Chapter 6. Cardiovascular System Conditions

6.1. Systemic Hypertension

6.1.1. Chronic Hypertension

Description

Chronic elevation of blood pressure (BP) more than 140/90 mmHg is called hypertension (HTN). In 90–95% of patients, etiology is unknown (essential HTN or primary HTN). In 5–10% the cause is known (secondary HTN). The objective of the treatment of chronic HTN is to prevent long-term complications (e.g., cardiac disease or stroke) from HTN.

Diagnosis

- Determine the degree or classification in 3 different BP measurements, 2 days apart in a patient at rest in a sitting or reclined position. (See table 6.1.1A.) If BP is abnormal, take in both arms.
- Determine the patient's other risk factors for HTN and cardiovascular disease that influence the long-term prognosis:

TABLE 6.1.1A. Classification of Hypertension

BP Classification	Systolic BP (mmHg)	Diastolic BP (mmHg)
Normal	<120	<80
Pre-HtN	120–139	80–89
Stage 1 HtN (mild)	140–159	90–99
Stage 2 HtN (moderate)	160–179	100–109
Severe HtN	ε180	ε110

- Diabetes mellitus
- Obesity
- Smoking
- Blood lipid disorders (Dyslipidemia)
- Family history of primary HTN or premature cardiovascular disease in men younger than 50 years and in women younger than 55 years
- Physical inactivity

- Determine the patient's pre-existing diseases that affect prognosis:
  - Left ventricular hypertrophy
  - Ischemic heart disease (angina or prior myocardial infarction)
  - Heart failure
  - Transient ischemic attacks
  - Stroke
  - Chronic renal impairment
  - Retinopathy
  - Peripheral arterial disease
- Examine the patient for the symptoms and signs of HTN.
  - Symptoms
    - Mild to moderate primary HTN is largely asymptomatic for many years. The most frequent symptom is headache, which is nonspecific.
    - Severe HTN may be associated with somnolence, confusion, visual disturbances, nausea, and vomiting and with palpitations, unstable angina, pulmonary edema, and renal failure.
    - Untreated chronic HTN often leads to left ventricular hypertrophy, which can present with exertional dyspnea, paroxysmal nocturnal dyspnea, and other symptoms of secondary causes.
  - Signs
    - Duration, severity, and degree of effect on target organs are primary signs.
    - High BP maybe the only sign. BP is taken in both

arms and at rest (preferably 3 measurements at rest, at least 2 days apart). Never decide a patient has HTN based on one isolated elevated BP measurement.

- In secondary HTN, symptoms of the primary disease may be noted (e.g., Cushing's syndrome, polycystic kidney).
- In stroke patients who have neurological signs and symptoms (e.g., weakness or paralysis of one side of the body) complications such as hypertensive heart disease may be present.
- Retina artery damage (grade I, II, III, IV) may also indicate HTN.

Management

The goal is to achieve and maintain the target BP. (See table 6.1.1B for a summary of nonpharmacologic and pharmacologic management of HTN.)

- In most cases, the target BP should be—
  - Diastolic below 90 mmHg
  - Systolic below 140 mmHg
- In special cases (e.g., diabetic patients or patients who have cardiac or renal impairment), the target BP should be—
  - Diastolic below 80 mmHg
  - Systolic below 130 mmHg

Nonpharmacologic

Lifestyle changes for all patients who have HTN include the following:

- Restrict salt intake.
- Lose weight, if overweight.
- Stop smoking.
- Stop alcohol consumption.
- Get regular physical exercise.

TABIE 6.1.1B. Management of Hypertension

Classification	Treatment	Desired Effect
Step 1		
▪ Diastolic bP90–99 mmHg,systolic bP140–159 mmHg,or both▪ No major riskfactors present▪ No existingconcomitantdisease present	Nonpharmacologic treatment (see above)	bP falls below 140/90 mmHg within 3 months of starting treatment (i.e., controlled bP)
Step 2		
▪ Diastolic bP90–99 mmHg,systolic bP140–159 mmHg,or both▪ No major riskfactors present▪ No existingconcomitantdisease present▪ failure of step 1after 3 months**—OR—**▪ Diastolic bP90–99 mmHg,systolic bP140–159 mmHg,or both▪ Major risk factorsor existingconcomitantdisease present**—OR—**▪ Diastolic bP100–109 mmHg,systolic bP160–179 mmHg,or both	Nonpharmacologic treatment**—PIUS—** oral hydrochlorothiazide tablets, 12.5 mg in the morning, daily ***Caution:*** See contraindications above.	bP falls below 140/90 mmHg within 1 month of starting treatment (i.e., controlled bP)

TABIE 6.1.1B. Management of Hypertension (CONTINUED)

Classification	Treatment	Desired Effect
Step 3		
▪ failure step 2 after1 full month oftreatment**—OR—**▪ Diastolic bP ε110mmHg, systolicbP ε180 mmHg,or both	Nonpharmacologic treatment**—PIUS—** oral hydrochlorothiazide tablets, 12.5 mg in the morning, daily**—PIUS—**oral atenolol, 25 mg (up to 100 mg) once daily ***Caution:*** See	bP falls below 140/90 mmHg within 1 month of starting treatment (i.e., controlled bP)

	contraindications above.	
If BP has not been normalized after 1 month on treatment step 3, refer patient for further evaluation and therapeutic options.		

- Restrict saturated fat intake (i.e., butter, animal fat).
- Increase unsaturated fat intake (i.e., olive oil, fruits, vegetables).

Pharmacologic

Use when lifestyle changes and nonpharmacologic interventions are not successful.

- First-line therapy—hydrochlorothiazide: 12.5–25 mg daily, in the morning

Caution: Contraindicated in patients who are pregnant or who have renal disease, gout, or severe liver disease.

- Second-line therapy (if a 1-month trial of first-line therapy fails)—atenolol: 25–50 mg once daily (to a maximum dose of 100 mg once daily)

Caution: Atenolol is *absolutely* contraindicated in patients who have asthma and chronic obstructive pulmonary disease and *relatively* contraindicated in

patients who have heart failure, bradycardia (less than 50/minute), diabetes mellitus, and peripheral vascular disease. Further therapeutic options may include the following:

- A diuretic administered alone controls BP in 50% of patients who have mild to moderate HTN and can be used effectively in combination with other agents. Oral hydrochlorothiazide (12.5–50 mg daily preferably in the mornings) may be prescribed if not contraindicated.

Note: If renal function was disturbed, furosemide could be administered (initial dose: oral 40 mg in morning; maintenance: 20–40 mg daily). Furosemide is available in CHCs and DHs.

- A beta-adrenergic blocking agent may be used. Atenolol is a beta-blocking agent; the initial treatment dose of 25 mg once daily can be increased to up to a maximum of 100 mg once daily if not contraindicated. Atenolol is available in CHCs and DHs.
- Angiotensin-converting enzyme (ACE) inhibitors may be prescribed. The starting dose for captopril is 25 mg every 12 hours. Captopril is available in regional hospitals.
- Calcium channel blockers, such as amlodipine, may be prescribed at a dose of 5 mg once daily.

Referral

- Refer the following cases *before* initiating pharmacological treatment:
  - Children and young adults (younger than 30 years)
  - Pregnant women (see section 9.3 “Hypertension Disorders of Pregnancy”)
- Refer all of the following for more specialized investigation and care:
  - Patients not responding adequately to step 3 after 1 month of treatment
  - Patients showing signs of organ damage such as angina pectoris, dyspnea, edema, or proteinuria
  - Patients showing severe side effects of the medicines

Patient Instructions

- Restrict salt intake. Do not add salt at the table.
- Lose weight.
- Restrict fatty diet.
- Stop smoking.
- Stop consuming alcohol.
- Take medication daily.
- Come back weekly for BP check until BP is well controlled; then every 2 months. Take the medication

the morning of the visit.
- Get regular, moderate physical exercise.
- Avoid stress and other risk factors (see above).

6.1.2. Hypertension Emergency

Hypertension (HTN) with diastolic blood pressure (BP) more than or equal to 130, systolic BP more than or equal to 180, or both that is associated with any of the following constitutes an emergency:
- Unstable angina pectoris (see section 6.4 "Angina Pectoris")
- Grade 3 or 4 hypertensive retinopathy
- Neurological signs: severe headache, confusion, visual disturbances, seizures, decreased consciousness, or coma
- Pulmonary edema (see section 16.1 "Acute Pulmonary Edema")
- Renal failure

Management

Treat patient and urgently refer.
- Treat emergency conditions: pulmonary edema, cardiac ischemia, and coma.
- Give nifedipine: one tablet 10 mg. Repeat after 1 hour for BP more than 180/130.

—OR—
- Give captopril (if available) tablet 25–50 mg.

Referral

All HTN emergencies need immediate urgent referral.

6.2. Cardiac Failure

Description

Cardiac, or heart, failure is a condition in which the heart is unable to pump sufficient blood for metabolizing tissues, or it is the inability of the heart to maintain adequate cardiac output to meet the demands of the body. It can result from conditions that depress ventricular function (e.g., coronary artery disease, hypertension, dilated cardiomyopathy, valvular heart disease, or congenital heart disease) and from conditions that restrict ventricular filling (e.g., mitral stenosis, restrictive cardiomyopathy, or pericardial disease).

Acute precipitating factors include the following:
- Increased sodium intake
- Arrhythmia
- Infection
- Anemia
- Thyrotoxicosis
- Pregnancy

Diagnosis

Signs and symptoms are related to whether the right, left, or both sides of the heart are affected:
- Left-side failure—principally from fluid backing up in the lungs
  - Dyspnea or tachypnea (may first appear when patient assumes supine position)
  - Cough—heart failure may be confused with respiratory infection, especially in infants and children
  - Fatigue
  - Nocturia
  - Crackles
  - Tachycardia, gallop rhythm, or heart murmur—depending on underlying cause
- Right-side failure
  - Peripheral edema
  - Hepatomegaly, ascites
  - Fatigue, nocturia

- Jugular-venous distension
- Tachycardia, gallop rhythm, or heart murmur—

depending on underlying cause
- Right- and left-side failure
- Combination of above signs and symptoms
- Infants may demonstrate poor feeding and sleeping

Chest X-ray (when available) may demonstrate cardiomegaly with or without pulmonary congestion.

Management

Nonpharmacologic

- Advise bed rest to reduce the demand on the heart, and

to reduce lung congestion as well, the sitting position in bed is recommended.
- Encourage a low-salt diet (i.e., limit intake to no more

than 2 g salt per day) and good general nutrition.
- Advise weight reduction if patient is obese.
- Instruct the patient to stop smoking.
- Encourage regular, moderate exercise within the limits

imposed by the patient's symptoms.

Pharmacologic

- Correct reversible causes such as myocardial ischemia (see section 6.4 "Angina Pectoris"), hypertension (see section 6.1 "Systemic Hypertension"), arrhythmia, or cardiomyopathy.
- Prescribe diuretic therapy, which is the most effective means of providing symptomatic relief to patient who has moderate to severe cardiac failure.
- Prescribe hydrochlorothiazide 25–100 mg once (mild). ***Caution:*** Contraindicated in pregnancy, renal disease, gout, and severe liver disease.

—OR—

- Prescribe oral furosemide.
  - Initial dose: 20–80 mg per dose
  - Maintenance dose: 20–40 mg/dose every 6 to 8

hours to desired effect

—OR—

- Prescribe IV or IM furosemide injection.
  - 10 to 20 mg once over 1 to 2 minutes.
  - A repeat dose similar to the initial dose may be

given within 2 hours if response is inadequate.
  - Following the repeat dose, if response remains

inadequate after another 2 hours, the last IV dose may be raised by 20–40 mg until effective diuresis is achieved.
- Prescribe a combination of angiotensin-converting enzyme (ACE) inhibitor **PLUS** diuretics. All patients who have heart failure should be on ACE-inhibitor unless contraindicated.

Caution: Pregnancy is a contraindication.

- Prescribe captopril 6.25–12.5 mg every 8 hours. **Referral**
- All severe cases of heart failure (e.g., pulmonary edema; see section 16.1 "Acute Pulmonary Edema") must be referred.

Start treatment before referral:

- Initiate emergency care with oxygen and IV

furosemide (1 mg/kg) when available.
- Avoid giving IV fluids.
- All newly diagnosed heart failure cases must be

referred for further tests and therapeutic options.
- New complications of heart failure (e.g., arrhythmia,

progression of disease, new signs and symptoms) must be referred.

6.3. Rheumatic Fever

Description

Rheumatic fever is an acute systemic immune process occurring 1–3 weeks after a streptococcal throat infection, commonly in children 3–15 years old. Streptococcal skin infections are not associated with rheumatic fever. The best way

to prevent rheumatic fever is to treat promptly and properly any episode of acute streptococcal infection (see section 4.5.2 “Bacterial Tonsillitis”).
Long-term prophylaxis treatment against further attacks of rheumatic fever can decrease the long-term damage.

Diagnosis

Rheumatic fever signs and symptoms may include the following:

- Fever
- Painful and red, hot, swollen joints
  - Most often the ankles, knees, elbows, or wrists; less often the shoulders, hips, hands, and feet
  - May involve multiple joints or migrate from joint to joint
- Cardiac disease
  - May include endocarditis, heart failure, valvular disease (heart murmur upon auscultation)
  - May include arrhythmia or a sensation of rapid, fluttering, or pounding heartbeats (palpitations)

- Small, painless nodules beneath the skin (subcutaneous nodules); infrequent
- Fatigue
- Flat or slightly raised, painless rash with a ragged edge (erythema marginatum); infrequent
- Chorea: jerky, uncontrollable body movements (Sydenham’s chorea or Saint Vitus Dance); most often in the hands, feet, and face; rare. Unusual behavior, such as crying or inappropriate laughing; infrequent

Management

Objectives:

- Prevent rheumatic fever disease by early and proper treatment of streptococcal throat infection.
- Limit damage or further damage by preventing recurrent attacks of rheumatic fever disease through a prophylaxis treatment.
- Treat inflammation, heart disease, and other symptoms.

Nonpharmacologic

Patient should be kept at strict bed rest until—

- The temperature returns to normal
- Resting pulse rate is normal (under 100/minute in children)

Pharmacologic

- Initiate pharmacologic treatment for all patients who have confirmed rheumatic fever and—
  - Carditis and persisting heart disease. These patients need 10 years of treatment after the last episode of acute rheumatic fever, or until the age of 45, whichever is longer.
  - Rheumatic valvular disease. These patients need 10 years of treatment after the last episode of acute rheumatic fever, or until the age of 25, whichever is longer.
  - No rheumatic valvular disease. These patients need 5 years of treatment or until the age of 21, whichever is longer.
- Prescribe the following medications for duration according to the protocol above.
  - First choice of treatment: benzathine benzylpenicillin, powder for IM injection, 1.2 million IU in a vial of 5 ml. Give 1 IM injection *every 4 weeks*. For high-risk patients or patients who are still having recurrences of rheumatic fever, give the IM injection every 2 or 3 weeks.
    - Children less than 30 kg: 2.5 ml deep IM (i.e., 600,000 IU)

◆ Adults and children more than 30 kg: 5 ml deep IM

Caution: Avoid using IM injection for patients who are taking warfarin.

—OR—

• When injections are contraindicated, give oral penicillin V (phenoxymethylpenicillin). Use powder for oral liquid 250 mg/5 ml, or tablet 250 mg.

◆ Children younger than 5 years: 125 mg every 12 hours (1/2 tablet or 2.5 ml) *every day*

◆ Adults and children older than 5 years: 250 mg every 12 hours (1 tablet or 5 ml) *every day*

—OR—

• If patient is allergic to penicillin, give oral erythromycin. Use powder for oral liquid, 100 mg/5 ml, or 250 mg erythromycin stearate, base, or estolate tablet (which is equivalent to 400 mg erythromycin ethylsuccinate tablet).

◆ Children younger than 5 years: 125 mg every 12 hours (1/2 tablet or 2.5 ml) before meals, *every day*

◆ Adults and children older than 5 years: 250 mg every 12 hours (1 tablet or 5 ml) before meals, *every day*

■ Treat inflammation

• Give oral acetylsalicylic acid (aspirin). Advise patient to take during meals to prevent gastric irritation.

◆ Children older than 5 years: 10–20 mg/kg/dose every 6 hours for 2–4 weeks (until fever and joint swelling subside). Caution: Do *not* give aspirin to children younger than 5 years because of the risk of Reye's syndrome.

◆ Adults: 500 mg every 6 hours for 2–4 weeks (until fever and joint swelling subside)

Referral

■ All suspected cases for confirmation

■ All complicated cases suspected of heart disease for further investigation and treatment options

■ Patients who have a poor response to treatment

■ Patients who have no tolerance or for whom aspirin is contraindicated

■ Patients who have other complications (e.g., chorea)

Prevention

■ Ensure prompt and appropriate antibiotic treatment of streptococcal throat infection (see section 4.5.2 "Bacterial Tonsillitis").

■ Continue prophylaxis treatment until age limits (see above).

■ Inform patient of possible symptoms of complications (e.g., heart disease, heart failure, and other symptoms as described above).

6.4. Angina Pectoris

Description

Angina pectoris can present as a stable or unstable form:

■ *Stable angina pectoris:* Angina pectoris is a clinical syndrome characterized by paroxysmal chest pain due to transient myocardial ischemia. Chest pain is precipitated by stress or exertion and relieved rapidly by rest or sublingual nitrate. The most common cause is atherosclerosis; however, angina may occur in aortic stenosis and hypertrophic cardiomyopathy.

■ *Unstable angina pectoris:* Unstable angina is usually characterized by new onset severe angina or sudden worsening of previously stable angina and may not be relieved by sublingual nitroglycerin.

Diagnosis ■ Symptoms

• Patient has chest pain, a sensation of tightness, squeezing, burning, pressing, hooking, aching, or gas indigestion. The pain is located behind or slightly to

the left of the mid sternum.
- Pain may radiate to the jaw or left shoulder and upper arm, and move down the inner arm to the elbow, forearm, wrist, or four and fifth finger. The pain maybe associated with dizziness or fainting.
- Exclude other causes of chest pain.

▪ Signs
- During attack, patient looks anxious, dyspneic, and pale; cold sweats may also be present.
- ECG between attacks maybe normal; during attack, ECG shows ST segment depression and T wave inversion.

Management

Nonpharmacologic
- Do not smoke.
- Aim for ideal body weight.
- Avoid vigorous exercise after heavy meal or in very cold weather, and stress.

Pharmacologic
- Prescribe sublingual nitroglycerin (0.5 mg sublingual tablet) to be repeated after 5 minutes if needed (not more than 3 times). Nitroglycerin causes coronary vasodilatation and acts in about 1–2 minutes. It is available at regional hospitals and district hospital.
- Give an aspirin dose of 81–325 mg orally once a day beginning as soon as unstable angina is diagnosed and continuing indefinitely.
- Prescribe isosorbide dinitrate, which is available in DHs.
- In acute attack, give initial dose of 2.5 mg sublingual tablet once, and repeat as needed as soon as the tablet has dissolved. The dose may be doubled and titrated upward as tolerated. The onset of action is within 3 minutes.
- In chronic angina and as maintenance dose, give 10-40 mg sustained release tablet every 12 hours. Sustained release preparations, if available, are preferred for patient tolerance.
- Prescribe atenolol 50–100 mg daily for chronic angina.

Caution: Atenolol is *absolutely* contraindicated in patients who have asthma and chronic obstructive pulmonary disease and *relatively* contraindicated in patients who have heart failure, bradycardia (fewer than 50 beats/minute), diabetes mellitus, and peripheral vascular disease.

Note: Unstable angina could be treated like myocardial infarction. See following section on Acute Myocardial Infarction

Referral

Refer all patients who have recurrent or persistent chest pain for additional investigation, including an exercise tolerance test and coronary angiography, and for treatment.

Patient Instructions ▪ Do not smoke.
- Restrict fatty diet (e.g., saturated fats, nuts).
- Avoid heavy exertion, heavy meals, and cold weather.
- Get regular exercise and activity.

6.5. Acute Myocardial Infarction

Description

Acute myocardial infarction (AMI) is acute ischemic necrosis of an area of myocardium caused by complete or partial occlusion of a coronary artery.

Diagnosis

Note: Not all symptoms and signs need to be present, and 25% of AMIs do not give any clear clinical signs.

- The primary clinical sign is severe chest pain similar to angina:
  - Retrosternal or epigastric
  - Crushing or burning
  - Radiating to the neck, the inner part of the left arm, or both
  - Persisting more than 30 minutes
  - Occurring at rest
- Other signs that may be present include the following:
  - Paleness
  - Sweating
  - Irregular heartbeat