MNT of Atherosclerosis and Hypertension

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REFERENCE

- Williams’ Basic Nutrition and Diet Therapy 15 EDETION.
- KRAUSE AND MAHAN’S FOOD AND THE NUTRITION CARE PROCESS, SIXTEENTH EDITION

What is medical nutrition therapy?

- Medical nutrition therapy (MNT) is a form of treatment that uses nutrition education and behavioral counseling to prevent or manage a medical condition.

What does medical nutrition therapy involve?

- Dietitians generally follow these steps for medical nutrition therapy:
- **Nutrition assessment**: Learning about the patient and his(her) nutritional needs.
- **Nutrition diagnosis**: Identifying a nutrition-related issue to address.
- **Nutrition intervention**: Creating a plan and explaining what the patient will need to do.
- **Nutrition monitoring and evaluation**: Checking on how things are going and changing the plan as needed.

MNT of Cardiovascular Disease

The major cause of CVD and the underlying pathologic process in coronary heart disease is atherosclerosis.

. This process is characterized by fatty plaques, which are largely composed of cholesterol, on the inside lining of major blood vessels.

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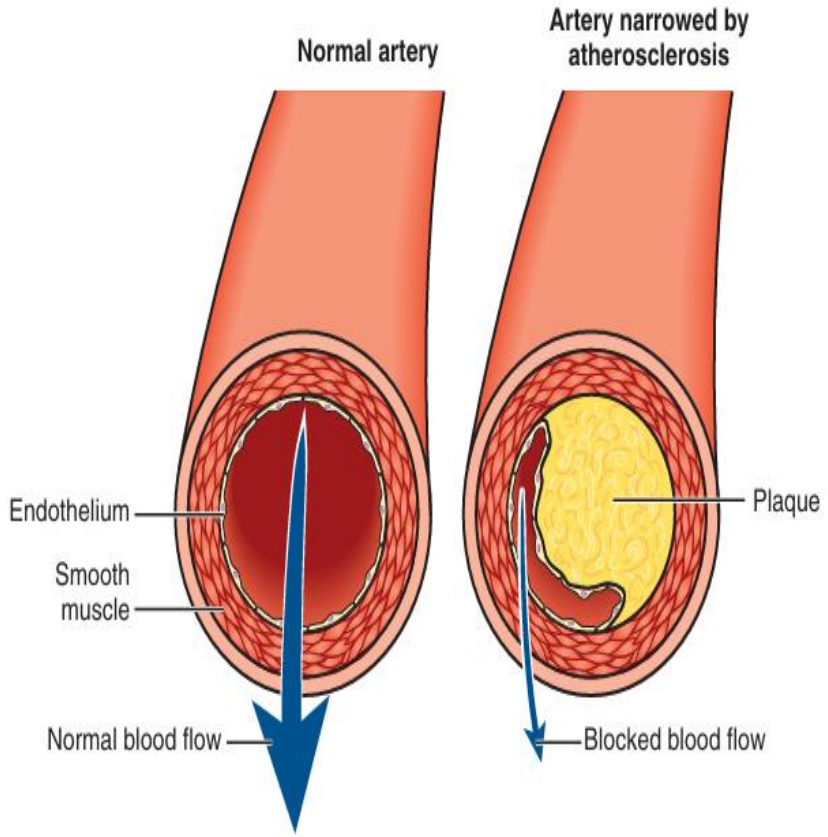


FIGURE 19-2 An atherosclerotic plaque in an artery.

- Although the exact mechanisms and all of the contributing factors involved are not known, it is believed that the plaques begin as a result of an initial injury to the endothelial lining of the artery and inflammation ensues.
- Atherosclerotic plaque may begin as early as childhood in susceptible individuals.

Atherosclerosis Relation to Fat Metabolism

1. Chylomicrons: dietary TGL.
2. Very low-density lipoproteins (VLDLs): formed in the liver from endogenous fat.
3. Intermediate-density lipoproteins (IDLs): Degradation of VLDLs leaves IDLs in circulation.

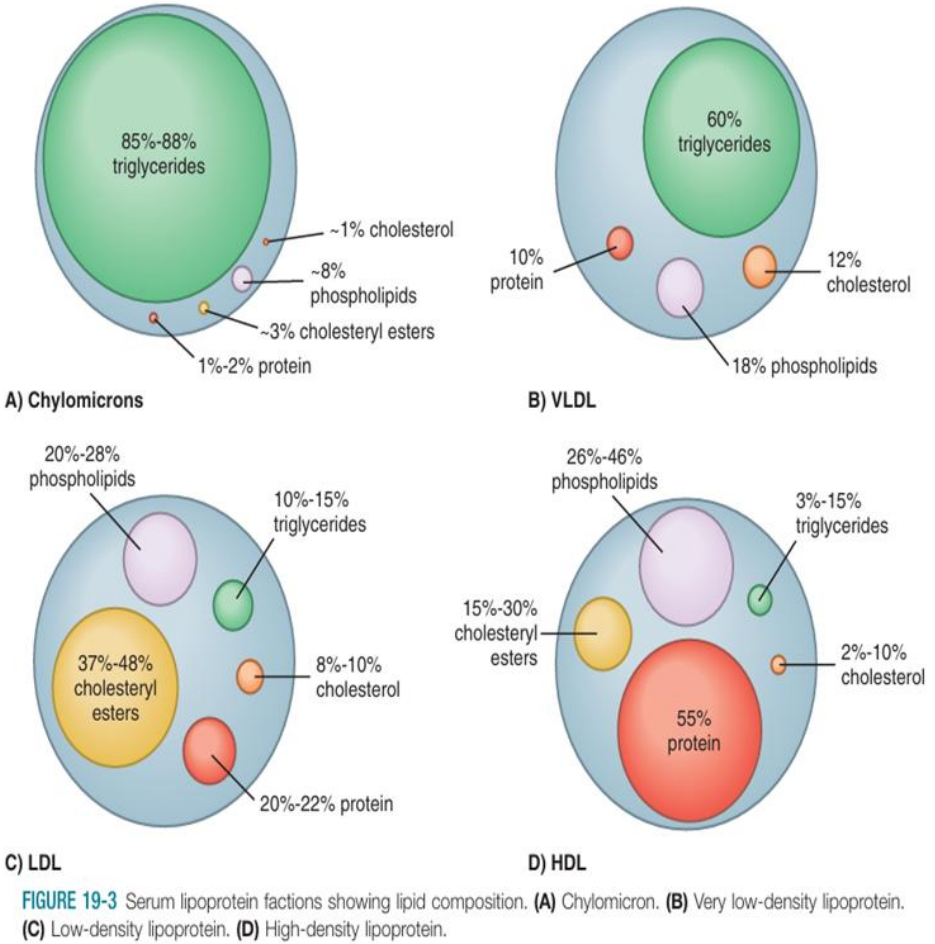


FIGURE 19-3 Serum lipoprotein factions showing lipid composition. **(A)** Chylomicron. **(B)** Very low-density lipoprotein. **(C)** Low-density lipoprotein. **(D)** High-density lipoprotein.

Blood lipids(cont.)

4. Low-density lipoproteins (LDLs): LDLs are formed endogenously in the liver and in serum from the catabolism of VLDLs and IDLs, Because LDLs deliver cholesterol to the tissue, they are considered the “bad cholesterol.” With regard to cardiovascular health.

5.High-density lipoproteins (HDLs): HDLs carry less total fat and more protein than the other lipoproteins). They transport cholesterol from the tissues and arteries back to the liver for catabolism. HDLs are endogenously produced in the liver. Compared with LDL-cholesterol, HDL is the “good cholesterol,” and higher serum levels are protective against CVD

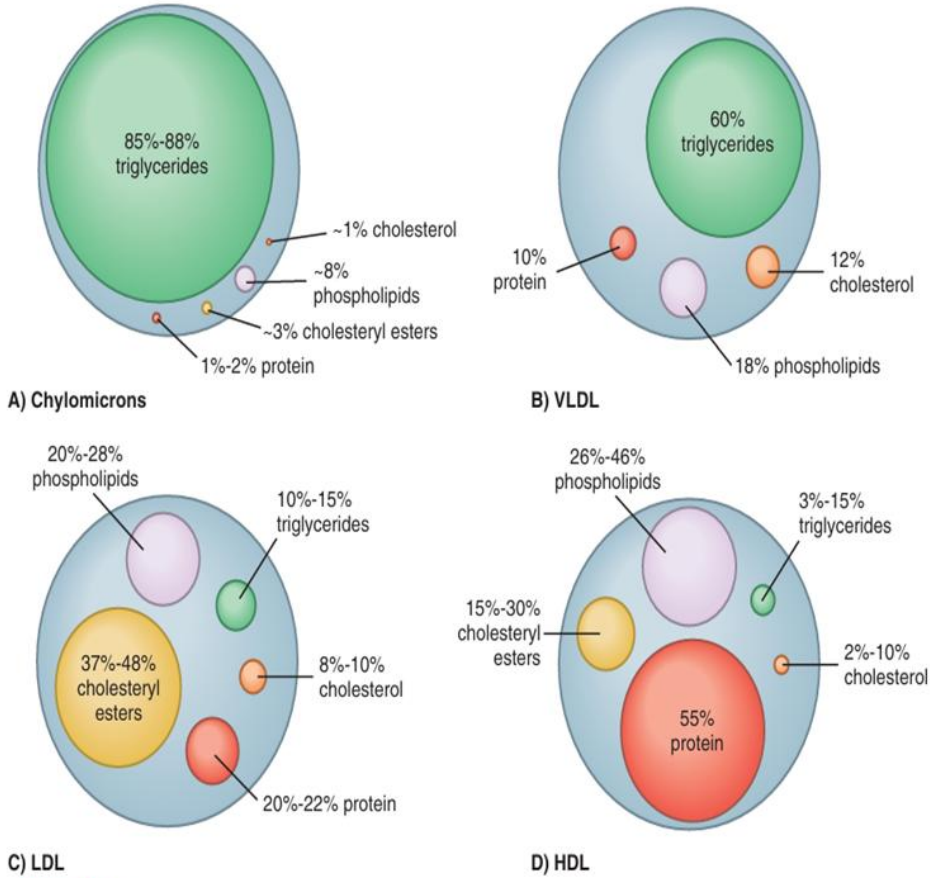


FIGURE 19-3 Serum lipoprotein factions showing lipid composition. **(A)** Chylomicron. **(B)** Very low-density lipoprotein. **(C)** Low-density lipoprotein. **(D)** High-density lipoprotein.

- There are both pharmacologic interventions and lifestyle modifications that influence HDL metabolism.
- Exercise increases metabolic kinetics within the liver, skeletal muscle, and adipose tissue, all of which are cardio protective and favor HDL production.

Triglycerides

- Simple fats, whether in the body or in food.
- Cardiovascular disease screenings will test for the levels of total triglycerides circulating in the blood.
- Hypertriglyceridemia is commonly associated with low HDL cholesterol, both of which are independent risk factors for CVD.

The current guidelines for starting cholesterol-lowering medications are not based exclusively on these classifications.
The algorithm for determining drug therapy needs to take into account many factors, including age, race, sex, family history, blood pressure measurements, co-morbidities, and lifestyle factors.

Table 19-1 Cholesterol and Lipoprotein Profile Classification*

CHOLESTEROL READING	CLASSIFICATION
Total Cholesterol (mg/dL)	
<180	Optimal
<200	Near-optimal
200 to 239	Borderline high
≥240	High
Low-Density Lipoprotein Cholesterol (mg/dL)	
<100	Optimal
100 to 129	Near-optimal
130 to 159	Borderline high
160 to 189	High
≥190	Very high
High-Density Lipoprotein Cholesterol (mg/dL)	
≥60	Optimal
40 to 59	Borderline/normal
<40	A major risk factor for heart disease
Total Cholesterol/HDL ratio†	
≤3.5 : 1	Optimal
<5 : 1	Near-optimal
>5 : 1	A major risk factor for heart disease
Triglycerides (mg/dL)	
<150	Optimal
150 to 199	Borderline high
200 to 499	High
≥500	Very high

Box 19-1 Risk Factors for Cardiovascular Disease

LIPID RISK FACTORS

- Elevated levels of low-density lipoprotein cholesterol
- Low levels of high-density lipoprotein cholesterol (<40 mg/dL)*
- Elevated total cholesterol levels
- Elevated levels of triglycerides
- Atherogenic dyslipidemia†
- High total cholesterol/HDL-cholesterol ratio

NONLIPID RISK FACTORS

Nonmodifiable

- Sex (males have greater risk than females)
- Age (men ≥45 years, women ≥55 years)
- Heredity (including race)
- Family history of premature cardiovascular disease (i.e., myocardial infarction or sudden death at 55 years of age or less in a male first-degree relative or at 65 years of age or less in a female first-degree relative)
- Estimated glomerular filtration rate of <60 mL/min or microalbuminuria
- Type 1 diabetes mellitus

Modifiable

- Poor diet quality: This is the leading risk factor for death and disability in the United States
- Cigarette smoking: approximately one third of all coronary heart disease deaths are attributable to smoking and exposure to second-hand smoke
- Hypertension (blood pressure >140/90 mm Hg or taking antihypertensive medication)
- Physical inactivity
- Obesity (body mass index of >30 kg/m^2) and overweight (body mass index of 25 to 29.9 kg/m^2)
- Impaired fasting glucose level and type 2 diabetes mellitus
- Metabolic syndrome
- Inflammatory markers (e.g., C-reactive protein)

Atherogenic dyslipidemia (AD) refers to elevated levels of triglycerides (TG) and small-dense low-density lipoprotein and low levels of high-density lipoprotein cholesterol (HDL-C)

- metabolic syndrome a combination of disorders that, when they occur together, increases the risk of cardiovascular disease and diabetes; it is also known as syndrome X and insulin resistance syndrome.

Table 19-2 Diagnostic Criteria for Metabolic Syndrome

MEASURE*	CATEGORIC CUT POINTS
Increased waist circumference†,‡	≥102 cm (≥40 inches) in men, ≥88 cm (≥35 inches) in women
Elevated level of triglycerides	≥150 mg/dL (1.7 mmol/L) or drug treatment for elevated triglycerides§
Reduced HDL-cholesterol level	<40 mg/dL (1.03 mmol/L) in men <50 mg/dL (1.3 mmol/L) in women or drug treatment for reduced HDL-cholesterol§
Elevated blood pressure	≥130 mm Hg systolic or ≥85 mm Hg diastolic or drug treatment for hypertension
Elevated fasting glucose level	≥100 mg/dL or drug treatment for elevated glucose

IDEAL CARDIOVASCULAR GOALS ARE AS FOLLOWS FOR ADULTS:

- • Never smoked or quit >1 year ago
- • At least 150 min of moderate or 75 min of vigorous physical activity each week
- • Body mass index between 18.5 and 24.9 kg/m2

What is Light, Moderate, And Vigorous Activity?

- **Light Intensity**
- Light intensity activities require the least amount of effort compared to moderate and vigorous activities, but it is acceptable because it encourages people to do more activity to gain additional health benefits, which may encourage a higher level of physical activity.
- **Talk test**: "I can sing" while doing the activity.

Light activity Examples:

- Casual walking
- Bicycling (less than 5 mph=8 km)
- Stretching
- Light weight training
- Dancing slowly
- Leisurely sports (table tennis, playing catch, fishing)
- Light yard and house work

Moderate Intensity

- Moderate intensity activities mean you’re working hard enough to raise your heart rate and break a sweat.
- **Talk test**: "I can talk, but I can't sing" while doing the activity.

Examples:

- Brisk walking (3 to 4.5 mph)
- Hiking
- Bicycling (5 to 9 mph)
- Low impact aerobics
- Moderate dancing
- Competitive tennis and volleyball
- Housework that involves intense scrubbing and cleaning

Vigorous Intensity

- Vigorous intensity activities means you’re breathing hard and fast, and your heart rate has gone up quite a bit.
- **Talk test**: "I can't say more than a few words without pausing for a breath" while doing the activity.

Examples:

- Race walking (more than 4.5 mph)
- Jogging/Running
- Mountain climbing
- Bicycling (more than 10 mph)
- High impact or step aerobics
- Vigorous dancing
- Karate, judo, tae kwon do, jujitsu
- Competitive basketball, soccer, or football
- Swimming laps

While Karate has a focus on punching and hand-based strikes, and Taekwondo focuses on (often spectacular) kicking combinations, Jiu-Jitsu is about subduing an opponent or aggressor.

IDEAL CARDIOVASCULAR GOALS ARE AS FOLLOWS FOR ADULTS: (CONT.)

- Achieve at least 4 of the 5 following key components of a healthy diet:
  - **Fruits and vegetables**: consume >4.5 cups per day
- **Fish**: consume more than two, 3.5-oz servings per week (preferably oily fish)
- **Fiber-rich whole grains** (>1.1 g of fiber per 10 g of carbohydrates): consume three 1-oz-equivalent servings per day
- **Sodium**: limit to <1500 mg per day
- **Sugar-sweetened beverages**: limit to <450 kcal (36oz) total per week

Blood pressure: <120/<80 mm Hg

Fasting blood glucose: <100 mg/dL

Cholesterol: <200 mg/dL

Box 19-2 American Heart Association Dietary Guidelines

WEIGHT AND PHYSICAL ACTIVITY

- Burn at least as many calories as consumed.
- Aim for at least 30 minutes of physical activity on most, if not all, days. To lose weight, do enough activity to burn more calories than eaten every day.

FOODS TO FOCUS ON

- Eat a variety of nutritious foods from all food groups.
- Choose foods like vegetables, fruits, whole-grain products, nuts, and fat-free or low-fat dairy products most often.
- Choose lean meats such as poultry and prepare them without added saturated and trans fats.
- Eat fish at least twice a week.

FOODS TO LIMIT OR CONSUME IN MODERATION

- Limit the amount of saturated fat to 5% to 6% of total calories.
- Avoid trans fat.
- Limit sodium to a maximum of 2400 mg/day (<1500 mg/day reduces blood pressure even more).
- Limit red meat.
- Eat less of the nutrient-poor foods, such as beverages and foods with added sugars.
- Drink alcohol in moderation, if at all. That means one drink per day for women and two drinks per day for men.

GENERAL RECOMMENDATIONS

- Follow the American Heart Association recommendations when eating out, and keep an eye on portion sizes.
- Do not smoke tobacco, and stay away from tobacco smoke.

Trans fats

- Trans fat, also called trans-unsaturated fatty acids, or trans fatty acids, is a type of unsaturated fat that occurs in foods.
- Trace concentrations of trans fats occur naturally, but large amounts are found in some processed foods.
- Saturated fat increases serum cholesterol. Trans fat does the same thing, but the increase in LDL (bad cholesterol) is greater, while HDL (good cholesterol) may decrease, making the critical LDL/HDL ratio worse. In addition, trans fat may have a greater impact on inflammation.

Therapeutic Lifestyle Changes (TLC)

- an intensive lifestyle intervention that is focused on appropriate weight, diet, physical activity, and other controllable risk factors to reduce cholesterol levels and to prevent other complications of heart disease.

- When the risk factor of obesity is present, weight loss via negative energy balance is encouraged.
- Negative energy balance should be achieved through reduced energy intake and increased energy expenditure from regular physical activity.
- A treadmill exercise tolerance test is ideal to determine the exercise limit for individuals who are older, who are obese, or who have a history of CVD or hypertension before they start an exercise program

Drug therapy

- As the number and severity of risk factors increase, the point at which drug therapy should begin is hastened.
- For example, a person with few or no risk factors associated with CVD may wait to initiate drug therapy until LDL-cholesterol levels exceed 190 mg/dL .
- whereas an individual with significant risk for CVD should consider drug therapy when LDL-cholesterol levels rise to more than 100 mg/dL.

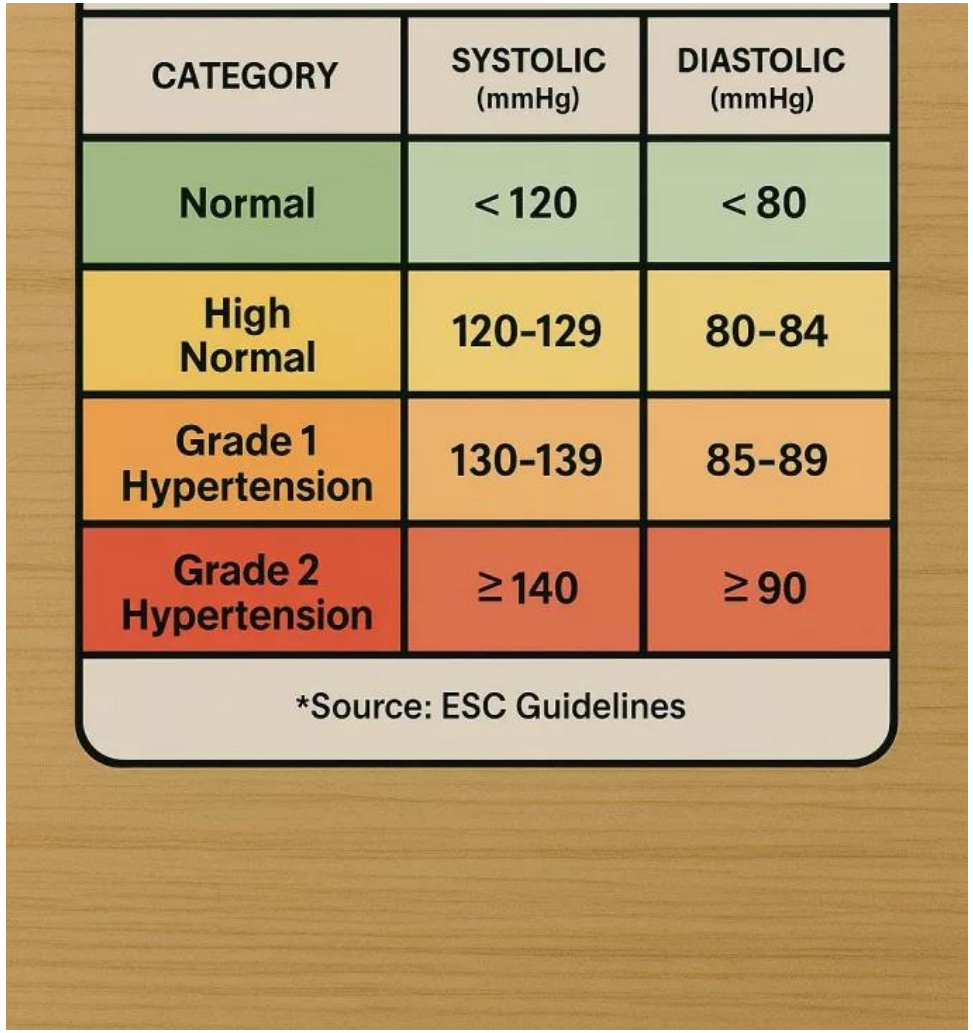
ESSENTIAL HYPERTENSION “The silent killer,”

- Essential (or primary) hypertension(90%) an inherent form of high blood pressure with no specific identifiable cause; it is considered to be familial.
- When speaking of the chronic condition of elevated blood pressure, the term hypertension is more appropriate than high blood pressure, because blood pressure may occasionally be elevated during situations that involve over exertion or stress.

There are significant indications that many genetic variants play a role in the heritability of hypertension and the individual differences to medication treatment.

- A family history of hyper tension quadruples one's risk of developing hyper tension.
- Children of hypertensive parents are twice as likely to develop hypertension; and hypertension during childhood is strongly associated with pervasive hypertension throughout life.
- Obesity worsens the condition through a multitude of pathways, including inflammation, renal damage, endothelial damage, oxidative stress, and hyperinsulinemia.
- Smoking also increases blood pressure, because nicotine constricts the small blood vessels.
- Other risk factors include increasing age, ethnicity, physical inactivity, alcohol consumption, sodium intake, and chronic stress.

BLOOD PRESSURE CATEGORY ACCOIRDING TO ESC GUIDELINES(ESC&AHA)2025



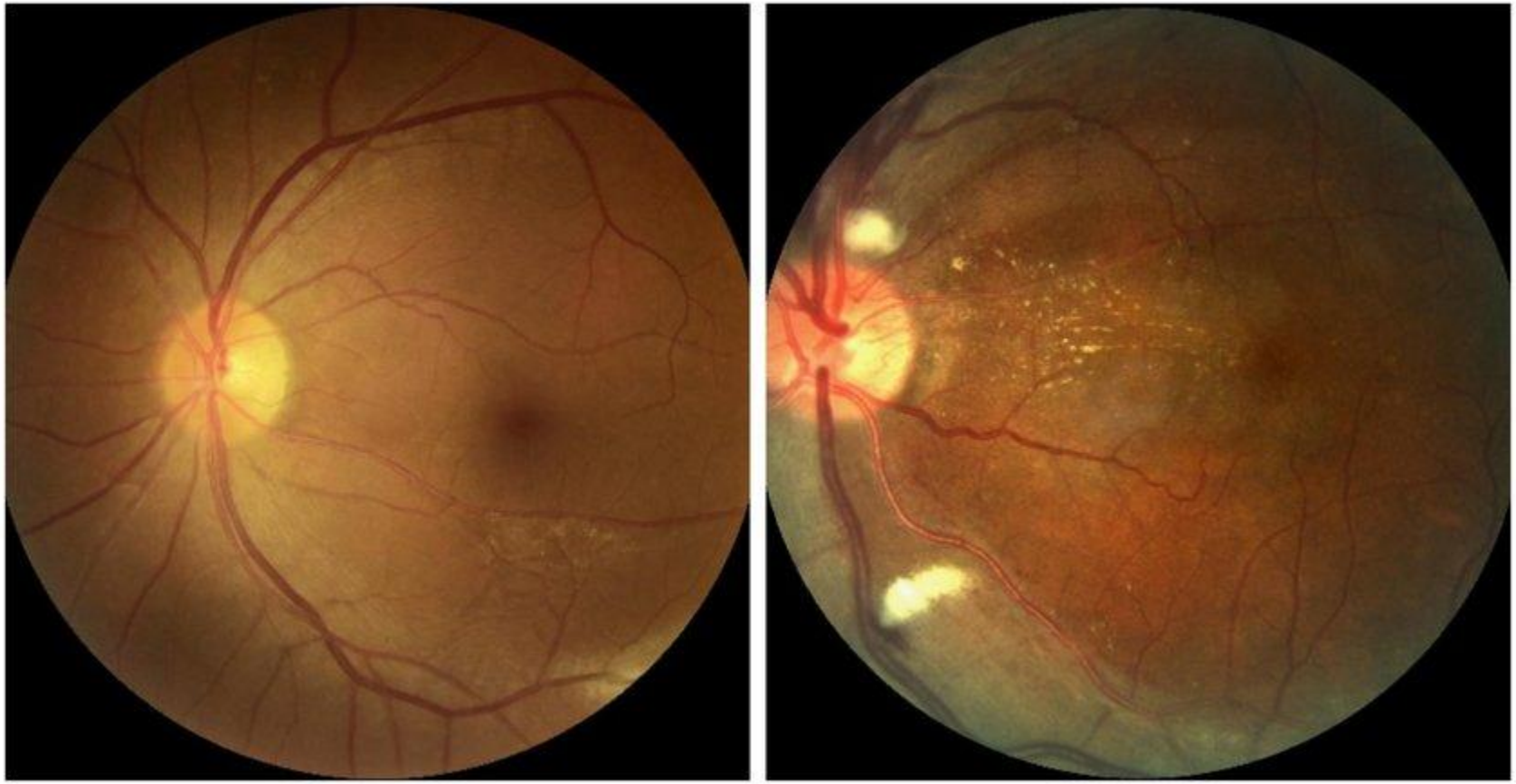
CATEGORY	SYSTOLIC (mmHg)	DIASTOLIC (mmHg)
Normal	< 120	< 80
High Normal	120-129	80-84
Grade 1 Hypertension	130-139	85-89
Grade 2 Hypertension	≥ 140	≥ 90

*Source: ESC Guidelines

TABLE 33.2 Manifestations of Target Organ Disease from Hypertension

Organ System	Manifestations
Cardiac	Clinical, electrocardiographic, or radiologic evidence of arterial wall thickening left ventricular hypertrophy; left ventricular malfunction or cardiac failure
Cerebrovascular	Transient ischemic attack or stroke
Peripheral	Absence of one or more pulses in extremities (except for dorsalis pedis) Ankle-Brachial Index <0.9
Renal	Serum creatinine elevated: men 1.3–1.5 mg/dL, women 1.2–1.4 mg/dL Calculated GFR <60 mL/min/1.73 m^2 Elevated albumin excretion
Retinopathy	Hemorrhages or exudates, with or without papilledema

Normal vs hypertensive retinopathy



Prehypertension

- is identified by blood pressure measurements that are above normal but are not so high as to meet the diagnostic criteria for hypertension.
- It is similar in this regard to prediabetes.
- The assumption is that without intervention, the patient will likely progress to stage 1 hypertension.

Prehypertension(cont.)

- The initial focus of hypertension treatment is on lifestyle modifications. Lifestyle choices that are encouraged include the following:
- (1) weight loss, if indicated;
- (2) increased fruit, vegetable, and low-fat dairy consumption;
- (3) reduced sodium, total fat, and saturated fat intake;
- (4) moderation of alcohol use;
- (5) regular aerobic physical fitness; and
- (6) cessation of smoking, if indicated.
- Such lifestyle changes are able to reduce the risk of chronic disease and improve blood pressure

- **Resistant hypertension** the presence of high blood pressure despite treatment with three antihypertensive medications

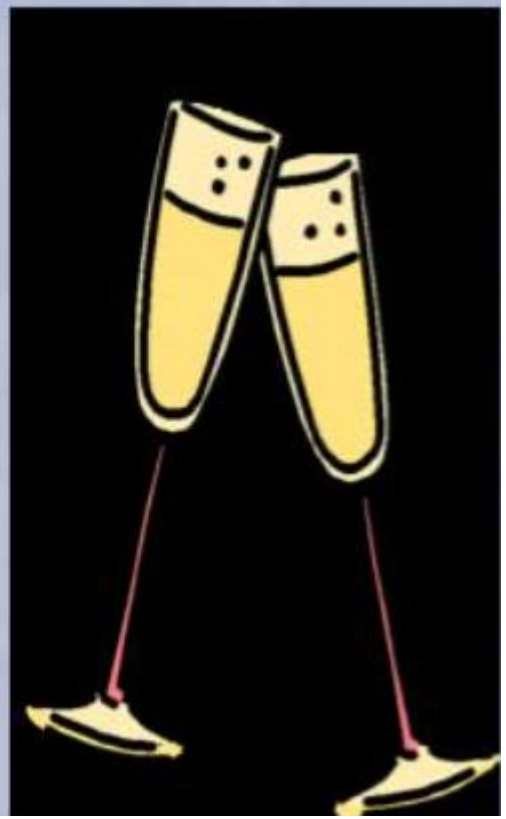
Table 19-4 Lifestyle Modifications to Prevent and Manage Hypertension*

MODIFICATION	RECOMMENDATION	APPROXIMATE SYSTOLIC BLOOD PRESSURE REDUCTION†
Weight reduction	Maintain a healthy body weight (i.e., body mass index of 18.5 to 24.9 kg/m^2)	5 to 20 mm Hg/10 kg
Adopt the DASH eating plan‡	Consume a diet that is rich in fruits, vegetables, and low-fat dairy products with a reduced content of saturated and total fat	8 to 14 mm Hg
Lower sodium intake	Consume no more than 2400 mg of sodium/d; further reduction of sodium intake to 1500 mg/d is desirable because it is associated with a greater reduction in blood pressure; reduce sodium intake by at least 1000 mg/d since that will lower blood pressure, even if the desired daily sodium intake is not achieved	2 to 8 mm Hg
Physical activity	Engage in regular aerobic physical activity such as brisk walking at least 30 minutes per day most days of the week	4 to 9 mm Hg
Moderation of alcohol consumption	Limit alcohol consumption to no more than two drinks per day for most men and to no more than one drink per day for women and lighter-weight men§	2 to 4 mm Hg

The effects of alcohol

Effects

- May increase HDL
- May increase blood pressure
- May increase triglycerides
- Significant source of calories

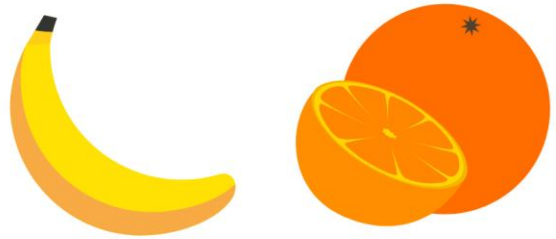


The DASH Diet

- Dietary Approaches to Stop Hypertension
- able to lower blood pressure significantly by diet alone within a 2-week period.
- The diet recommends eating 4 to 6 servings of fruits, 4 to 6 servings of vegetables, and 2 to 3 servings of low-fat dairy foods per day in addition to lean meats, nuts, seeds, dried beans, and high-fiber grains.

HOW MUCH IS A SERVE OF FRUIT?

A STANDARD SERVE IS ABOUT 150G OR:

1 medium	Apple, banana, orange or pear	
2 small	Apricots, kiwi fruits or plums	
1 cup	Diced or canned fruit (no added sugar)	

TBD
THE BODYBUILDING DIETITIANS

The DASH Diet(cont.)

- Combining the DASH diet with exercise and weight loss also produces a reduction in total cholesterol and LDL-cholesterol levels, a reduced risk for coronary heart disease and heart failure, and improvements in insulin sensitivity.
- The DASH diet is recommended for individuals with high blood pressure, blood pressure in the prehypertension range, and a family history of high blood pressure; it is also recommended for those who are trying to eliminate the use of blood–pressure lowering medications.

Additional life style factors

- Smoking cessation and stress management techniques are lifestyle modifications that can help reduce the burden of hypertension.

Coffee &Hypertension

- Moderate, regular coffee consumption is generally not linked to an increased risk of long-term hypertension and may even be associated with a slightly lower risk.
- However, caffeine can cause a temporary, short-term increase in blood pressure, so occasional or new consumption might cause a noticeable but temporary rise in blood pressure.
- Some studies suggest the potential for a protective effect at moderate levels (1-3 cups a day), especially in non-smokers, while higher consumption has less consistent results.

Supplements that may help lower blood pressure

- **Potassium**: Helps with blood pressure regulation and is found in foods like bananas, sweet potatoes, and spinach.
- **Magnesium**: Plays a crucial role in blood pressure regulation and can be obtained through foods like pumpkin seeds and black beans.
- **Coenzyme Q10 (CoQ10**): Has shown evidence of benefit in lowering blood pressure.
- **Garlic**: Some studies suggest it may help lower blood pressure.
- **Fish oil/Omega-3s**: Can help with blood pressure management.

Supplements that may help lower blood pressure

- **Vitamin D:** Deficiency is common, and some studies suggest that supplementation may help reduce high blood pressure.
- **Vitamin C**: May lower blood pressure in individuals with both normal and high blood pressure.
- **Beetroot**: Contains nitrates that can help lower blood pressure.
- **Green tea**: Has shown some potential benefits for blood pressure.

Coenzyme Q10 (CoQ10),

- also known as ubiquinone,
- is a naturally produced, fat-soluble, vitamin-like substance found in virtually all human cells.
- It is crucial for cellular energy production (ATP) and acts as a powerful antioxidant, protecting cells from damage caused by free radicals.

Health benefits

- **Heart Failure**: CoQ10 may improve symptoms and reduce the risk of heart-related complications in patients with heart failure when used alongside standard therapy. It might also aid recovery from heart surgery.
- **Migraine Prevention:** Some evidence suggests CoQ10 may reduce the frequency and duration of migraine headaches in adults, though it may take several months to see benefits.
- **Statin Side Effects**: Statins, cholesterol-lowering drugs, can deplete natural CoQ10 levels and cause muscle pain. Some studies show CoQ10 supplements can help ease these muscle-related side effects, although evidence is mixed.

Health benefits

- **Diabetes and Blood Pressure**: CoQ10 may help manage blood sugar levels, improve insulin resistance in people with diabetes, and potentially lower high blood pressure.
- **Fertility:** Oxidative stress can damage eggs and sperm. CoQ10 supplementation may improve sperm count and motility in men and enhance egg quality and ovarian response in women undergoing assisted reproductive technologies.
- **Skin Health**: When applied topically, CoQ10 may help reduce oxidative damage from UV rays and decrease wrinkle depth.

Dietary Sources and Supplements

- While the body produces CoQ10 naturally, levels decline with age and in chronic disease states.
- **Food sources** include organ meats (heart, liver), fatty fish (mackerel, sardines), vegetable oils, and nuts.
- **Supplements** are available over-the-counter in various forms (capsules, tablets, liquid). The two main forms are ubiquinone (oxidized) and ubiquinol (reduced), with ubiquinol often noted for better absorption.

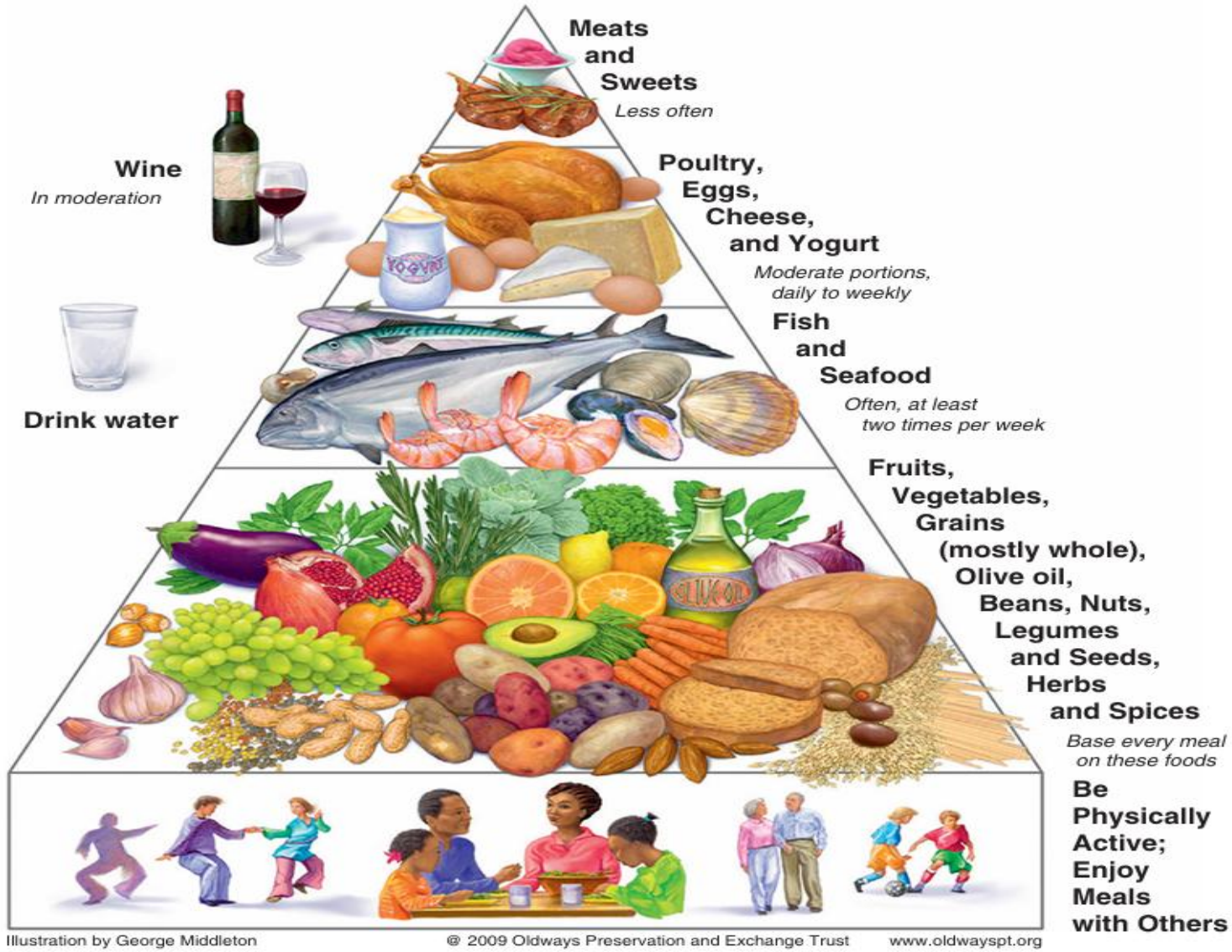


Fig. 33.7 The Traditional Healthy Mediterranean Diet Pyramid. (Courtesy Oldways Preservation and Exchange Trust, https://www.oldwayspt.org.) (http://www.cardiacrehabilitation.org.uk/docs/Mediterranean-Diet Score.pdf.)

Fatty Fish and Flaxseed

- Contain Omega-3 Fatty Acids
- Benefits include
  - Decreased risk of arrhythmias, which can lead to sudden cardiac death
  - Decreased triglyceride levels (very effective)
  - Decreased platelet aggregation
  - May decrease blood pressure
  - **Decrease inflammation**

Vegan Diet

- A vegan diet is a strict vegetarian diet that includes no dietary sources from animal origins

- ACC/AHA lifestyle guidelines recommend the DASH diet as best for prevention of CVD, but also suggest that a MeD pattern is cardioprotective.
- There is ongoing research to suggest only vegan diet(very restricted diet) can actually reverse ASCVD

Heart failure

- Normally the heart pumps adequate blood to perfuse tissues and meet metabolic needs.
- In heart failure (HF), formerly called congestive HF, the heart cannot provide adequate blood flow to the rest of the body, causing symptoms of fatigue, dyspnea (shortness of breath), and fluid retention.
- Diseases of the heart (valves, muscle, blood vessels) and vasculature can lead to HF.
- HF can be right-sided or left-sided or can affect both sides of the heart. It is further categorized as systolic failure when the heart cannot pump or eject blood efficiently out of the heart or diastolic failure, meaning the heart cannot fill with blood as it should.

Aetiology

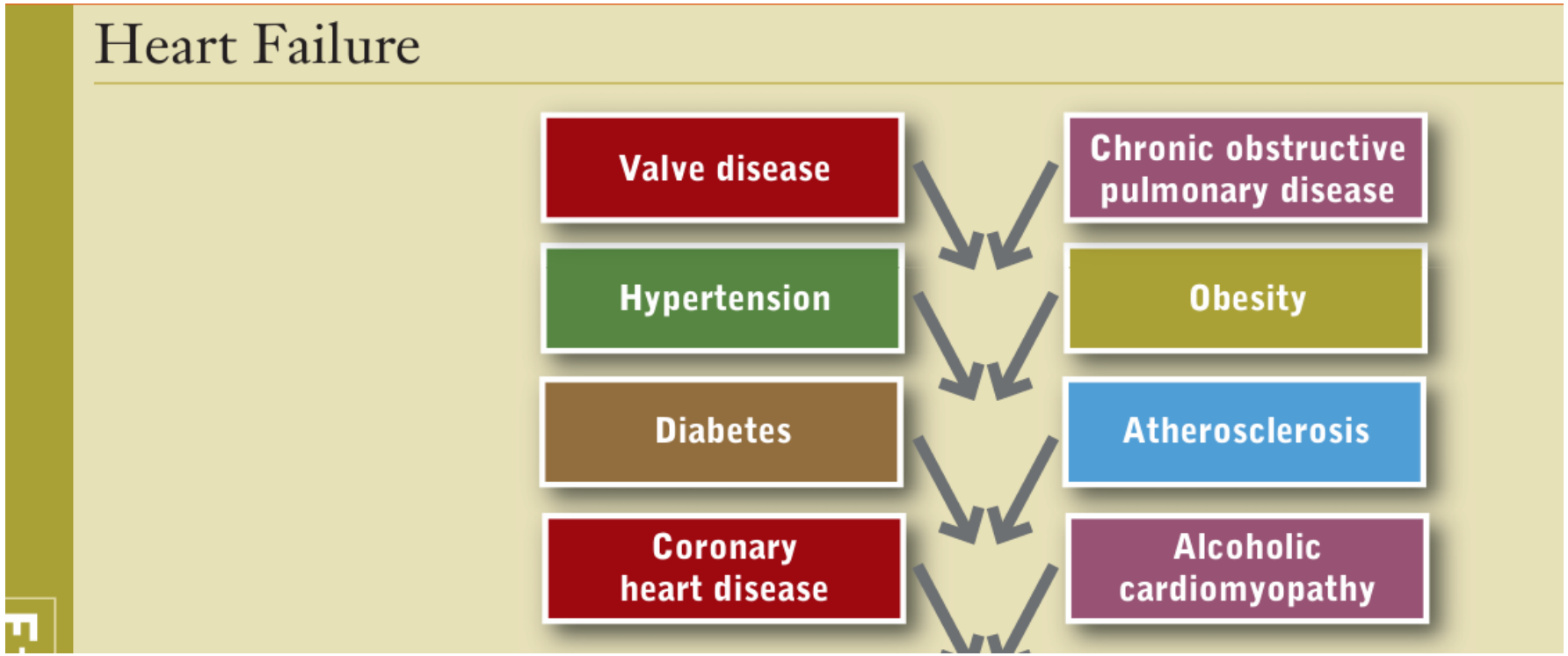

Heart Failure
Valve disease
Hypertension
Diabetes
Coronary heart disease
Chronic obstructive pulmonary disease
Obesity
Atherosclerosis
Alcoholic cardiomyopathy

TABLE 33.5 Classifications of Heart Failure

Class I	No undue symptoms associated with ordinary activity and no limitation of physical activity
Class II	Slight limitation of physical activity; patient comfortable at rest
Class III	Marked limitation of physical activity; patient comfortable at rest
Class IV	Inability to carry out physical activity without discomfort; symptoms of cardiac insufficiency or chest pain at rest

Heart failure

Nutrition Management

- DASH diet
- Diet low in saturated fat, *trans* fat
- Restricted sodium diet—<3 gm/day
- Increased use of whole grains, fruits, vegetables
- Limit fluid to 2 L per day
- Lose to or maintain appropriate weight
- Magnesium supplementation
- Thiamin supplementation
- Increase physical activity as tolerated
- Avoid alcohol and tobacco