STUDENT WORKBOOK
IN CARDIOLOGY

Department of Medicine
Faculty of Medicine
Sabaragamuwa University of Sri Lanka

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CLINICAL APPOINTMENT IN CARDIOLOGY

1. Name of the student

……

2. Year passed GCE Advanced Level Examination

……..

3. Duration of the appointment

From: ……/……/…… To: ……../……/……..

4. Name of the consultant

……

CONTENTS

PREFACE

Students of the Faculty of Medicine, Sabaragamuwa University of Sri Lanka, study cardiology as a separate cardiology appointment of 2 weeks at the Teaching Hospital Rathnapura. During this period, they will be attached to the cardiology unit under the consultant cardiologist(s) appointed by the Ministry of Health.

This workbook in cardiology is compiled to help students achieve essential knowledge and skills in cardiology which are expected from an undergraduate when they qualify to work in medical wards as intern house officers. Thus, the workbook will guide the students during their cardiology short appointment.

This Workbook is a joint effort between the academic staff of the Department of Medicine, SUSL, and the current Cardiologist(s) of the Teaching Hospital Rathnapura. Students are expected to organize their classes and do self-studies in order to complete the tasks set out in the workbook.

We value your feedback to improve the workbook.

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CHAPTER 1

INTRODUCTION

Dear Students,

We have prepared a series of workbooks to guide you during your medical appointments. These include 3rd year workbook, 4th year workbook and workbook for each short appointment and a workbook for the professorial appointment.

The appointments in finer specialties are organized based on the University Grants Commission guidelines and according to the needs of the Ministry of Health.

The short appointment in Cardiology will give you the opportunity to study Cardiology with exposure to specific case scenarios in more detail. This workbook is prepared to provide guidance to the students during the Cardiology appointment to cover the essential areas expected from an undergraduate. You are expected to learn the management plans in further detail. This includes the investigation, treatment of common medical conditions, and management of common emergencies, which are essential clinical topics for an intern medical officer. The knowledge, skills, and experience you gather during the short appointments will help you to understand patient problems in greater depth.

Your continuous assessments will be based on these workbooks.

Learning Outcomes in Cardiology

At the end of the appointment, students should be able to,

1. Describe the anatomy and physiology of the cardiovascular system, the pathogenesis of its disorders and the scientific basis of their management.

2. Obtain histories, elicit physical signs and interpret physical signs, arrive at a clinical diagnosis, and describe pathophysiology, principles of management (including prevention) and prognosis of patients having the following conditions.
    a. Acute coronary syndrome
    b. Acute and chronic heart failure
    c. Cardiogenic shock
    d. Common arrhythmias
    e. Pulmonary embolism
    f. Valvular heart disease
    g. Congenital heart disease
    h. Hypertension
    i. Infective endocarditis
    j. Myocarditis, pericardial diseases, and cardiomyopathy
    k. Rheumatic heart disease
    l. Risk factors and determinants of cardiovascular disorders

3. Describe the indications, limitations, and necessary preparations and be able to interpret the basic findings of the following investigations.
    a. ECG
    b. Chest radiograph
    c. Echocardiography
    d. Trans esophageal echocardiography
    e. Stress ECG
    f. Holter monitoring
    g. Coronary angiography

4. Identify the indications and describe the necessary preparations of the following procedures.
    a. DC cardioversion
    b. Insertion of Temporary Pacemaker

5. Describe an appropriate plan of management for patients having cardiovascular disorders and the emergency management of the following conditions.
    a. Acute coronary syndromes (with introduction to thrombolytic therapy, heparinization, intravenous nitrates and primary revascularization)
    b. Acute left ventricular failure
    c. Cardiogenic shock
    d. Cardiac arrest and resuscitation (with emphasis on guidelines for resuscitation & defibrillation)
    e. Heart block (with introduction to pacing)
    f. Tachyarrhythmia (monitoring and cardioversion)

6. Communicate effectively with patients from different social and cultural backgrounds and with their families with particular reference to obtaining consent and giving information in relation to,
    a. The nature of illness risk factor modification
    b. Medication used and the side effects
    c. Therapeutic options including surgical options
    d. The prognosis

7. Communicating breaking serious news to patients or relatives in relation to cardiovascular disorders: cardiac arrest, intractable heart failure, agonal rhythm.

8. Write case notes, daily status, referrals, discharge summaries, clinic notes and prescriptions.

9. Demonstrate empathy and kindness.

10. Be an effective member of the healthcare team and know the health facilities and social support available to care for cardiac diseases in Sri Lanka.

11. Recognize key ethical issues and help to resolve them.

12. Play an advocacy role in preventing cardiovascular disorders.

CHAPTER 2

CORE CLINICAL KNOWLEDGE AND SKILLS

At the end of the cardiology appointment, you should be competent in the technique of history taking, physical examination (general examination and examination of the cardiovascular system), and clinical reasoning at a level of a student about to enter the final year.
In addition to the cases you are allocated during the appointment, you are advised to see the following presentations given in the next section on "Topics to cover During the Cardiology Appointment"

2.1 Clinical Presentations: Cardiology Appointment

These are some of the key presentations that ought to be 'covered' during the cardiology appointment.

- Acute chest pain
- Chest pain on exertion
- Acute shortness of breath
- Shortness of breath on exertion
- Palpitations
- Faintness
- Bilateral ankle edema
- Prolonged fever

2.2 EMERGENCIES

Following is a list of common cardiological emergencies.

- Acute coronary syndrome
- Acute left ventricular failure
- Cardiogenic shock
- Cardiac arrythmias VT, SVT, AF and CHB
- Acute pulmonary embolism
- Cardiac tamponade
- Hypertensive emergencies

2.3 Topics in Cardiology

These topics are often termed the theoretical aspects of Cardiology and require didactic teaching (e.g., lectures) or self-study using standard textbooks.

1. Common clinical presentations
2. Imaging and other cardiac investigations
3. Management of severe chest pain: Acute coronary syndrome; diagnosis, risk assessment & treatment
4. Hypertension; diagnosis, investigation & treatment
5. Heart failure; diagnosis, investigation & treatment
6. ECG/Cardiac arrhythmias
7. Cardiogenic shock
8. Cardiac arrest and CPR
9. Acute coronary syndromes (repeat)
10. Valvular heart disease and rheumatic fever
11. Infective endocarditis
12. Pericardial disease, cardiomyopathies and cardiac tumors
13. Pulmonary hypertensions
14. Pulmonary embolism and deep vein thrombosis
15. Ethical issues related to resuscitation (DNA-CPR, CPR)
16. Risk factors and determinants of cardiovascular disorders

CHAPTER 3

HISTORY TAKING OF A PATIENT WITH A CARDIOVASCULAR DISORDER

Patients with the cardiovascular disorder can present with a wide variety of symptoms including acute chest pain, chest pain on exertion, acute shortness of breath, Shortness of breath on exertion, orthopnoea, palpitations, faintness, syncope,oedema, fatigue ,and intermittent claudication.

PRESENTING COMPLAINT

Initially use open-ended questions and find out the main complaint of what brought the patient to the hospital.

HISTORY OF PRESENTING COMPLAINT

Then ask a few questions to understand the story of the problem in chronological order. For example, if a patient complains of chest pain, inquire about the duration and associated other clinical symptoms and the sequence of events until the patient is admitted to the hospital.
Symptoms are needed to be analyzed in order to arrive at a diagnosis. For example, if the patient complains of chest pain,
***Onset*:** whether it is acute onset or sub-acute onset chest pain. The exact time the pain was started, and the duration that the patient experienced the pain.
location: where is the pain and whether the patient can point to the site of pain.
Character: ask the patient to describe the symptom (e.g., dull ache, throbbing, sharp), whether it is persistent or intermittent.
Radiation: Ask if the pain spread elsewhere (e.g., spreading towards your arm, back, or neck) ***Associated symptoms*:** Ask if there are other symptoms with pain (e.g., fever in pericarditis, weight gain in heart failure)
***Temporal nature*:** Clarify whether how pain has changed over time
***Exacerbating or relieving factors*:** Ask about any factors which make the symptom worse (e.g., exertion in angina, lying flat in pericarditis) or better (e.g., glyceryl trinitrate in angina, leaning forwards in pericarditis)
***Severity*:** Mild moderate severe or you can grade from 0 – 10 scale
By this stage, you should have an idea as to the cause of the patient's illness. You can ask some questions to identify risk factors at this stage. however, when you work through the patient's history further you can find more information (e.g., Past medical history, social history)

SYSTEMIC INQUIRY

Once the questioning related to the main system involved is over you should ask about the involvement of other organ systems. You may also identify symptoms that the patient has forgotten to mention in the presenting complaint.

- **Systemic**: fevers, weight change, fatigue, oedema of the body,
- **Respiratory**: shortness of breath, cough, sputum production, colour of the sputum, wheeze, chest pain when breathing
- **Gastrointestinal**: dyspepsia, nausea, vomiting, dysphagia, abdominal pain, constipation
- **Genitourinary**: oliguria, polyuria, anuria,
- **Neurological**: visual changes, motor or sensory disturbances, headache
- **Musculoskeletal**: chest wall pain, trauma
- **Dermatological**: rashes, ulcers

PAST MEDICAL HISTORY

Ask if the patient has any medical conditions: (e.g., hypertension, diabetes mellitus, ischemic heart disease, stroke, rheumatic fever), and how well controlled all these diseases and the complications, including life threatening conditions that needed hospital admissions. Any procedures patient has undergone (e.g., cardiac valve replacement, coronary artery stents)

ALLERGIES

Ask if the patient has any allergies and if so, clarify what kind of reaction (e.g., mild rash or anaphylaxis) they had to the substance (e.g., mild rash vs anaphylaxis).

DRUG HISTORY

Ask if the patient is currently taking any medications or past medications used.

FAMILY HISTORY

Ask the patient if there is any family history of cardiovascular disease, the age that they have detected and, the complications. Ask about any unexplained sudden deaths in the family to consider the possibility of channelopathies.

PERSONAL AND SOCIAL HISTORY

Explore the patient's social history such as occupation, income, and habitus to understand their social context and identify potential cardiovascular risk factors such as smoking and alcohol. Identify their personal supportive network. Capacity to continue the current occupation. Find out the impact of the illness on the occupation.
The location of the home, the distance between the home and the closest hospital, and the mode of transport in an emergency.

It is important to find out the level of education and whether the patient is able to handle medications. (e.g., use of warfarin, insulin injections)
You need to assess the capacity to get done the activities of daily living and the ability to get done instrumental activities of daily living and the ability to get done the activities. (e. g. Personal hygiene, cooking, household work, and shopping). Find out the stresses and needs of careers and the impact of role changes in the family.

Smoking

Record the patient's smoking history, including the type and amount of tobacco used. Calculate the number of 'pack-years 'the patient has smoked for to determine their cardiovascular risk profile:

Alcohol

Record the frequency, type, and volume of alcohol consumed on a weekly basis.
Ask the patient if they use recreational drugs and if so, determine the type of drugs used and their frequency of use. Recreational drugs may be the underlying cause of a patient's presentation with cardiovascular symptoms:

Diet

Ask the patient what their diet looks like on an average day. Take note
of unhealthy foods which are known to contribute to cardiovascular disease (e.g., high salt intake, high saturated fat intake).

Exercise

Ask if the patient regularly exercises (including frequency and exercise type).

SYMPTOM ANALYSIS

Symptom	causes	symptoms to differentiate the causes you have mentioned.
Chest pain	1	
	2	
	3	
Shortness of breath	1	
	2	
	3	
Palpitations	1	
	2	
	3	
Syncope	1	
	2	
	3	
Ankle oedema	1	
	2	
	3	

CHAPTER 4

EXAMINATION OF THE CARDIOVASCULAR SYSTEM

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Important features in General Examination commonly relevant to the Cardiovascular System Examination are given below,
You should have a sequence of examination that is efficient (for example, begin with body habitus, the face, neck, out-stretched hands, details of hands, sacral area and lower limbs)

- Positioning- The patient should be examined in the semi- sitting position/45^0 position
- General appearance- Focus on dysmorphic features and evidence of Marfan Syndrome (Tall and thin, kyphosis, arachnodactyly, high arched palate, hyper-extensibility of the digits)
- Looking for stigmata suggestive of hypercholesterolemia (corneal arcus, xanthelasma, tendon xanthomata)
- Dyspnea (shortness of breath may indicate left ventricular failure)
- Temperature (low grade fever seen in endocarditis)
- Pallor (noted by examining for conjunctival pallor, tongue and mucus membrane of lips) pallor seen in infective endocarditis
- Cyanosis (mention if it is central or/ and peripheral). Central cyanosis, especially in a relatively well person is often due to cyanotic heart disease (either congenital or acquired)
- Dental hygiene (important as a focus of infection in endocarditis)
- Clubbing (seen in infective endocarditis and cyanotic heart disease)
- Peripheral stigmata of infective endocarditis- Osler's nodes, Janeway lesions, and splinter hemorrhages
- Sacral and ankle edema (congestive cardiac failure)

Examination of the neck

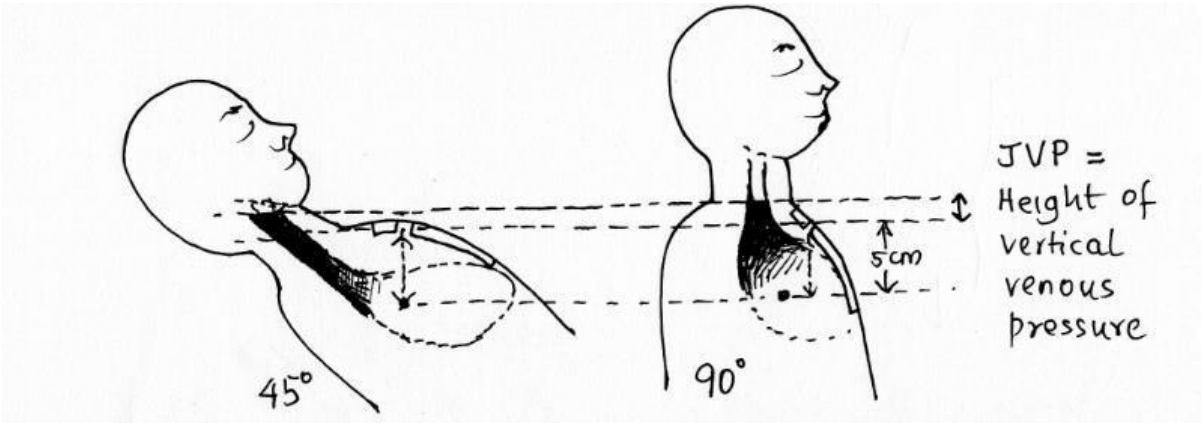
Observe the neck for pulsations before you move on to the precordial examination. A visible pulse in the neck might be a hyperdynamic carotid pulse or an elevated jugular venous pressure. Remember the carotid pulse will move towards the JVP upwards.

Examination of the cardiovascular system proper

Pulse examination

- Commence with an examination of the arterial pulse, starting with the radial pulse. Palpate using the fingertips of the index, middle and ring fingers.
- Rate
- Rhythm
- Volume, (if it is high volume, look for collapsing pulse- seen with aortic regurgitation) and character of pulse (best noted with a relatively large vessel such as carotids or brachial). If regular, palpate and count for 15 seconds. If irregular, count for 1 minute.
- Examine the other pulses including the carotids, brachial, femoral, posterior tibial and dorsalis pedis pulses.

- Examine for radio- radial and radio-femoral delay (in coarctation of aorta), especially in patient with weak or impalpable lower limb pulses.
- Examine the jugular venous pulse (observe for height and wave forms)

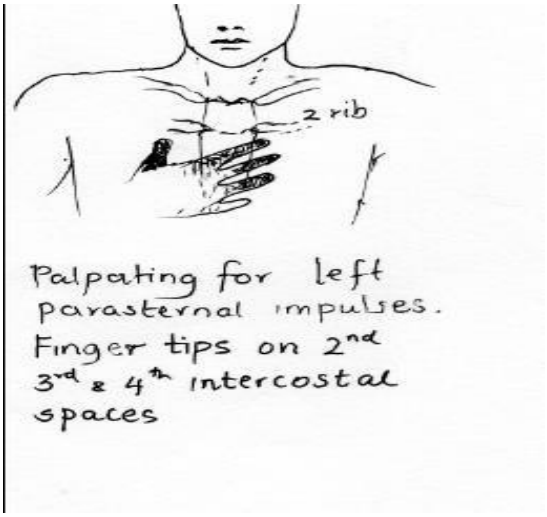


Blood pressure

- Measure blood pressures (both arms in patients with peripheral vascular disease, and young patients with hypertension)

Precordial examination

- Move to the precordium
- Inspect the precordium for visible pulsations, surgical scars, (Lateral thoracotomy and midline sternotomy scars)
- Chest deformities
- Palpate the apex (identify site, character of apex and area of apex beat). It is the most inferolateral point at which the apex beat can be felt.
- Look for palpable heat sounds and thrills
- Palpate for parasternal heave



- Auscultate foe heart sounds, pericardial rub, murmurs and their radiation, and bruits over carotids. Use the diaphragm in all areas and the bell of the stethoscope to listen to the low-frequency sounds. These are heard usually in the apex and include the third heart sound (from ventricular filling), the fourth heart sound (due to atrial contraction filling the ventricle) and mid-diastolic murmur of mitral stenosis. Turning the patient to the left-decubitus position increases the intensity of these sounds because the heart moves closer to the chest wall. Carotid bruits are heard over the carotid arteries in the neck. The diaphragm can be used to listen to these areas. The bell may be easier to flatten the area of the neck.

- The murmur of aortic stenosis radiates to the neck, and this is an important sign for the diagnosis

An Example of how to present a CVS Short case

History presentation is different from history taking. You may ask various questions and system review when taking history. In contrast, you should state the important positive and negative findings when presenting the history. In the same way examination should also be carried out in details however you may select important positive and negative findings to present.

You will be given time to examine the patient and at the end of the allocated time you will be prompted (e.g., ringing a bell) to conclude examination and present your findings to the examiner. Always remember before leaving the patient after examining them, cover the clothes that you exposed and thank the patient. Then you turn towards the examiner and make eye contact with them. It is not appropriate to look at the patient again, time to time while you present your findings to the examiner.

You may start with presenting general details of the patient like saying 'I examined this middle aged averagely built patient who is kept propped up and looks comfortable at the moment'.

Then you may start with the presentation of findings of the general examination. It may be easy for you to present in order of starting from head and proceed to hands and to legs (head to toe). As an example, you can present as 'this patient is afebrile, pale and has dental caries. There is grade 2 clubbing and pitting bilateral ankle oedema'.

Pulse examination, blood pressure and jugular venous pulse examination are very important in CVS and you may present them in more details. 'His pulse is about 80 beats per minute, irregularly irregular in rhythm with varying volume, suggestive of atrial fibrillation. His peripheral pulses are felt. There is no radio-radial or radio-femoral delay. I obtained a blood pressure of 120/80mm Hg. This too varies because of his atrial fibrillation. The jugular venous pressure is not elevated.'

You may then present the findings of the precordial examination. 'On inspection of the chest, there are no surgical scars in the precordium and the apical impulse is not visible. Palpation showed that the apex is in the 5^{th} intercostal space in the midclavicular line. It's a taping apex, indicating a loud first heart sound. There is parasternal heaving on palpation. On auscultation the first heart sound was loud, and I thought the pulmonary component of the second heart sound also loud. There is a rumbling murmur at the apex heard best with the bell and with the patient in the left decubitus position. I could not hear a pre-systolic accentuation. There was no ejection click.'

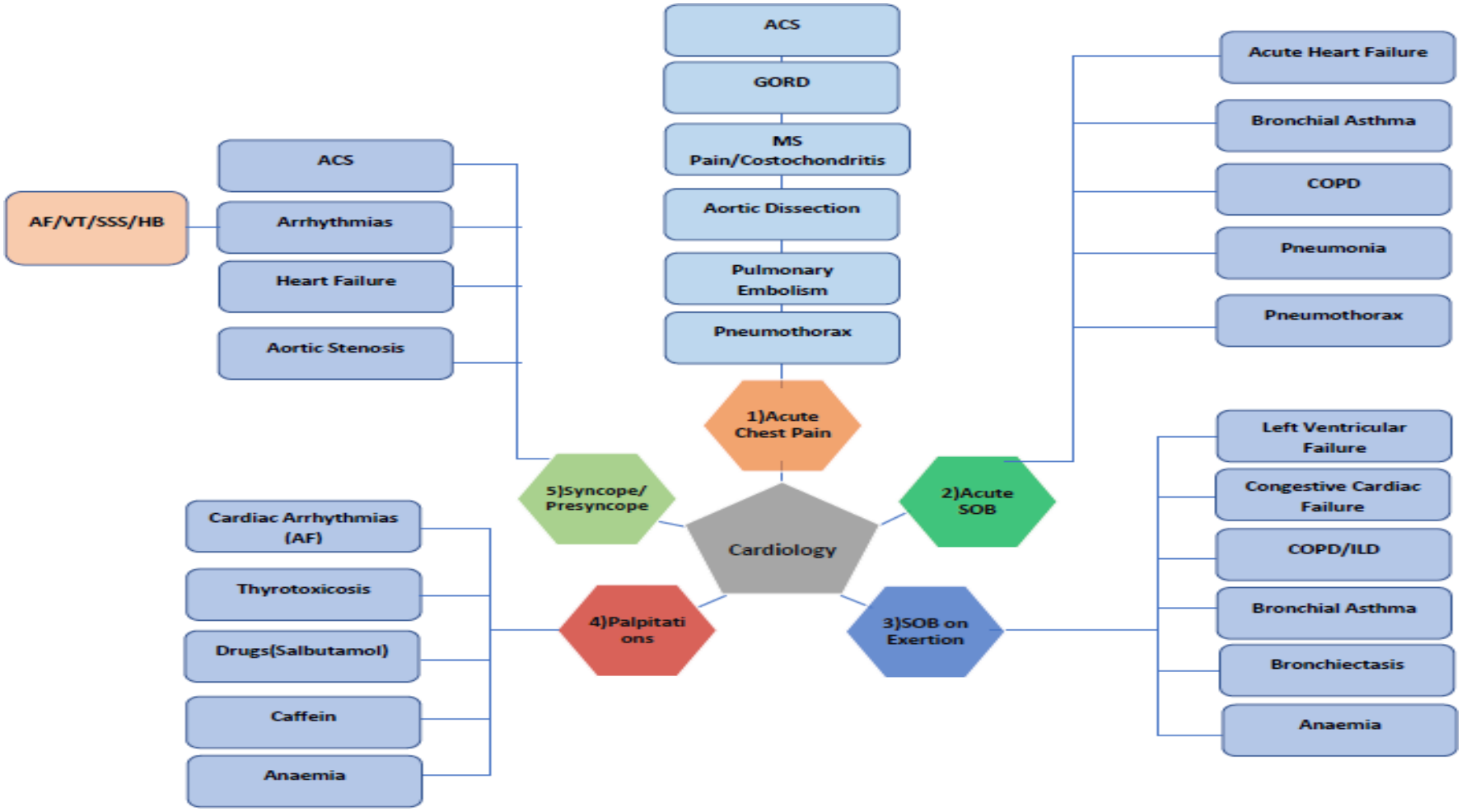
Always remember you must auscultate the lung bases and you will have to check for liver if right heart failure is suspected. 'I also auscultated the lung bases which were clear'

If time permit you can conclude the presentation with summarizing your findings. 'These findings indicate mitral valve stenosis with pulmonary hypertension and atrial fibrillation'. You can add further comments to tells those findings that you can't explain only with this

diagnosis. 'I could not explain the presence of clubbing and pallor from this examination alone, but I like to evaluate further to look for presence of infective endocarditis or other explanation for their presence'. It will be best if you could look for presence of complications like stroke (from AF) or over-coagulation like ecchymosis (from warfarin therapy).

But no neurological sequelae or evidence of over coagulation. E.g., Ecchymosis

See the mind map below relating the important differential diagnosis for the key symptoms in cardiology



ACS-Acute Coronary Syndrome, GORD-Gastro-oesophageal Reflux Disease, MS-Musculo-Skeletal, COPD-Chronic Obstructive Pulmonary Disease, ILD- Interstitial Lung Disease, SOB-Shortness of Breath, AF-Atrial Fibrillation, VT-Ventricular Tachycardia, SSS-Sick Sinus Syndrome, HB-Heart Block

CHAPTER 5

COMMON INVESTIGATIONS

1. **ECG**
    a. Draw a detailed diagram to explain components of a normal ECG.

    b. Collects the copies of following common ECG abnormalities.
        i. Anterior STEMI
        ii. Inferior STEMI
        iii. LBBB and RBBB
        iv. ECG of a NSTEMI or UA
        v. AF
        vi. VT and VF
        vii. CHB
        viii. LVH strain pattern
        ix. Hyperkalaemia
        x. Idioventricular rhythm
        xi. Normal ECG

You may please annex these ECGs at the end of this workbook, for your future references.

2. Doppler Echocardiography

a. Copy down the report of one of your patients Echocardiography examination issued by consultant cardiologist.

b. Read and discuss with your teacher and identify the important of the components in the report. You may write a summary here.

3. Cardiac biomarkers

a. Draw a diagram to explain the post MI response of different cardiac biomarkers.

b. Explain how you utilize these tests in clinical reasoning of natural history of ACS.

4. **Coronary angiography (CA)**
    a. Observe or watch a video of how the CA is done

    b. What are the possible complications of CA?
    c. Draw a figure of the main coronary arteries

5. **Exercise ECG**
    a. Observe or watch a video of how the TMT (Trade Mill Test) is done

    b. Learn how to take a consent for TMT from a patient and write down a summary as a stepwise illustration.

6. **24-hour ambulatory blood pressure monitoring**
    a. Observe the equipment use for ABPM. Attach a picture or draw a diagram of it.

7. **Holter monitor (HM)**
    a. Write a referral to the cardiac electrophysiologist requesting a date for HM for your patient.

CHAPTER 6

EXERCISES

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1) Acute coronary syndrome

a) Take a history from a patient who is being managed as myocardial infarction.
   i) Describe the chest pain in the same language used by the patient (Sinhala, Tamil or English)

b) Mention your examination findings of your patient.

   i) What are the risk factors that lead to develop an MI?

c) Attach a copy of the ECG at acute presentation and describe the findings.

d) Write the medications given to her as prescribed on acute management.

e) What are the common complications of MI that you checked for, in this patient?

f) What are secondary preventive strategies planned for your patient?

2) Acute heart failure

a) Take a history from a patient presented with acute heart failure.

i) Describe the presentation

ii) Mention examination findings of your patient

iii) What has precipitated the AHF?

b) How did you confirm the diagnosis of AHF suspected at the end of history taking, from your patient?

c) Prescribe the medications used to treat the patient during acute management.

3) Arrhythmia

a) Briefly describe the presentation of a patient you have observed having an arrhythmia (AF/ SVT/ VT/ VF/ CHB)

b) Mention examination findings of each of the presentations you mention above.

c) Attach a copy of the ECG taken at the acute presentation and describe the findings.

d) What is the immediate management implemented for your patient?

e) How do you investigate to find the underlying cause?

4) Hypertensive emergency

a) Participate in the management of a patient with hypertensive emergency. Briefly write the presentation of your patient.

b) Mention examination findings of your patient

c) What are the criteria to diagnose hypertensive emergency?

d) How do you investigate to search for target organ damage?

e) Write the prescription of the medication for your patient during acute management.

f) What are the secondary causes you looked for as a possible cause to the presentation of hypertensive emergency?

5) Cardiogenic shock

a) Observe a patient being managed for cardiogenic shock and write brief summary of presentation.

b) What are the immediate steps to manage your patient?

c) How did you find the etiology, using history, examination and investigations?

d) What are the complications that you search following shock?

CHAPTER 7

CASE BASED SCENARIOS

In this section we expect you to write histories (minimum of 5 cases as complete documentations) of patients that you encountered during your cardiology appointment.

This book is peer reviewed and recommended as a teaching and learning material for the Department of Medicine, Faculty of Medicine Sabaragamuwa University of Sri Lanka, by the following experts,

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