Chapter 6
Hypertension/Hyperlipidemia/ Hyperhomocysteinemia and Nutrition Approaches

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Key Points

- Hypertension, hyperlipidemia, and hyperhomocysteinemia are modifiable risk factors for stroke that can be controlled through dietary intervention.
- Hypertension, hyperlipidemia, and hyperhomocysteinemia contribute to atherosclerosis, causing hardening and narrowing of artery walls, including carotid arteries which carry oxygen-rich blood to the brain.
- Hardening and narrowing of carotid arteries could result in two types of stroke: a rupture, known as intracranial hemorrhage, or a blood clot, which would cause a cerebral infarction.
- A diet low in sodium can prevent and control hypertension.
- A diet low in saturated fat, trans fat, and cholesterol can prevent and control hyperlipidemia.
- A diet that meets 100 % of recommended intake of vitamins can prevent hyperhomocysteinemia.
- The DASH Diet Eating Plan is an effective way to follow a low sodium, low-fat, and vitamin-rich diet.
- Regular physical activity reduces risk of stroke and hypertension and lowers both blood pressure and blood lipids.

Keywords Hypertension • Hyperlipidemia • Hyperhomocysteinemia • Nutrition • DASH • Diet • Physical activity

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Abbreviations

DASH	Dietary Approaches to Stop Hypertension
DGA	Dietary Guidelines for Americans
HDL	High-Density Lipoprotein
HOPE	Heart Outcomes Prevention Evaluation
HTN	Hypertension
LDL	Low-Density Lipoprotein
NCEP	National Cholesterol Education Program
PAGA	Physical Activity Guidelines for Americans
RDA	Recommended Daily Allowance
TG	Triglycerides

Introduction

Hypertension, hyperlipidemia, and hyperhomocysteinemia are modifiable risk factors for stroke that can be controlled through dietary intervention. The commonality between hypertension, hyperlipidemia, and hyperhomocysteinemia and risk of stroke is related to atherosclerosis as each of these conditions contribute to atherosclerosis. Atherosclerosis is the build-up of plaque along artery walls resulting in hardening and narrowing of arteries. Carotid arteries carry oxygen-rich blood to the brain. Hardening or narrowing of carotid arteries can result in a rupture, known as intracranial hemorrhage, or a blood clot causing a cerebral infarction preventing oxygen-rich blood flow to the brain. The Dietary approaches to stop hypertension (DASH) eating plan is a diet that is proven to lower blood pressure, restricts dietary fats that contributes to hyperlipidemia, and incorporates micronutrients that are necessary to possibly prevent hyperhomocysteinemia; therefore the DASH eating plan is an excellent dietary intervention to prevent stroke. Regular physical activity has been shown to prevent stroke, as well as a variety of other comorbid diseases. Modifying lifestyle behaviors to include physical activity most days of the week is recommended to prevent stroke.

Facts and Statistics About Hypertension and Stroke

Hypertension (HTN) is a modifiable risk factor for cerebral infarction and intracranial hemorrhage (ICH). Hypertension is high arterial blood pressure represented by two measures of systolic blood pressure of 140 mmHg or greater and or a diastolic blood pressure of 90 mmHg or greater. HTN increases the risk for stroke is secondary to HTN causing atherosclerosis. Atherosclerosis results in hardening and narrowing of arteries which leads to blockage and weakening of the walls of blood vessels in the brain which causes them to dilate and rupture [1].

The prevalence of HTN is high and increases with age [1]. For men and women 20–34 years of age, the prevalence percentage for HTN is 13.4 % and 6.2 %, 35–44 years of age is 23.2 % and 16.5 %, 45–54 years of age is 36.2 % and 35.9 %, 55–64 years of age is 53.7 % and 55.8 %, 65–74 years old is 64.7 % and 69.6 %, and for greater than 75 years old is 64.1 % and 76.4 % [1]. According to the Centers for Disease Control and Prevention statistics from 2007 to 2008, 33 % of adults over the age of 20 have HTN which represents greater than 76 million adults [2]. Another 25 % of American adults have prehypertension [1].

Prehypertension is a systolic blood pressure of 120–139 mmHg and diastolic blood pressure between 80 and 89 mmHg [1]. Prehypertensive patients do not require antihypertensive medications; rather, lifestyle modification is encouraged. Lifestyle modification is critical in the prehypertensive stage because certain aspects of dietary intake can lead to HTN. Dietary factors that can lead to HTN are excess sodium intake, low potassium, overweight or obesity, high alcohol consumption, and suboptimal dietary intake [3]. The rise in the incidence of HTN is associated with a rise in overweight and obesity, therefore weight management is crucial in preventing HTN [4, 5].

Research shows the higher the blood pressure, the greater the risk of stroke [6]. According to one study, only 72 % of subjects knew they were diagnosed with HTN, 61 % were treated for HTN, and 35 % had a blood pressure less than 140/90 mmHg [7, 8]. Those unaware of their diagnosis, who are not treated, or have uncontrolled BP are putting themselves at risk for stroke when HTN can be controlled with lifestyle modification and medications.

Facts and Statistics About Hyperlipidemia and Stroke

The simple definition of hyperlipidemia is extra fat or lipid in the blood. The lipids that circulate in the blood are high-density lipoprotein (HDL), low-density lipoprotein (LDL), and triglycerides (TG). The total cholesterol level is composed of HDL, LDL, and TG [9]. Excess LDL in the blood is harmful because it can cling to artery walls, which contributes to atherosclerosis and increases the risk of stroke [1]. Extra HDL in the blood is positive because it helps prevent the LDL from clinging to artery walls. Elevated TG in the blood can also contribute to atherosclerosis [9].

According to the American Stroke Association's (ASA) "Guidelines for the Primary Prevention of Stroke," epidemiological research infers that high total cholesterol may be related to a higher risk of ischemic stroke, while lower total cholesterol is associated with a higher risk of hemorrhagic stroke. There is also inconclusive relationship between TG and stroke. Despite this conflicting evidence, elevated total cholesterol, LDL, and TG increase the risk for atherosclerosis and are modifiable risk factors to prevent stroke [1].

A total cholesterol greater than 200 mg/dL is elevated and a risk factor for stroke. According to the National Center for Health Statistics and National Health and Nutrition Examination Survey 2005–2008 data (NCHS/NHANES 2005–2008), greater than 33 million adults have a total cholesterol greater than 240 mg/dL [10]. A LDL cholesterol between 60 and 129 mg/dL is within normal limits. The average LDL cholesterol among American adults in 2008 was 115.2 mg/dL according to the NCHH/NHANES data [10]. Adults with a TG level greater than 150 mg/dL are at risk for stroke. A positive for American adults is that the average TG level is 137.6 mg/dL [10]. The average TG level among American men is higher at 149.4 mg/dL and lower for women, 125.5 mg/dL [10]. Many epidemiological studies show inverse relationship between HDL and ischemic stroke [11, 12]. Adults with a HDL less than 40 mg/dL are at risk for stroke. Among American adults, the average HDL is 53.3 mg/dL [10].

Facts and Statistics About Hyperhomocysteinemia and Stroke

Homocysteine is a nonessential amino acid, as the human body naturally produces it. Homocysteine is created from two different metabolic pathways which require certain B vitamins. The amount of homocysteine in the body is determined by a person's genetics and lifestyle. Human genetics control how homocysteine is processed in the body. For example, genetic defects may inhibit enzymes that play a role in homocysteine metabolism, therefore causing elevated homocysteine levels. Lifestyle factors such as dietary intake affect homocysteine levels. One dietary mechanism relates to how pyridoxine (vitamin B6), folate (vitamin B9), and cyanocobalamin (vitamin B12) work as cofactors and precursors in the metabolism of homocysteine. A deficiency of pyridoxine, folate, or cyanocobalamin can result in hyperhomocysteinemia [13].

Homocysteine has atherogenic and prothrombotic properties making elevated levels of homocysteine dangerous. One property of homocysteine is its ability to increase smooth cell proliferation and enhance collagen production [13]. A metabolite of homocysteine can attach to LDL cholesterol, therefore contributing to risk for atherosclerosis. Other problems associated with hyperhomocysteinemia are increased oxidative stress and endothelial dysfunction [13].

Hyperhomocysteinemia is associated with a two- to threefold increased risk for atherosclerotic disease, such as stroke [14–16]. More specifically, research shows both carotid artery intima-media thickness (IMT) and carotid artery stenosis are increased in those with elevated homocysteine [17–19]. A meta-analysis from the *Journal of the American Medical Association* found a 19 % reduction in stroke risk per 25 % lower homocysteine when adjusted for smoking, systolic blood pressure, and cholesterol [20]. British researcher's 2002 meta-analysis published in the *British Medical Journal* found an association between every 5 μmol/L increase in homocysteine, increased risk of stroke by 59 % and for every 3 μmol/L decrease in homocysteine, decreased risk of stroke by 24 % [21].

Certain studies have found a correlation between folate, cyanocobalamin, and pyridoxine intake and lower homocysteine levels, but a correlation between these vitamins and decreased risk of ischemic stroke is not consistent among research [22–25]. The Heart Outcomes Prevention Evaluation (HOPE 2) study has provided variable outcomes. One outcome of HOPE 2 was that subjects with a history of vascular disease or diabetes treated with a combination of folate, cyanocobalamin, and pyridoxine had a decrease in homocysteine levels, but it did not affect the end point of cardiovascular disease, myocardial infarction or stroke, but it reduced the risk of stroke by 25 % [26]. There is stronger support of B vitamins effect on the primary prevention of stroke. A 2007 meta-analysis by Wang concludes that folate supplementation ranging from 0.5 to 15 mg/day can decrease the risk of stroke in primary prevention [27]. A more recent meta-analysis found folate supplementation did result in statistically significant effect on stroke risk; however, when combined with cyanocobalamin and pyridoxine, there was a minor chance of preventing stroke in primary prevention for male subjects [28].

Goals of Therapy in HTN to Prevent Stroke

Treatment of HTN is among the most effective strategies for preventing cerebral infarction and ICH [1]. The ASA's "Guidelines for the Primary Prevention of Stroke" recommends regular BP screening, lifestyle modification, and pharmacological therapy. The ASA also recommends systolic BP <140 mmHg and diastolic <90 mmHg or systolic BP <130 mmHg and diastolic <80 mmHg for those with diabetes and chronic kidney disease. The 7th Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) recommends BP measurement at least once every 2 years for adults with systolic BP below 120 mmHg and diastolic BP below 80 mmHg. The JNC 7 recommends an annual BP measurement for adults with systolic BP 120–139 mmHg and diastolic BP 80–99 mmHg. Lifestyle modification includes nutrition approaches, exercise, and weight management which will be discussed later in the chapter [29].

Goals of Therapy in HPL to Prevent Stroke

The primary goal of therapy for HPL in order to prevent stroke is to reduce blood lipids to within a normal range. The two most effective ways to reduce blood lipids, which is endorsed by the ASA's guidelines, is to treat with a statin and promote lifestyle changes to reduce LDL cholesterol based on the National Cholesterol Education Program (NCEP) guidelines for primary prevention of ischemic stroke for patients with coronary heart disease or diabetes. There is strong evidence to support that statins can reduce risk of stroke. For example, one meta-analysis of 26 trials including >90,000 patients showed that statins reduced risk of all strokes by

Table 6.1
Nutrient composition of the therapeutic lifestyle changes (TLC) diet [9]

Nutrient	Recommended intake
Saturated fat[a]	<7 % of total calories
Polyunsaturated fat	Up to 10 % of total calories
Monounsaturated fat	Up to 20 % of total calories
Total fat	25–35 % of total calories
Carbohydrate[b]	50–60 % of total calories
Fiber	20–30 g/day
Protein	Approximately 15 % of total calories
Cholesterol	<200 mg/day
Total calories[c]	Balance energy intake and expenditure to maintain desirable body weight/prevent weight gain

[a]*Trans* fatty acids are another LDL-raising fat should be kept at a low intake
[b]Carbohydrates should be derived predominately from foods rich in complex carbohydrates including grains, especially whole grains, fruits, and vegetables
[c]Daily energy expenditure should include at least moderate physical activity (contributing approximately 200 kcal/day)

21 %. Risk of all strokes was estimated to decrease by 15.6 % for every 10 % reduction in LDL [30]. Further discussion of pharmacological strategies to reduce stroke will be presented in a later chapter (*see* Chap. 17).

The NCEP guidelines recommend therapeutic lifestyle changes to reduce LDL cholesterol. Therapeutic lifestyle changes include diet, weight reduction, and increased physical activity. See Table 6.1 for complete breakdown of recommended macronutrient and micronutrient needs of the Therapeutic Lifestyle Changes Diet [9].

One additional treatment option in the management of HPL to prevent stroke involves another B vitamin, niacin (also known as nicotinic acid). Not only does niacin increases HDL cholesterol, but it can decrease LDL cholesterol and triglycerides [9]. The ASA opinion on niacin therapy is that it is an option for patients with low HDL cholesterol; however, there is not enough evidence to support its effect on preventing ischemic stroke. Niacin is available in prescription form and as a dietary supplement. The ASA does not recommend the dietary supplement form of niacin to treat HPL because of its risk of serious side effects and because dietary supplements are not regulated by the United States Food and Drug Administration [31].

Goals of Therapy in Hyperhomocysteinemia to Prevent Stroke

The goal of therapy in hyperhomocysteinemia is to reduce homocysteine to within normal limits of 5–15 μmol/L. Research shows that a 20–25 % relative reduction in homocysteine levels or 2.5–3.0 μmol/L reduction is correlated with a significant decrease in cardiovascular events [13]. The most studied treatment to lower

Table 6.2
RDA and tolerable upper limits for folate, cyanocobalamin, and pyridoxine [32]

Vitamin	Recommended daily allowance (μg)	Tolerable upper limit (μg)
Folate	400	1,000
Cyanocobalamin	2.4	No data to support
Pyridoxine	1,300 (ages 19–50)	1,000
	1,500 (females > 51 years old)	100,000
	1,700 (males >51 years old)	

homocysteine is through the use of B vitamins. The ASA's position on B vitamin therapy is that B vitamins may be considered, but additional studies are needed. Regardless of whether or not B vitamins will benefit or not, it is practical to first test for folate, cyanocobalamin, and pyridoxine deficiencies. If someone is deficient, then supplementation with at least recommended daily allowance (RDA) of each vitamin is warranted. See Table 6.2 for the RDA of certain B vitamins. There is no tolerable upper limit for cyanocobalamin because there is lack of data on adverse effects [32].

Nutrition and Stroke

There are challenges and opportunities when it comes to following a healthy, balanced diet to prevent stroke. It can be a challenge as there are a number of components to monitor: sodium, potassium, fat, cholesterol, alcohol, and weight. When nutrient rich, balanced meals are chosen, it will be easy to consume adequate intakes of sodium, potassium, fat, cholesterol, and alcohol in order to maintain a healthy weight.

Sodium and potassium are both minerals and also known as electrolytes, a substance that conducts electricity in the body. Other electrolytes include chloride, calcium, and magnesium. Sodium is responsible for maintaining fluid balance both in the blood and around cells, transmitting nerve impulses, and allowing muscles to work properly. Potassium is necessary to regulate heartbeat and allow muscle function. The kidneys are responsible for maintaining electrolyte balance by conserving or excreting electrolytes accordingly. Since sodium attracts fluid to maintain fluid balance, excess dietary sodium intake will increase blood volume [13]. Research has shown that low blood potassium causes sodium chloride retention. Increased blood volume puts stress on the heart to circulate more blood through blood vessels, which increases pressure in the arteries, therefore increasing blood pressure. A combination of excess sodium and inadequate potassium in the diet is a contributing factor of hypertension [13].

Another dietary component to monitor to prevent stroke is fat and cholesterol. As was mentioned earlier, hyperlipidemia can lead to atherosclerosis which is

associated with increased risk of stroke; therefore, limiting total fat and cholesterol intake in the diet is crucial. Excess alcohol consumption is a risk factor for all types of stroke [33–35]. The ASA summarizes that light to moderate consumption of alcohol, mostly from wine, may reduce the risk of stroke.

The prevalence of overweight and obesity is associated with increased risk of stroke. One meta-analysis found that for subjects with body mass index (BMI) from 25 to 50 kg/m^2, each 5 kg/m^2 increase in BMI was associated with a 40 % increased risk of stroke mortality [36]. There is no research documenting the effect of weight loss on stroke outcome; however, weight loss is associated with lowering BP.

Nutrition to Prevent Stroke

The ASA's recommendation to prevent stroke through diet and nutrition is to follow the *Dietary Guidelines for Americans* (DGA) and a DASH style diet. The 2010 DGA recommends consuming less than 2,300 mg of sodium for adults ages 18–50. The recommendation decreases to less than or equal to 1,500 mg for adults 51 and older and adults of any age who are African American or have HTN, DM, or CKD. Unfortunately, on average Americans consume 3,400 mg per day according to the 2010 DGA. Americans consume sodium in their diet through table salt and processed foods. Salt is used as preservative in processed foods in order to retain moisture, improve flavor, and maintain the shelf life of the food. According to NHANES 2005–2006, the highest sources of sodium in the American diet, respectively, were yeast breads (7.3 %), chicken and chicken mixed dishes (6.8 %), pizza (6.3 %), pasta and pasta dishes (5.1 %), cold cuts (4.5 %), condiments (4.4 %), tortillas, burritos, tacos (4.1 %), sausage, hotdogs, bacon, ribs (4.1 %), and regular cheese (3.5 %) [37].

The 2010 DGA emphasizes the importance of consuming an adequate intake of potassium daily in order to prevent retention of sodium and potential for elevated blood pressure. Potassium is one of the nutrients that is under consumed in the USA, likely because it is most abundant in fruits, vegetables, and milk, which most Americans do not eat enough of. The adequate intake (AI) for potassium is 4.7 g per day for adults. Consuming at least four servings of fruits, four servings of vegetables, and 2 or 3 servings of milk or yogurt per day would meet the recommended 4.7 g per day [37].

Fat and cholesterol recommendations are also listed in the 2010 DGA. The DGA follows the Institute of Medicine's (IOM) recommendation of 20–35 % of total calories from fat which is fairly consistent with ASA's recommendation for LDL cholesterol lowering based on NCEP recommendation of 25–35 % of total calories from fat. Both the ASA and 2010 DGA recommend moderate alcohol consumption defined as up to 1 drink per day for women and up to 2 drinks for men [1, 37].

The DASH trial was a study done by the National Institutes of Health to assess the impact of certain nutrients and foods on hypertension. In the first study, subjects were adults with systolic blood pressure less than 160 mmHg and diastolic

pressures of 80–95 mmHg. Of these subjects, 27 % had HTN. The study compared three eating plans: (1) similar to the typical American diet with about 3,000 mg sodium, (2) similar to the typical American diet plus extra fruits and vegetables with about 3,000 mg sodium, and (3) the DASH eating plan. The DASH eating plan consisted of 55 % of calories from carbohydrate, 18 % from protein, 27 % from total fat, 6 % of saturated fat, 150 mg cholesterol, 2,300 mg sodium, 4,700 mg potassium, 1,250 mg calcium, 500 mg magnesium, and 30 g of fiber [38]. Subjects in both the second group and the DASH group had lower blood pressure. The DASH group had the greatest effect on lowering blood pressure, especially subjects with high blood pressure.

The second DASH study compared diets effect on blood pressure with a greater sodium restriction [39]. The subjects either followed the typical American diet or the DASH eating plan. Subjects on either diet were randomized to consume either 3,300 mg, 2,300 mg, or 1,500 mg of sodium per day. A decrease in sodium intake was associated with lower blood pressure for both diets; however, blood pressure was lower for subjects on the DASH diet at each sodium level. The 1,500 mg sodium DASH group had the greatest decrease in blood pressure. From this research, the DASH diet was created [39].

The DASH diet is endorsed by the National Heart, Lung, and Blood Institute; AHA; and the 2010 DGA. Regardless of the risk factors for stroke, the DASH diet is a balanced meal plan that helps lower blood pressure and cholesterol and is associated with lower risk of certain types of cancer, heart disease, stroke, heart failure, kidney stones, and type 2 diabetes [40]. The DASH diet is broken down in to serving sizes of each of the food groups. The number of serving sizes varies according to your recommended calories per day. See Table 6.3 for recommendations based on 2,000 calories per day [41].

Physical Activity and Stroke

Physical inactivity is a modifiable risk factor associated with stroke. The benefits of physical activity are numerous and outweigh the negative outcomes. Regular physical activity reduces the risk of premature death, heart disease, stroke, high blood pressure, and type 2 diabetes; lowers blood pressure and blood lipids; and helps people maintain a healthy weight [42]. The 2008 Physical Activity Guidelines for Americans (PAGA) reports that physically active men and women have a 25–30 % lower risk of stroke or death compared to physically inactive people [42]. Physical activity's positive effect on lowering blood pressure and blood lipids as well as helping people manage their weight contributes to managing other risk factors in order to prevent stroke [43–45].

The 2008 PAGA defines physical activity as bodily movement that enhances health [42]. Types of physical activity include aerobic, muscle strengthening, and bone strengthening. Aerobic activity is defined as moving the body's large muscles in consistent manner for continued duration of time [42]. Examples of aerobic

Table 6.3
2,000 cal DASH eating plan [41]

Food group	Daily servings	Serving sizes	Examples and notes	Significance of each food group to DASH eating pattern
Grains[a]	6–8	1 slice bread 1 oz dry cereal[b] ½ cup cooked rice, pasta, or cereal	Whole wheat bread, rolls, pasta, bagel, cereal, oatmeal, brown rice	Major sources of energy and fiber
Vegetables	4–5	1 cup raw leafy vegetable ½ cup cut-up raw or cooked vegetable ½ cup vegetable juice	Broccoli, carrots, collards, green beans, green peas, kale, potatoes, tomatoes	Rich sources of potassium, magnesium, and fiber
Fruit	4–5	1 medium fruit ¼ cup dried fruit ½ cup fresh, frozen, or canned fruit ½ cup fruit juice	Apples, raisins, apricots, bananas, dates, grapes, melons, peaches, pears	Important sources of potassium, magnesium, and fiber
Fat-free or low-fat milk and milk products	2–3	1 cup milk or yogurt 1 ½ oz cheese	Fat-free (skim) or low-fat (1 %) milk, cheese, yogurt, or frozen yogurt	Major sources of calcium and protein
Lean meats, poultry, and fish	6 or less	1 oz cooked meats, poultry, or fish 1 egg[c]	Select only lean; trim away visible fats; broil, roast, or poach; remove skin from poultry	Rich sources of protein and magnesium
Nuts, seeds, and legumes	4–5 per week	1/3 or 1½ oz nuts 2 Tbsp peanut butter 2 Tbsp or ½ oz seeds ½ cup cooked legumes (dry beans and peas)	Almonds, hazelnuts, peanuts, walnuts, sunflower seeds, kidney beans, lentils, split peas	Rich sources of energy, magnesium, protein, and fiber
Fats and oils[d]	2–3	1 tsp soft margarine 1 tsp vegetable oil 1 Tbsp mayonnaise 2 Tbsp salad dressing	Soft margarine, vegetable oil, low-fat mayonnaise, light salad dressing	The DASH study had 27 % of calories as fat, including fat in or added to foods
Sweets and added sugars	5 or less per week	1 Tbsp sugar 1 Tbsp jelly or jam ½ cup sorbet, gelatin 1 cup lemonade	Fruit-flavored gelatin, fruit punch, hard candy, jelly, maple syrup	Sweets should be low in fat

[a]Whole grains are recommended for most grain servings as a good source of fiber and nutrients
[b]Serving sizes vary between ½ cup and 1¼ cups, depending on cereal type. Check the product's Nutrition Facts label
[c]Since eggs are high in cholesterol, limit egg yolk intake to no more than four per week; two egg whites have the same amount of protein content as 1 oz of meat

activity are brisk walking, running, bicycling, jumping rope, and swimming. Muscle strengthening activity includes resistance training and lifting weights. Muscle strengthening using weights, resistance bands, or body weight should incorporate a variety of muscle groups. Bone strengthening activity is also referred to as weight-bearing exercise because it causes a force on bones that supports bone growth and strength. Examples of bone strengthening are jumping jacks, running, brisk walking, and weight lifting [42].

The benefits of physical activity start with as little as 60 min of activity per week; however, research proves that 150 min of moderate intensity aerobic activity per week reduces the risk of chronic diseases. The 2008 PAGA recommends 150 min per week of moderate intensity physical activity or 75 min of vigorous intensity activity per week to support some overall health benefit [42]. When physical activity increases to 150–300 min of moderate intensity physical exercise per week or 75–150 min of vigorous intensity exercise per week, there is a more substantial overall health benefit [42].

The ASA's position on physical inactivity is to increase physical activity because of its correlation with decrease of stroke risk. The ASA also endorses the 2008 PAGA recommendations of at least 150 min of moderate intensity exercise per week or 75 min of vigorous intensity exercise per week [1].

Conclusion

Following a healthy balanced diet and engaging in physical activity over a lifetime are effective ways to prevent risk factors associated with stroke and stroke itself. A healthy diet and physical activity promote a strong cardiovascular system which allows blood to pump efficiently throughout the body in order to transfer nutrients to vital organs. The DASH diet plan is an excellent reference to guide a healthy, balanced diet. The 2008 PAGA offers recommendations on why and how to start exercising for persons of any age. Incorporating healthy eating and exercise habits at any age is a critical component to preventing stroke.

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