure (Pescatello, *et al.*, 2004).

Endurance exercise training may elicit other beneficial effects in hypertensive individuals besides lowering their blood pressure. The incidence of other modifiable CHD risk factors, including obesity, dyslipidemia and insulin resistance is also more prevalent in hypertensive people. Endurance exercise training improves insulin resistance, promotes weight loss, and improves lipid and lipoprotein profiles in hypertensive people (ACSM, 1993; Whelton, *et al.*, 2002).

## Pharmacological Treatment

Thiazide-type diuretics should be used as initial therapy for most patients with hypertension, either alone or combined with drugs from other classes. Most patients will require two or more antihypertensive medications to achieve the goal blood pressure. Certain high-risk conditions such as heart failure, history of myocardial infarction, high coronary disease risk, chronic kidney disease, and recurrent stroke prevention are compelling indications for the initial use of other antihypertensive drug classes (AHA, 2007; Chobanian, *et al.*, 2003).

The JNC 7 report emphasizes that the most successful therapy prescribed by the most meticulous health care provider will control hypertension only if patients are motivated to take the prescribed medication and to establish and maintain a healthy lifestyle. Motivation increases when patients have favorable encounters with, and trust in, their health care providers. Compassion builds trust and is a powerful motivator (Chobanian, *et al.*, 2003).

## References

- Alonso A, Buena J, *et al.* Vegetable protein and fiber from cereal are inversely associated with the risk of hypertension in a Spanish cohort. *Arch Med Res*, 37: 778-86, 2006.
- Alonso A, Martinez-Gonzalez MA. Olive oil consumption and reduced incidence of hypertension: the SUN study. *Lipids*, 39: 1233-8, 2004.
- \_\_\_\_\_. American College of Sports Medicine. Physical activity, physical fitness, and hypertension (Position Statement). *Med Sci Sports Exerc*, 25: i-ix, 1993.
- \_\_\_\_\_. American College of Sports Medicine. ACSM Position Stand on the recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness and flexibility in healthy adults. *Med Sci Sports Exer*, 30: 975, 1998.
- \_\_\_\_\_. American Heart Association. Heart Disease and Stroke Statistics – 2009 Update. Dallas TX. American Heart Association, 2009.
- Appel LJ, Moore TJ, Obarzanek E, *et al.* A clinical trial of the effects of dietary patterns on blood pressure. DASH collaborative research group. *N Eng J Med*, 336: 1117, 1997.
- Appel LJ, Brands MW, *et al.* Dietary approaches to prevent and treat hypertension: a scientific statement from the American Heart Association. *Hypertension*, 47: 296-308, 2006.

- Appel LJ, Sacks FM, Carey VJ, *et al.* Effects of protein, monounsaturated fat, and carbohydrate intake on blood pressure and serum lipids: results of the OmniHeart randomized trial. *JAMA*, 294: 2455-64, 2005.
- Behall K, *et al.* Whole-grain diets reduce blood pressure in mildly hypercholesterolemic men and women. *J Am Diet Assoc*, 106: 1445-9, 2006.
- Blair SN, Kohl HW, *et al.* Physical fitness and all-cause mortality in hypertensive men. *Ann Med*. 23: 307, 1991.
- Blair SN, Goodyear NN, *et al.* Physical fitness and incidence of hypertension in healthy normotensive men and women. *JAMA*, 252: 487, 1984.
- 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*, 289:2560-2572, 2003.
- Chobanian AV, Hill M. National Heart, Lung, and Blood Institute Workshop on Sodium and Blood Pressure: A critical review of current scientific evidence. *Hypertension*, 35:858-863, 2000.
- Cook NR, Culter AJ, *et al.* Long-term effects of dietary sodium reduction on cardiovascular disease outcomes: observational follow-up of the trials of hypertension prevention (TOHP). *BMJ* 334(7599):885, 2007.
- Criqui MH. Alcohol and hypertension: New insights from population studies. *Euro Heart J*, (Suppl.) B:19, 1987.
- Eckel RH. Obesity in Heart Disease. *Circulation*, 96:3248, 1997.
- Elliott P, Stamler J, *et al.* Association between protein intake and blood pressure: the INTERMAP Study. *Arch Intern Med*, 166: 79-87, 2006.
- Fagard RH. Exercise characteristics and the blood pressure response to dynamic physical training. *Med Sci Sports Exerc*, 33(6 suppl): S484-S492, 2001.
- Geleijnse JM, Giltay EJ, Grobbee DE, *et al.* Blood pressure response to fish oil supplementation: meta-regression analysis of randomized trials. *J Hypertens* 20: 1493-99, 2002.
- He J, Whelton PK, Appel LJ, *et al.* Long-term effects of weight loss and dietary sodium reduction on incidence of hypertension. *Hypertension*, 35:544-549, 2000.
- He FJ, MacGregor GA. Effects of longer-term modest salt reduction on blood pressure. *Cochrane Database Syst Rev*, 3:CD004937, 2004.
- He J, GU D, *et al.* Effect of soybean protein on blood pressure: a randomized, controlled trial. *Ann Intern Med*, 143: 1-9, 2005.
- \_\_\_\_\_. Institute of Medicine. *Dietary Reference Intakes: Water, Potassium, Sodium Chloride, and Sulfate*, 1st ed. Washington DC: National Academy Press; 2004.
- Klatsky AL, *et al.* Risk of cardiovascular mortality in alcohol drinkers, ex-drinkers, and non-drinkers. *Am J Cardiol*, 66: 1237, 1990.
- Lichtenstein AH, Appel LJ, Brands M, *et al.* Diet and Lifestyle Recommendations Revision 2006. A Scientific Statement from the American Heart Association Nutrition Committee. *Circulation* 114:82-96, 2006.
- Moore LL, Visoni AJ, Qureshi MM. Weight loss in overweight adults and the long-term risk of hypertension: the Framingham study. *Arch Int Med*, 165: 1298-303, 2005.
- \_\_\_\_\_. National Heart, Lung, and Blood Institute. *Your Guide to Lowering Blood Pressure*. NIH Publication No. 03-5232, 2003a. Available on-line at: [http://www.nhlbi.nih.gov/health/public/heart/hbp/hbp\\_low/hbp\\_low.pdf](http://www.nhlbi.nih.gov/health/public/heart/hbp/hbp_low/hbp_low.pdf)
- \_\_\_\_\_. National Heart, Lung, and Blood Institute. Facts about the DASH Eating Plan. NIH Publication No. 03-408, 2003b. Available on-line at: [http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new\\_dash.pdf](http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf)
- \_\_\_\_\_. National Heart, Lung, and Blood Institute. *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults*. NIH Publication No. 98-4083, 1998.
- Neter JE, Stam BE, *et al.* Influence of weight reduction on blood pressure: a meta-analysis of randomized controlled trials. *Hypertension*, 42: 878-884, 2003.
- Paffenbarger RS, Jung DL, *et al.* Physical activity and hypertension: an epidemiological view. *Ann Med*, 23: 319, 1991.
- Paffenbarger RS, Wing AL, *et al.* Physical activity and incidence of hypertension in college alumni. *Am J Epidemiol*, 117: 245, 1983.
- Pereira MA, Swain J, *et al.* Effects of a low-glycemic load diet on resting energy expenditure and heart disease risk factors during weight loss. *JAMA*, 292: 2482-90, 2004.
- Pescatello LS, Franklin BA, Fagard R, *et al.* American College of Sports Medicine position stand. Exercise and hypertension. *Med Sci Sports Exerc*, 36: 533-53, 2004.
- Psaltopoulou T, Naska A, *et al.* Olive oil, the Mediterranean diet, and arterial blood pressure: the Greek European Prospective Investigation into Cancer and Nutrition (EPIC) study. *Am J Clin Nutr*, 80: 1012-8, 2004.
- Sacks FM, Svetkey LP, Vollmer WM, *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 Med*, 344:3-10, 2001.
- Whelton SP, Chin A, Xin X, He J. Effect of aerobic exercise on blood pressure: A meta-analysis of randomized, controlled trials. *Ann Intern Med*. 2002;136:493-503.
- Welty F, Lee K, *et al.* Effect of soy nuts on blood pressure and lipid levels in hypertensive, prehypertensive, and normotensive postmenopausal women. *Arch Intern Med*, 167: 1060-7, 2007.
- Xin X, He J, Frontini MG, *et al.* Effects of alcohol reduction on blood pressure: A meta-analysis of randomized controlled trials. *Hypertension*, 38:1112-7, 2001.

## Examination (BLP10)

- Hypertension affects about \_\_\_\_\_ adult Americans:
  - One in two
  - One in three
  - Thirty million
  - One in four
  - Forty million
- A systolic blood pressure of 120 to 139 mmHg or a diastolic blood pressure of 80 to 89 mmHg is classified as:
  - Normal
  - Prehypertension
  - Stage 1 hypertension
  - Stage 2 hypertension
  - Extremely risky
- The relationship between blood pressure and risk of cardiovascular disease events is continuous, consistent, and independent of other cardiovascular risk factors.
  - True
  - False
- Implementing the *Dietary Approaches to Stop Hypertension* (DASH) eating pattern can decrease systolic blood pressure by:
  - 2 to 4 mmHg
  - 2 to 8 mmHg
  - 6 to 10 mmHg
  - 8 to 14 mmHg
  - None of the above
- Which following statement best describes the DASH eating pattern?
  - Rich in fruit and vegetables, dairy products, and moderate in total and saturated fat
  - An ovo-lacto vegetarian diet
  - Rich in fruit and vegetables, low-fat dairy products, and low in total and saturated fat
  - A typical American diet with supplemental potassium, calcium, and magnesium
  - A diet providing about 3000 mg of sodium
- Which combination provided the greatest blood pressure reductions in the DASH sodium study?
  - 1500 mg sodium per day, typical American diet
  - 2400 mg sodium per day, typical American diet
  - 3300 mg sodium per day, DASH diet
  - 2400 mg sodium per day, DASH diet
  - 1500 mg sodium per day, DASH diet

7. \_\_\_\_\_ should be used as initial drug therapy for most patients with hypertension.
- A. Beta-blockers
  - B. Calcium channel blockers
  - C. Thiazide-type diuretics
  - D. Loop diuretics
  - E. ACE inhibitors
8. Most patients will only require one antihypertensive medication to achieve the goal blood pressure.
- A. True
  - B. False
9. Which lifestyle modification has the potential to reduce blood pressure the greatest?
- A. Weight loss in overweight or obese individuals
  - B. Implementing the DASH eating pattern
  - C. Restricting dietary sodium to no more than 2400 mg per day
  - D. Limiting alcohol consumption to no more than two drinks per day in men and one drink per day in women
  - E. Engaging in regular aerobic physical activity (*e.g.* brisk walking) for at least 30 minutes per day on most days of the week
10. Successful control of hypertension requires:
- A. Patient motivation
  - B. Compassionate health care providers
  - C. Adoption of a healthy lifestyle
  - D. Appropriate pharmacological treatment
  - E. All of the above
11. A reduced sodium intake can also reduce the risk of developing hypertension by \_\_\_\_ and facilitate control of hypertension.
- A. 25%
  - B. 20%
  - C. 15%
  - D. 10%
  - E. 5%
12. The AHA and JNC 7 recommend an upper limit of \_\_\_\_\_ mg of sodium per day.
- A. 1500
  - B. 2000
  - C. 2400
  - D. 3300
  - E. None of the above

13. Harvard alumni who did not engage in vigorous sports or other activity had a \_\_\_\_\_ greater risk of developing hypertension during a six- to 10-year follow-up than those who did.
- A. 15%
  - B. 20%
  - C. 25%
  - D. 30%
  - E. 35%
14. The relationship between alcohol intake and blood pressure:
- A. Is a positive association
  - B. Is a negatively association
  - C. Follows a “J-shaped” pattern
  - D. Follows a “U” shaped pattern
  - E. None of the above
15. The DASH group followed an eating plan that included nearly \_\_\_\_ servings of fruit and vegetables each day.
- A. 4
  - B. 6
  - C. 8
  - D. 10
  - E. 12

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