

4 Cardiovascular Diseases

4.1.1 Thrombosis/Pulmonary Embolism (DVT/PE)

ICD10 CODE: I82.409

Clot formation within the deep venous system, usually of the calf, thigh, or pelvic veins. The clot can cause a local problem at site of formation or dislodge, leading to thromboembolism in various parts of the body, particularly the lungs (pulmonary embolism).

Causes

- Venous stasis (slowing of blood flow)
- Increased coagulability states
- Endothelial injury

Risk factors

- Immobilisation, prolonged bed rest, surgery, limb paralysis
- Heart failure, myocardial infarction
- Blunt trauma, venous injury including cannulation
- Oral contraceptive pills, pregnancy and postpartum
- Malignancies and some forms of chemotherapy
- Long distance airtravel
- Inherited thrombophilic states
- For PE: any other cause of dyspnoea and chest pain e.g. bronchopneumonia and myocardial infarction



Clinical features

- ⦿ 50% of cases may be clinically silent
- ⦿ Pain, swelling and warmth of the calf, thigh, and groin
- ⦿ Dislodgement of the thrombus may lead to pulmonary embolism characterised by dyspnoea, tachycardia, chest pain, hypotension
- ⦿ Half of the cases of PE are associated with silent DVT

Differential diagnosis

- ⦿ Cellulitis, myositis, phlebitis, contusion
- ⦿ For PE: any other cause of dyspnoea and chest pain

Investigations

Compression ultrasound +/- doppler

- » In case of pulmonary embolism: chest CT angiogram
- » Other useful tests (not specific): blood D-dimer, ECG, Chest X ray, echo cardiogram

Management

TREATMENT	LOC
<ul style="list-style-type: none"> ▶ Enoxaparin (Low molecular weight heparin- LMWH) 1 mg/kg every 12 hours for at least 5 days <ul style="list-style-type: none"> - No monitoring is required 	H
<ul style="list-style-type: none"> ▶ Plus warfarin 5 mg single dose given in the evening, commencing on the same day as the heparin <ul style="list-style-type: none"> - Maintenance dose: 2.5-7.5 mg single dose daily, - adjusted according to the INR 2 -3 	H
If enoxaparin not available <ul style="list-style-type: none"> - Unfractionated heparin given as: 5000 units IV bolus and then 1000 units hourly or 17500 units subcutaneously 12 hourly for 5 days. Adjust dose according to activated partial thromboplastin time (APTT) 	H

Management

TREATMENT	LOC
<ul style="list-style-type: none"> - Or 333 units/kg SC as an initial dose followed by 250 units/kg SC every 12 hours - Plus warfarin as above <p>Alternative to warfarin and heparin combination:</p>	H
Rivaroxaban <ul style="list-style-type: none"> - No need to initiate with heparin - Dose: 15mg orally twice a day for 3 weeks then 20mg daily for the duration of anticoagulation. - Patients must take the drug at the same time every day to prevent re-thrombosis. - Not to be used in pregnant or breast feeding mothers - Associated with reduced bleeding risk compared to warfarin 	
Apixaban <ul style="list-style-type: none"> - Dose: 10mg twice a day for 7 days then 5mg twice a day for the duration of the anticoagulation - Associated with a reduced bleeding risk than warfarin - Not to be used in pregnant or breast-feeding mothers 	
Notes <ul style="list-style-type: none"> ▪ Monitor for bleeding complications ▪ When using Apixaban, patients should be asked to ambulate as soon as possible ▪ See section 1.3.10. for treatment of warfarin overdose and PGD 2015 monograph on protamine for excessive heparin dose ▪ Do not start therapy with warfarin alone because it initially increases risk of thrombus progression 	

Prevention

- Early mobilisation
- Prophylaxis with enoxaparin 40 mg SC daily in any acutely ill medical patient and in prolonged admission

4.1.2 Infective Endocarditis ICD10 CODE: I33.0

An infection of the heart valves and lining of the heart chambers by microorganisms, usually bacterial, rarely fungal.

Management

TREATMENT	LOC
<input type="checkbox"/> Low molecular weight heparin- <ul style="list-style-type: none"> - (LMWH) e.g., Enoxaparin given as 1 mg/kg - every 12 hours or 1.5mg/kg once a day, for at least 5 days <input type="checkbox"/> Plus warfarin 5 mg single dose given in the evening, commencing on the same day as the heparin. Overlap treatment of warfarin and heparin. Heparin is stopped when the warfarin dose leads to an optimal INR of 2-3.	H
<input type="checkbox"/> Maintenance dose: single dose daily, that need a higher maintenance dose than others especially when there are drugs that may interact with warfarin. Typical dose may range between 2.5 – 10mg daily. adjusted according to the INR 2 -3	H

Causes

It is classified into 3 types:

- Sub-acute endocarditis: caused by low virulence organisms such as *Streptococcus viridans*
- Acute endocarditis: caused by common pyogenic organisms such as *Staphylococcus aureus*
- Post-operative endocarditis: following cardiac surgery and prosthetic heart valve placement. The most common organism involved is *Staphylococcus aureus*

Clinical features

- Disease may present as acute or chronic depending on the microorganism involved and patient's condition
- Fatigue, weight loss
- Low grade fever and chills or acute severe septicaemia
- Embolic phenomena affecting various body organs (e.g. brain)
- Heart failure, prominent and changing heart murmurs
- Splenomegaly, hepatomegaly
- Anaemia
- Splinter haemorrhages (nail bed and retina)
- Finger clubbing
- Diagnostic triad: persistent fever, emboli, changing murmur

Risk factors

- Rheumatic heart disease, congenital heart disease
- Prosthetic valve
- Invasive dental/diagnostic/surgical procedures (including cardiac catheterization)
- Immunosuppression
- IV drug use/abuse



Note: Any unexplained fever in a patient with a heart valve problem should be regarded as endocarditis

Differential diagnosis

- Cardiac failure with heart murmurs
- Febrile conditions associated with anaemia

Investigations

- Blood cultures: These are usually positive and all efforts should be made to identify the responsible pathogen and obtain sensitivity data
- At least 3 sets of blood cultures (8 ml) each should be obtained (each from a separate venipuncture) at least one hour apart
- Blood: Complete blood count, ESR
- Urinalysis for microscopic haematuria, proteinuria
- Echocardiography
- ECG

Management

TREATMENT	LOC
<ul style="list-style-type: none"> ▶ Bed rest ▶ Treat complications e.g. heart failure Initial empirical antibiotic therapy ▶ Benzylpenicillin 5 MU IV every 6 hours for 4 weeks <p>Child: Benzylpenicillin 50,000 IU/kg every 6 hours for 4 weeks</p> <ul style="list-style-type: none"> ▶ Plus gentamicin 1 mg/kg IV every 8 hours for 2 weeks If staphylococcus suspected, (acute onset) add: ▶ Cloxacillin IV 3 g every 6 hours <p>Child: 50 mg/kg every 6 hours for 4 weeks</p> <p>If MRSA (Multi-Resistant Staphylococcus aureus)</p> <ul style="list-style-type: none"> ▶ Vancomycin 500 mg IV every 6 hours ▶ Child: 10 mg/kg (infused over 1 hour) 6 hourly for 6 weeks <p>Once a pathogen has been identified</p> <ul style="list-style-type: none"> ▶ Amend treatment to correspond with the sensitivity results 	H
	RR

Prevention

- Prophylaxis in case of dental procedures and tonsillectomy in patients at risk (valvular defects, congenital heart disease, prosthetic valve). Give amoxicillin 2 g (50 mg/kg for children) as a single dose, 1 hour before the procedure.

4.1.3 Heart Failure

ICD10 CODE: I50

Clinical syndrome caused by inadequate cardiac output for the body's needs, despite adequate venous return.

For management purposes, it can be classified into:

- Congestive/acute heart failure



- Chronic heart failure
- Acute pulmonary oedema (see section 4.1.4)

Causes

- Hypertension
- Valvular heart disease, e.g. rheumatic heart disease
- Myocardial infarction
- Myocarditis
- Prolonged rapid irregular heartbeat (arrhythmias)
- Congenital heart disease
- Severe anaemia, thyroid disease

Clinical features

Infants and young children

- Respiratory distress with rapid respiration, cyanosis, wheezing, subcostal, intercostal, and sternal recession
- Rapid pulse, gallop rhythm, excessive sweating
- Tender hepatomegaly
- Difficulty with feeding
- Cardiomegaly

Older children and adults

- Palpitations, shortness of breath, exercise intolerance
- Fatigue, orthopnoea, exertional dyspnoea, wheezing
- Rapid pulse, gallop rhythm
- Raised jugular venous pressure (JVP)
- Dependent oedema, enlarged tender liver
- Basal crepitations

Differential diagnosis

- Severe anaemia, severe acute malnutrition
- Nephrotic syndrome, cirrhosis
- Severe pneumonia
- Any severe sickness in infants

Investigations

- Chest X-ray
- Blood: Haemogram (for ESR, anaemia)
- Urea and electrolytes
- Echocardiogram, ECG

Management

TREATMENT	LOC
▶ Bed rest with head of bed elevated ▶ Prop up patient in sitting position ▶ Reduce salt intake and limit fluid intake (1-1.5 L/ day) ▶ Furosemide 20-40 mg oral or IV daily for every 12 hours increasing as required to 80-160 mg according to response Child: 1 mg/kg oral or IV daily or every 12 hours according to response (max: 8 mg/kg daily)	HC4
▶ ACE inhibitors: start with low dose Enalapril 2.5 mg once daily, increase gradually over 2 weeks to 10-20 mg (max 40 mg) if tolerated (or Lisinopril 5mg increase gradually over 2 weeks to 40mg)	HC4
▶ Child: Enalapril 0.1-1 mg/kg daily in 1-2 doses Or ▶ Captopril 6.25-12.5 mg 8 -12 hourly, increase over 2-4 weeks to max 150 mg daily in divided doses ▶ Child: Captopril 0.1-0.3 mg/kg daily every 8-12 hours	H
If available and when patient stable add: ▶ Adults: Carvedilol 3.125 mg every 12 hours, increase gradually every 2 weeks to max 25 mg 12 hourly (or Bisoprolol 1.25mg once daily increase gradually to max 10mg) ▶ Child: Carvedilol 0.05 mg/kg every 12 hours, increase gradually to max 0.35 mg/kg every 12 hours	H



TREATMENT	LOC
Additional medicines (second/third line) <ul style="list-style-type: none"> ▶ Spironolactone 25-50 mg once a day Child: Initially 1.5-3 mg/kg daily in divided doses ▶ Digoxin 125-250 micrograms/daily Child maintenance dose: 15 micrograms/kg daily 	H HC4

Caution

- △ Use ACE inhibitors and beta blockers with caution if systolic BP is less than 90 mmHg: monitor renal function
- △ Use digoxin with caution in elderly and renal disease

Prevention

- Management of risk factors
- Early diagnosis and treatment of the cause (e.g. hypertension)
- Treatment adherence

Chronic heart failure

Patients with chronic heart failure need continuous treatment to control symptoms and prevent disease progression and complications

Management

TREATMENT	LOC
<ul style="list-style-type: none"> ▶ Periodic monitoring of body weight, blood pressure, heart rate, respiratory rate and oxygen saturation ▶ Salt and fluid restriction ▶ Limit alcohol intake ▶ Regular exercise within limits of symptoms ▶ Continued treatment with the medicines listed above, with doses progressively increased to achieve control 	HC2 HC4

4.1.4 Pulmonary Oedema

ICD10 CODE: I50.21

Congestion of the lung tissue with fluid, usually due to heart failure.

Cause

- Cardiogenic
- Severe fluid overload e.g. in renal failure or iatrogenic
- Non-cardiogenic pulmonary oedema: severe pneumonia, altitude sickness, inhalation of toxic gases, acute respiratory distress syndrome

Clinical features

- Severe dyspnoea, rapid breathing, breathlessness
- Tachycardia, wheezing
- Cough with frothy blood stained sputum

Differential diagnosis

- Pneumonia, pleural effusion
- Foreign body
- Trauma (pneumothorax, pulmonary contusion)

Investigations

- Chest X-ray
- ECG
- Renal function, electrolytes
- Echocardiography

Management

TREATMENT	LOC
Acute <ul style="list-style-type: none"> ▶ Prop up patient in sitting position ▶ High concentration oxygen : start with 5 L/min, aim at SpO₂ >95% 	HC4

TREATMENT	LOC
▶ Furosemide 40-80 mg IM or slow IV - Repeat prn up to 2 hourly according to response Child: 0.5-1.5 mg/kg every 8-12 hours (max: 6 mg/kg) daily	HC4
▶ Glyceryl trinitrate 500 microgram sublingually every 4-6 hours	H
▶ Give morphine 5-15 mg IM or 2-4 mg slow IV Child: 0.1 mg/kg slow IV single dose	HC4
▶ Repeat these every 4-6 hours till there is improvement	
Consider also	
▶ Digoxin loading dose IV 250 micrograms 3-4 times in the first 24 hours then maintenance dose of 125-250 micrograms daily Child: 10 mg/Kg per dose as above then maintenance dose of 15 microgram/kg/day	H
Caution	
△ Do not give loading dose if patient has had digoxin within the past 14 days but give maintenance dose	

Prevention

- Early diagnosis and treatment of cardiac conditions
- Compliance with treatment for chronic cardiac conditions
- Avoid fluid overload

4.1.5 Atrial Fibrillation ICD10 CODE: I48

Common cardiac arrhythmia characterised by irregular pulse due to the loss of the regular atrial electrical activity. Its onset can be acute or chronic, and it can be symptomatic or asymptomatic.



Risk factors

- Heart disease (heart failure, valvular heart diseases, ischaemic heart disease)
- Thyroid disease (hyperthyroidism)

Clinical features

- Irregular pulse (frequency and volume), heart rate can be either normal or very high
- Acute onset (often with high heart rate): palpitations, dizziness, fainting, chest pain, shortness of breath
- Chronic (with normal or almost normal heart rate): often asymptomatic, discovered at routine checks
- It can precipitate heart failure or pulmonary oedema
- It can cause embolic stroke if clots form in the heart and are then dislodged to the brain circulation

Investigations

- ECG

Objectives

- Control heart rate
- Restore normal rhythm if possible (specialist only)
- Prevent or treat complications
- Treat underlying conditions

Management

TREATMENT	LOC
If acute onset, high heart rate or patient in congestive heart failure and/or pulmonary oedema: <ul style="list-style-type: none"> ▶ Treat heart failure as per guidelines (section 4.1.3), use digoxin and or Carvedilol (or Bisoprolol) to reduce heart rate 	HC4
If acute onset and high heart rate but no signs of heart failure: <ul style="list-style-type: none"> ▶ Use atenolol 50 mg to control heart rate 	HC4

Management

TREATMENT	LOC
If chronic but normal heart rate: <ul style="list-style-type: none"> ▶ Only treat underlying conditions ▶ Refer to regional level to assess indication for anticoagulation with aspirin or warfarin to prevent stroke 	H

4.1.6 Hypertension ICD10 code: I10

Persistently high resting blood pressure (>140/90 mmHg for at least two measurements five minutes apart with patient seated) on at least 2 or 3 occasions 1 week apart.

Classification of blood pressure (BP)

Category	Sbp Mmhg		Dbp Mmhg
Normal	<120	and	<80
Pre-hypertension	120-139	or	80-89
Hypertension, stage 1	140-159	or	90-99
Hypertension, stage 2	>160	or	>100

SBP=systolic blood pressure; DBP=diastolic blood pressure

Causes

- In the majority of cases, the cause is not known (essential hypertension)

Secondary hypertension is associated with:

- Kidney diseases
- Endocrine diseases
- Eclampsia/pre-eclampsia
- Medicines (steroids and decongestants containing caffeine and pseudoephedrine)

Risk factors

- Family history, race
- Obesity, physical inactivity
- Excessive intake of salt and alcohol
- Diabetes and dyslipidaemia

Clinical features

The majority of cases are symptomless and are only discovered on routine examination or screening.

General symptoms include:

- Headache
- Palpitations, dizziness

Hypertension may present as a complication affecting:

- Brain (stroke)
- Heart (heart failure)
- Kidney (renal failure)
- Eyes (impairment of vision)

Differential diagnosis

- Anxiety

Investigations

To identify complications and possible cases of secondary hypertension:

- » Urine analysis
- » Blood sugar
- » Plasma urea and electrolytes
- Chest X-ray
- ECG