Advanced Assessment in Clinical Practice:
Cardiovascular Disorders

I. Cardiovascular disorders

A. Possible causes of chest pain

Cardiac	Angina pectoris Prinzmetal variant angina Unstable angina Coronary insufficiency Myocardial infarction Mitral valve prolapse Dissection of the aorta
Musculoskeletal	Cervical radiculopathy Shoulder disorders such as bursitis Costochondral disorders
Pleuropericardial pain	Pericarditis Pleurisy Pneumothorax Emphysema
Gastrointestinal disease	Hiatal hernia Reflux esophagitis Esophageal spasm Cholecystitis Peptic ulcer disease Pancreatitis
Pulmonary disease	Pulmonary hypertension Pneumonia Pulmonary embolus
Psychoneurotic	Illicit drug use Anxiety attacks

B. Characteristics of chest pain

Anginal	Substernal. Worse with exertion, emotion, or eating. Relieved by rest and/or nitroglycerine. Often accompanied by diaphoresis, occasionally by nausea
Pleural	Precipitated by breathing or coughing. Usually described as sharp. Absent when breath is held.
Esophageal	Burning, substernal. May radiate to the shoulder. Occurs frequently at night or when lying flat. Relief with food, antacids and sometimes with nitroglycerine.
Peptic ulcer	Epigastric. Occurs at night. Daytime attacks are relieved with food. Not related to activity.
Biliary	Right scapular pain. May trigger an actual anginal attack.
Arthritis/bursitis	Locally tender. Worse with movement or palpation. Lasts for hours at a time.
Cervical	Associated with some form of injury. Worse with activity. Painful with movement or palpation.
Musculoskeletal (chest)	Worse with twisting movement, deep breathing or palpation. Lasts for hours at a time.
Psychoneurotic	Associated with anxiety either during the attack or after. Poor defined. Usually in the mammary area.

C. Acute coronary syndrome

1. Risk factor assessment.
2. Chest pain assessment.
3. Stable angina: Consistent pattern of angina.
4. Unstable angina: Increasing frequency or severity of attacks. See evidence of ischemia on the 12-lead. T wave inversion and/or ST segment depression.
5. Variant angina: Angina which occurs at rest. May see ECG changes of ischemia but may also progress to an AMI and ST segment elevation seen.

Lab effects: Acute coronary syndrome
Homocysteine can be a predictor of CAD
C-reactive protein predicts the risk of AMI
CPK-MB ↑ 3-9 hours after MI
Troponin ↑ 3-6 hours after MI
↑ sed rate in AMI, not in angina

6. Acute myocardial infarction (AMI): Damage to the myocardium resulting from an interruption of blood flow.

STEMI	• Usually partial occlusion of the vessel. • ST segment depression is generally seen. • If ST segment elevation is present it will last less than 20 minutes.
Non-STEMI	• Usually complete occlusion of a vessel. • Thrombolytics may be used and then additional interventions.

7. Assessment
   - Chest pain
   - Pallor
   - Cool, clammy
   - Increased BP
   - Dyspnea
   - Heart failure
   - Fatigue
   - Weakness
   - Nausea and vomiting
   - Decreased level of consciousness
   - Temperature elevation

D. Heart failure: Failure of the heart to handle the volume load presented to it due to a structural or functional disorder.

1. Assessment

Lab effects: Heart failure
↑ BNP, ↑ LFT in right heart failure

Classic signs
- Paroxysmal nocturnal dyspnea
- Pulsus alternans

Left sided
- Orthopnea
- Dyspnea on exertion
- Cough
- Blood tinged sputum
- Crackles
- Wheezes
- S3 gallop
- Restlessness
- Confusion
- Cyanosis
- ↑ HR, ↑ BP, ↑ PCWP

Right sided
- Fatigue
- Distended jugular veins
- Swelling in hands and fingers
- Dependent edema
- Enlarged liver and spleen from increased pulmonary pressure
- Exaggerated hepatojugular reflex
- Ascites
- Anorexia and GI distress
- ↑ CVP
- ↑ HR, ↑ BP

2. ECG abnormalities

Left sided	Right sided
• Tall R waves in V5 and V6	• Tall R waves in V1 and V2
• Deep S waves in V1 and V2	• Smaller complexes in V5 and V6.
• ST and T wave changes	• ST and T wave changes
• Left axis deviation	• Right axis deviation

E. Pericarditis: Disorder caused by inflammation of the pericardium

Lab effects: Pericarditis
↑ ESR

1. Assessment
   - Chest pain which is worse when supine
   - Pericardial friction rub which may be transient
   - Dyspnea when supine
   - Low grade fever
   - Weakness and fatigue
   - Dry cough
   - Dependent edema

2. ECG abnormalities: PR depression and diffuse ST elevation. Scooping, upwardly concave ST segments and notching at the end of the QRS.

F. Pericardial effusion: The presence of an abnormal amount and/or character of fluid in the pericardial space. Can be caused by a variety of local and systemic disorders or it may be idiopathic. Can be acute or chronic.

Pericardial tamponade: Compression of the heart caused by blood or fluid accumulation in the pericardial space.

1. Assessment
   - Chest pain or pressure
   - Light-headedness
   - Syncope
   - Palpitations
   - Cough
   - Dyspnea
   - Hoarseness
   - Hiccoughs
   - Tachycardia
   - Positive pulsus paradoxus

   Beck's triad
   - Narrowed pulse pressure
   - Muffled heart sounds
   - Jugular venous distension

2. ECG changes: Small QRS complexes and electrical alternans.

3. CXR: Widening mediastinum

G. Infective endocarditis: Inflammation of the inner lining of the heart which can result in vegetative growth on the cusps of the valves.

1. Two types

Acute	Most often affects healthy individuals.
Subacute	Usually occurs in children and adults who have a pre-existing condition such as rheumatic heart disease, mitral valve prolapse, or immunosuppression.

2. Assessment
   - New or changed murmur
   - Janeway lesions
   - Splinter hemorrhages
   - Petechiae
   - Fever and chills
   - Night sweats
   - Fatigue
   - Anorexia
   - Weight loss
   - Pleuritic pain
   - Arthralgia

H. Hypertension: Blood pressure consistently greater than 140/90. Systolic and diastolic blood pressures increase in the elderly population. Left ventricular hypertrophy develops due to increased afterload.

1. Types

Primary (essential)	• Occurs in 90-95% of the population. • Considered idiopathic.
Secondary	• Due to a cause such as renal artery stenosis or pregnancy.
Prehypertension	• Blood pressure between 120-139 mmHg systolic or 80-89 mmHg diastolic.

2. Blood pressure measurement
   - Seated with legs and back supported.
   - Legs uncrossed.
   - Support the arm at the level of the heart.
   - Quiet with no talking.
   - Don't pump it too high.
   - Cuff to skin.
   - Take in both arms at least once during the admission.

3. Orthostatic vital signs

   - Readings taken in the supine, sitting and standing positions.
   - Sitting on the side of the bed with the legs in a dependent position.
   - A fall in the systolic BP of > 20 mmHg and a rise in the pulse of > 20 BPM is considered a positive reading.

4. Assessment
   - Usually asymptomatic
   - Fatigue
   - Nocturia
   - Palpitations
   - Headache
   - Weight gain
   - Edema
   - Muscle cramps
   - Blurred vision
   - Dyspnea on exertion due to left ventricular failure.
   - Angina due to coronary insufficiency.
   - Poor renal perfusion leading to renal failure.
   - Changes in the eye such as areas of hemorrhage and cotton wool spots. Edema of the optic disc in malignant hypertension.

I. Venous insufficiency: Inability of the body to return blood from the distal circulation due to incompetent valves or obstruction in the deep veins of the lower extremities. Varicose veins are common.

1. Assessment
   - Thick, pigmented skin.
   - Brownish skin around ankles (Hemosiderin staining).
   - Ankle swelling during the day.
   - Pain and possible cyanosis when the legs are dependent.

2. Venous ulcers
   - Medial aspect of the lower extremities.
   - Irregular shape.
   - Partial to full thickness.
   - Bright red granular tissue in wound bed.
   - Yellow slough may be present.
   - Moderate to large drainage.
   - Infection causes odor and purulent drainage.
   - Pain is described as full, throbbing or aching.

3. Venous thrombosis may develop as a complication

Superficial vein thrombosis	• Red, tender along a superficial vein.
Deep vein thrombosis	• Most develop in the thigh and pelvis. • Swelling, pain and tenderness. • Unilateral edema with pitting. • Calf asymmetry > 1 cm increases the likelihood of DVT from 27% to 56% in a high risk individual.
Arterial disease or occlusion	• Unilateral edema without pitting.

J. Arterial insufficiency: Inability of the body to supply adequate blood flow due to vessel damage. Patient will have a history of peripheral vascular disease, diabetes mellitus, smoking or advanced age.

1. Assessment

   - Pale, dry, shiny skin with decreased or absent pulses. Pale when elevated, red when dependent. Thickened toenails.

   - Intermittent claudication is the pain and cramping experienced with activity which is relieved by rest. Seen in chronic arterial obstruction.

2. Arterial ulcers
   - Tips of toes and lateral aspect of the lower extremities.
   - Well defined margins.
   - Partial to full thickness.
   - Gray or gray-yellow in color.
   - Small amount of drainage.
   - Lower leg pain when in bed.
   - Pain relieved when in dependent position.
   - Gangrene can develop.

3. Diabetic ulcers
   - Plantar aspect of the foot.
   - Due to repetitive trauma.
   - Well defined margins.
   - Wound bed often red.
   - Moderate to large amounts of drainage.
   - Infection common.

4. Ankle-brachial index (ABI): Measure to determine if arterial insufficiency exists and how severe it is. Can be done at the bedside or in radiology.

Value	Interpretation
>1.3	Abnormally high
1-1.3	Normal value
≤ 0.9	Lower extremity disease.
0.6-0.8	Borderline perfusion present
≤ 0.5	Severe ischemia

5. The 6 P's of occlusion
   - Pain
   - Pallor
   - Polar
   - Pulselessness
   - Paresthesia
   - Paralysis

6. Pain location and probable obstructed artery

Calf muscles	Posterior tibial or superficial femoral artery.
Thigh	Common femoral artery or external iliac artery.
Buttock	Common iliac artery or distal aorta.

7. Comparing disorders

Arterial	Venous and Musculoskeletal
Comes on during exercise.	Comes on during or often several hours after exercise.
Quickly relieved by rest.	Relieved by rest but sometimes only after several hours or even day. Pain tends to be constant.
Intensity of the pain increases with the intensity and duration of exercise.	Greater variability than arterial pain in response to intensity and duration of exercise.

K. Aortic aneurysm: A widening, stretching, or ballooning of the aorta usually due to hypertension. May be in the abdominal or thoracic areas.

1. Abdominal aneurysm

- Palpable, pulsating mass may be felt and a bruit heard.
- May see aching in the lower back with radiation to flank or groin.
- Severe abdominal pain with nausea and vomiting if dissection or rupture. Suddenly develops signs of shock. The palpable mass will be lost.

2. Thoracic aneurysm

- Tracheal tug.
- May see dysphagia from pressure on the esophagus, dyspnea from pressure on the trachea along with cough and hoarseness.
- Sudden, tearing pain in chest and back with dissection or rupture.

3. Aortic dissection

- Sudden, severe and persistent pain.
- Describes as “tearing” or “ripping”.
- May extend to shoulder, epigastric, or abdomen.
- Pale, cool, clammy and tachycardia.
- Elevated BP which may differ in each arm.
- Decreased femoral pulses.
- Possible syncope and/or paralysis of lower extremities

L. Raynaud’s phenomenon and disorder: Blood vessel spasms as a result of exposure to cold or strong emotional triggers resulting in an interruption of blood flow to the fingers, toes, ears, and nose. Classic triphasic color changes are often seen in the hands. Pallor, cyanosis and then rubor.