

2020



CARDIOLOGY CURRICULUM

PREPARED BY
SCIENTIFIC COMMITTEE OF CARDIOLOGY



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Reviewed and Approved by
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INTRODUCTION

Cardiology is the medical subspecialty concerned with the prevention, diagnosis, management, and rehabilitation of patients with diseases of the cardiovascular system. Cardiovascular disease (CVD) is recognized as the leading cause of death and disability worldwide; furthermore, CVD is the leading cause of death within Syria. Consequently, the SBOMS has established an adult cardiology training program to satisfy this need.

The goal of postgraduate medical education is to produce the highest skilled physicians who practice safely and meet the health care needs of society. Medical educators, trainees, patients, and society recognize that being well trained in the scientific aspects of medicine is necessary, but this alone is insufficient for effective medical practice; a good doctor must also possess a wide array of knowledge and skills.

The Syria board's program of adult cardiology consists of three years of full-time supervised training in adult cardiology; this includes rotations in all noninvasive and invasive diagnostic and therapeutic procedures related to the field, as well as in the areas of emergency and critical care. These rotations are essential for gaining adequate exposure to the broad range of contemporary cardiologic practice. In addition, weekly rounds, seminars, and core curriculum lectures will supplement trainees' education and enhance didactic learning. In order to offer the Syria Board program in Adult Cardiology, a training institution must be accredited by the SBOMS. Comprehensive training that includes areas such as inpatients, ambulatory care, and the emergency department will be offered. Trainees will be actively involved in patient care, with their responsibilities increasing as further experience and competence are acquired. In addition, trainees must acquire a working knowledge of the theoretical basis of the specialty, including its foundations in basic medical sciences and research. They must also demonstrate that they possess the requisite knowledge, skills, and attitudes to provide effective patient-centered care and service to a diverse population. Trainees must adhere to the rules and regulations of the training program. Upon successful completion of the program, trainees will be awarded the "Syria Board in Adult Cardiology" qualification and will be expected to be competent specialists in adult cardiology, capable of assuming a consultant's role in the specialty. In all aspects of specialist practice, the graduate must be capable of addressing issues of gender, sexual orientation, age, culture, ethnicity and ethics in a professional manner.

PROGRAM STRUCTURE

Admission requirements

In addition to the SBOMS general training policy, which requires classification from SBOMS as senior registrar, medical and physical fitness and payment of due tuitions, the following requirements must be fulfilled by any candidate accepted into the training program:

- 1) All candidates must hold an SBOMS certification in internal medicine or be enrolled in a SBOMS approved training program in internal medicine. All candidates must be certified in their primary specialty in order to be eligible to sit the SBOMS examination in adult cardiology.
- 2) All candidates must provide a comprehensive CV with references from two (2) consultants, preferably from the field of cardiology. These referees should provide recommendation letters stating the suitability of the candidate in regard to training in adult cardiology.
- 3) All candidates must provide a letter from a sponsoring organization. This should state that the organization pledges its support for the candidate throughout the total period of training, i.e., three years, and for sponsored positions.
- 4) All candidates must be registered as training in adult cardiology at the SBOMS.
- 5) All candidates must have basic life-support certification.
- 6) All candidates must have malpractice insurance.

General training requirements

- 1) Trainees shall abide by the training regulations and obligations set by the SBOMS.
- 2) Training is a full-time commitment. Fellows will be enrolled in full-time, continuous training for the program's duration.
- 3) Training is to be conducted in institutions accredited for training by the Syria Board of Adult Cardiology.
- 4) The training will comprehensively cover specialties related to Adult Cardiology.
- 5) Trainees should be actively involved in patient care, with a gradual progression of responsibility.

Rotations

This training involves three (3) years of approved training in an approved Adult Cardiology Fellowship program. The following core experiences are mandatory:

- 1) A minimum of fifteen (15) four-week blocks of clinical fellowship:
 - Five (5) four-week blocks of acute cardiac care/coronary care unit (CCU)
 - Six (6) four-week blocks of clinical cardiology (including cardiology clinical teaching unit (CTU)) and consultation)
 - Three (3) four-week blocks of ambulatory cardiology clinics □ One (1) four-week block of adult congenital heart disease
- 2) A minimum of fifteen (15) four-week blocks of laboratory-based fellowship:
 - Three (3) four-week blocks of cardiac catheterization
 - Three (3) four-week blocks of electrophysiology/pacemaker cardiology (which includes electrocardiogram (ECG) and ambulatory ECG monitoring)
 - Three (3) four-week blocks of nuclear cardiology if available (which includes exercise stress testing)
 - One (1) four-week block of advanced cardiac imaging (which includes CT scanning and possibly magnetic resonance imaging (MRI) and positron emission tomography (PET)) if available □ Six (6) four-week blocks of echocardiography
- 3) A minimum of two (2) four-week blocks dedicated to a research project, with a standard of completion that the program director deems to be acceptable.
- 4) A minimum of four (4) four-week blocks of electives approved by the program director, which are designed to allow the trainee to gain additional experience in any of the major rotations or to obtain exposure to areas related to their interests.

A Syria Board in Adult Cardiology certification FROM the SBOMS requires all of the following:

- 1) A certification in internal medicine;
- 2) Successful completion of a three-year SBOMS program in adult cardiology;
- 3) Successful completion of the certification examination in adult cardiology;

The three-year program outlined above should be regarded as the minimum training requirement. The program director may require trainees to undergo additional years of training to ensure that clinical competence has been achieved.

Structure of the training program

Basic sciences

Instruction will be offered through courses, seminars, lectures, workshops, and laboratory experience in order to provide trainees with an appropriate background in basic and fundamental disciplines related to the heart and cardiovascular system, such as embryology, anatomy, physiology, biochemistry, pathology, pharmacology, genetics, molecular biology, bioelectronics, and biostatistics.

- 1) The fellow will aim to master, through understanding the embryology and anatomy of a normal heart and cardiovascular system, the ability to detect any deviations from normal that may occur.
- 2) Normal and abnormal cardiovascular and cardiopulmonary physiology and metabolism will be taught, as well as fundamentals of cardiovascular pharmacology, including the mechanisms of drug action, therapeutic indications, and side effects.
- 3) Each cardiac center should organize a continuous-science-teaching program that includes basic clinical cardiology and lectures.

Clinical practice

Apart from giving care within the hospital setting, the fellow will participate in consultations and/or conferences in which the cardiology and cardiac surgical staff evaluate the results of surgery and the cardiac status of a patient before discharging the patient from the hospital. Primary and secondary prevention of cardiovascular disease and cardiac rehabilitation are also included in the program.

Cardiology Inpatients, outpatient clinics, and consultation

The candidate should spend four (4) four-week blocks for the first year, three (3) four-week blocks for second year, and two (2) four-week blocks for third year on these, giving a total period of nine (9) four week blocks.

- 1) Building on the knowledge, skills, and clinical judgments the fellow has already acquired in general medicine, including a thorough grasp of the concepts of the diagnostic process such as history-taking and performing physical examinations and investigations, the fellow will develop the more specific requirements demanded for the management of cardiovascular disorders.
- 2) The fellow will work in a designated "team" alongside the fellow seniors in daily rounds, teaching rounds, etc., participating in the on-call schedules as specified.
- 3) The fellow will participate in decisions made concerning the management of certain patients, with increasing levels of independence, but always subject to supervision by the consultant cardiologist. The fellow will prepare management plans for individual patients, including pre- and post-operative management as deemed appropriate.
- 4) As an "on-call fellow," the fellow will participate in the receipt of, action on, and follow-up of consultation requests from other specialties.
- 5) Fellows will attend cardiology outpatient clinics as scheduled, with a minimum of one clinic per week over the three-year period of training. In these clinics, cases will be discussed with the consultant cardiologist.

- 6) During this period, the candidate will also receive training in ECG, Ambulatory ECG, exercise testing, and nuclear cardiology.

Exercise testing & Nuclear Cardiology

Duration: One (1) four-week block each for first, second, and third year, giving a total of three (3) fourweek blocks. The specifics are as follows:

- 1) Instruction by the consultant cardiologist should be supplemented by self-teaching from a basic textbook on the principles of stress ECG, including the various protocols in general use and interpretations of the test, such as sensitivity and specificity, the safety measures and precautions to be taken, and indications for terminating the test.
- 2) After a period of training of not less than two weeks, independent supervision of stress ECG procedures, interpretation of results, preparation of written reports, and presentations at rounds or case discussions shall be implemented.
- 3) The fellow must perform and report at least 200 stress ECGs after assuming independent supervision of the test. A co-signed logbook that has been completed appropriately and in a timely fashion should be provided.
- 4) Instructions by the consultant cardiologist should be supplemented by self-teaching from a basic textbook on the principles of nuclear cardiology, including the various protocols in general use and interpretations of results.
- 5) The following procedures will be studied:
 - Stress thallium/cardiolyte scan
 - Persantin thallium scan
 - Technetium pyrophosphate scan
 - MUGA scan
- 6) The fellow should attend nuclear cardiology sessions and read the results under supervision of the consultant physicist in nuclear cardiology.
- 7) The fellow should correlate results with other investigations in order to achieve an overall correlation with the clinical condition.
- 8) The fellow must report at least 100 stress/persantin thallium scans during the period of training.

Coronary Care Unit

Duration: Two (2) four-week blocks each for first and second year, and one (1) four-week block for third year, giving a total period of five (5) four-week blocks. Under supervision, the trainee should experience: 1) Routine and on-call duties, as scheduled 2) Routine management of CCU patients.

- 3) Management of emergency situations concerning current patients and also emergency admissions.
- 4) All aspects of life-support. Fellows must pass the standard level for recognized life-support programs.
- 5) Invasive procedures and techniques, including Swan-Ganz insertion, arterial line insertion, intra-aortic balloon-pump insertion and management, and temporary pacemaker insertion and management.

Cardiac Catheterization Laboratory

The total period of time spent in the cardiac catheterization laboratory during the full period of training shall amount to three (3) four-week blocks, divided into one (1) four-week block for each training year. The trainee shall:

- 1) Learn from the consultant staff. This will be supplemented by a basic textbook on the principles of cardiac catheterization and angiography that includes various recording techniques. Additionally, monthly lectures from cathing and interventional cardiologists will also be provided.
- 2) Be familiar with the radiographic machines, hemodynamic equipment, and the various functions of the cath lab.
- 3) Review all patients clinically, as well as their investigations, before scheduled cardiac catheterization, whether diagnostic or interventional.
- 4) Attend procedures, initially as an assistant and then as the primary operator under supervision. To achieve recognition as an independent operator, the fellow must, over the entire period of training, perform at least 50 diagnostic right heart catheterizations, 250 coronary angiographies, and 300 ventriculographic procedures as the primary operator, albeit under supervision. Additionally, this must be documented in a logbook.
- 5) Perform follow-ups on patients after procedures.
- 6) Learn all of the various techniques and radiographic projections utilized across the full range of procedures.
- 7) Review and interpret results, both angiographic and hemodynamic, calculating the appropriate hemodynamic values, valve areas, etc.
- 8) Present appropriate reports for discussion with the consultant at the cardiac catheterization laboratory or during grand rounds with cardiac surgeons. Relevant topics should include:
 - Right- and left-sided cardiac catheterization.
 - Coronary angiography, including vein-graft angiography.
 - Exposure to interventional procedures during the third year.

Echocardiography

The total period of time spent in the echocardiography laboratory during the full period of training will amount to six (6) four-week blocks, with two (2) four-week blocks provided in each training year. The trainee shall:

- 1) Learn the principles of echocardiography, Doppler, Color Doppler, transthoracic, and transesophageal techniques from the textbook.
- 2) Receive lectures on the anatomy, physiology, and pathophysiology of the cardiovascular system.
- 3) Become familiar with echo machines and their various functions.
- 4) Perform echocardiography in conjunction with the echocardiography consultant and technicians; this is in order to gain an understanding of the normal and abnormal anatomy and morphology of the heart and its components in all recognized ranges and projections.
- 5) During the first rotation, acquire the ability to perform full, standard studies in M-mode, 2-D, and Doppler.

- 6) Attend echocardiography-reading sessions with the consultant cardiologist from the noninvasive laboratory and present results in the usual forums, including ward rounds with cardiac surgeons.
- 7) Gain the ability to perform emergency echocardiography during the second and third year of training.
- 8) Perform 75 studies and interpret at least 300 transthoracic studies, including Doppler and Color Doppler, over the entire period of training.
- 9) During the third year, assist in and be exposed to transesophageal and Dobutamine stress echocardiographic procedures.

Electrophysiology and Cardiac Pacing, ECG, & Ambulatory ECG Monitoring

Duration: One (1) four-week block allocated annually during second and third year, giving a total of two (2) four-week blocks. Under supervision, the trainee shall perform the following:

- 1) Electrophysiology and Pacing: The candidate will be involved in handling inpatient and outpatient services during this period of time. They shall perform 20 temporary pacemaker insertions, six cardioversions, interpret a minimum of 15 basic intracardiac recordings, assist in and be exposed to diagnostic EPS and ablation procedures, and assist in and be exposed to permanent pacemaker/ICD implantation procedures
- 2) ECG Reporting: Fellows must become familiar with clinically encountered patterns, wave forms and arrhythmias and their origins, and clinical implications and their management. This will include the various forms of pacer complexes and appropriate pacemaker adjustments. Fellows should report a minimum of 4000 ECGs during the period of training.
- 3) Ambulatory ECG: Reviewing, interpreting, and reporting Holter tracings under the supervision of the consultant cardiologist, assessing the relative importance of Holter tracing and the effect of anti-arrhythmic treatment in the context of particular cardiovascular conditions, and the presentation of interesting and difficult tracings in the rounds and discussions. The fellow must scan and report at least 150 Holter tracings during the period of training.

Adult congenital heart disease

In order to expose the trainee to congenital cardiology in respect to clinical and echocardiography investigation in children, he shall spend one (1) four-week block in pediatric cardiology.

Core specialty topics (Areas of learning & learning objectives)

AREA OF LEARNING	LEARNING OBJECTIVES
1. Basic Principles in Cardiology Fellows should have the ability to:	
a. Basic Cardiology Sciences	i. Describe cardiac anatomy, physiology, and biochemistry ii. Diagnose and manage heart conditions and diseases
b. Clinical Research	i. Recognize research principles and conduct research projects
c. Basic and Advanced Life Support	i. Perform and supervise the resuscitation of patients
2. Cardiovascular Disorders	
a. Clinical Presentations of Cardiovascular Disease	i. Manage patients presenting with chest pain ii. Manage patients presenting with acute shortness of breath iii. Manage patients presenting with chronic shortness of breath
b. Clinical Manifestations of Cardiovascular Disease	i. Manage patients with acute heart failure ii. Manage patients with chronic heart failure iii. Manage patients with presyncope and syncope iv. Manage patients presenting with cardiovascular manifestations of sleep disorders
c. Heart Diseases and Disorders	i. Manage patients with stable angina ii. Manage critically ill patients with hemodynamic disturbances iii. Manage patients with acute coronary syndromes iv. Manage patients with cardiac murmurs and valvular heart disease v. Manage patients with endocarditis vi. Manage patients with arrhythmias vii. Manage patients with cardiomyopathy viii. Manage patients with cardiac tumors ix. Manage patients with pericardial disease x. Evaluate patients with cardiovascular disease who intend to undergo non-cardiac surgery
d. Congenital and Inherited Heart Disease	i. Diagnose and manage patients with inherited heart disease ii. Diagnose and manage patients with congenital heart disease
e. Conditions affecting Circulation	i. Manage patients with hypertension ii. Manage patients with lipid abnormalities iii. Manage patients with acute and chronic thromboembolic disease iv. Manage patients with diseases of the aorta v. Manage patients with pulmonary hypertension vi. Manage patients with systemic vascular disease
f. Individuals and Groups at Risk	i. Manage heart disease during ii. Manage heart disease in elderly patients and in patients with comorbidity iii. Assess and treat patients with risk factors for atherosclerotic vascular disease
3. Clinical Procedures and Investigations	
a. Cardiac Catheterization and Angiography	i. Perform and interpret cardiac catheterization and angiography
b. Echocardiography	i. Perform and interpret echocardiography
c. Electrocardiography and Holter Monitoring	i. Perform and interpret electrocardiography and Holter-monitoring procedures
d. Exercise Testing	i. Perform, supervise, and interpret exercise testing
e. Electrophysiology (EP) and Pacing	i. Describe diagnostic and therapeutic electrophysiology and pacing

f. Percutaneous Coronary Intervention (PCI)	i. Select and manage patients for percutaneous coronary intervention
g. Cardioversion	i. Perform chemical and direct-current cardioversion
h. Pericardiocentesis	i. Perform pericardiocentesis
i. Ambulatory Care	i. Assess and manage patients in the outpatient setting
j. Cardiac Surgery	i. Assess and manage patients before and after cardiac surgery
k. Cardiac Imaging	<ul style="list-style-type: none"> i. Use radiation equipment for the diagnosis, assessment, and treatment of patients with cardiac disease ii. Define the indications for nuclear cardiology and interpret the results of common cardiac nuclear medicine investigations iii. Explain the applications and limitations of cardiac computed tomography (CT) and magnetic resonance (MR) imaging

Core specialty topics (Knowledge & Skills)

1. Basic Principles of Cardiology:
a. Basic Cardiology Sciences Fellows
 should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the following for common heart conditions and diseases: <ul style="list-style-type: none"> ✓ Pathogenesis ✓ Pathophysiology ✓ Natural history ✓ Epidemiology ✓ Clinical presentations ✓ Prognosis • Describe the following features of invasive and non-invasive investigations used in the assessment of heart conditions and diseases: <ul style="list-style-type: none"> ✓ Indications ✓ Limitations ✓ Risks ✓ Benefits ✓ Predictive values • Explain the pharmacology of drugs used in various treatments 	<ul style="list-style-type: none"> • Take patient history • Perform examinations • Select and interpret proper investigations • Show the ability to recognize indications for special investigation and intervention • Select drug therapy, treatments, and interventions for individual patients • Explain diagnoses, implications, and management strategies to patients and their families

b. Clinical Research Fellows
 should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Discuss groups of clinical-research studies, including: <ul style="list-style-type: none"> <input type="checkbox"/> Case reports ✓ Registry studies ✓ Meta-analyses ✓ Observational studies ✓ Randomized controlled trials • Explain basic statistical analyses applied to clinical-research studies, as well as levels of evidence applied to clinical trials 	<ul style="list-style-type: none"> • Critically review published research through the department journal club and presentations • Participate in clinical research projects during the training period

<ul style="list-style-type: none"> • Describe the concept of absolute versus relative risks • Explain statistical methodologies and their applications to risk assessment • Critically evaluate research studies • Outline possible approaches to studying a clinical question and designing a research study 	
c. Basic and Advanced Life Support Fellows should be able to:	
KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe current guidelines on resuscitation • Describe the principles of cardiopulmonary resuscitation • Describe the cardiac and non-cardiac causes of cardiac arrest • Explain the theoretical basis of cardiopulmonary resuscitation 	<ul style="list-style-type: none"> • Perform Basic Life Support • Perform Advanced Life Support • Perform cardiac defibrillation • Perform and supervise the resuscitation of patients suffering from cardiac arrest as well as the critically ill
2. <i>Cardiovascular Disorders</i>	
a. Clinical Presentations of Cardiovascular Disease	
i. Managing patients presenting with chest pain Fellows should be able to:	
KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Explain the causes of chest pain • Recognize the importance of individual risk-factor profiles • Describe the effect of chronic pain syndrome 	<ul style="list-style-type: none"> • Take patient history and conduct clinical examinations • Select and interpret appropriate investigations • Formulate differential diagnoses
2. <i>Cardiovascular Disorders</i>	
a. Clinical Presentations of Cardiovascular Disease	
ii. Managing patients presenting with acute shortness of breath Fellows should be able to:	
KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe causes of acute shortness of breath • Describe the management of cardiac and noncardiac diseases evidenced by acute shortness of breath • Describe the role of invasive and non-invasive assisted ventilation in compromised patients 	<ul style="list-style-type: none"> • Assess and treat urgent clinical presentations of shortness of breath, including: <ul style="list-style-type: none"> ✓ Acute pulmonary edema ✓ Major pulmonary thromboembolism
<ul style="list-style-type: none"> • Describe the indications for and methods of use of assisted ventilation, e.g., continuous/bi-level positive airway pressure (CPAP/BiPAP) 	<ul style="list-style-type: none"> □ Respiratory failure • Explain cardiac-related causes of shortness of breath in an acute setting (e.g., intensive care) • Recommend and initiate assisted ventilation in compromised patients (e.g., CPAP)
2. <i>Cardiovascular Disorders</i>	
a. Clinical Presentations of Cardiovascular Disease	
iii. Managing patients presenting with chronic shortness of breath Fellows should be able to:	
KNOWLEDGE	SKILLS

<ul style="list-style-type: none"> • Explain respiratory and cardiac causes of chronic shortness of breath • Recognize treatment methods for pulmonary disease • Recognize exertional shortness of breath as an indicator of angina • Explain management options for chronic shortness of breath 	<ul style="list-style-type: none"> • Diagnose and manage patients with chronic shortness of breath • Refer patients for lung function tests, such as: <ul style="list-style-type: none"> ✓ Spirometry ✓ Flow-velocity measurements • Interpret the results of these tests
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2. Cardiovascular Disorders
b. Clinical Manifestations of Cardiovascular Disease
i. Managing patients with acute heart failure Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Explain the etiology, pathophysiology, diagnosis, and management of acute heart failure • Explain the pharmacology of drugs currently used in the treatment of heart failure • Recognize complications that can arise in regard to the pharmacological treatment of patients with heart failure • Recognize the role of non-invasive and invasive ventilation • Explain indications for referring patients for intra-aortic balloon pump & percutaneous revascularization • Explain indications for referring patients for surgical interventions, including valve surgery, cardiac transplantation, and the implanting of assist devices 	<ul style="list-style-type: none"> • Select drug therapy and interventions for individual patients with acute heart failure • Manage patients requiring non-invasive ventilatory support

2. Cardiovascular Disorders
b. Clinical Manifestations of Cardiovascular Disease
ii. Assess and treat patients with chronic heart failure Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the etiology, pathophysiology, diagnosis, and management of chronic heart failure • Describe the natural history and clinical presentation of patients with heart failure • Describe the pharmacology of drugs currently used in the treatment of heart failure • Discuss the indications for referring patients for surgical interventions such as: <ul style="list-style-type: none"> ✓ Valve surgery ✓ Cardiac transplantation ✓ Implantation of assist devices • Discuss the role of non-pharmacological treatments for heart failure, such as exercise • Recognize complications that can arise in relation to pharmacological treatments for patients with heart failure • Discuss the indications for an implantable cardioverter-defibrillator (ICD) • Explain the role of biventricular pacing and resynchronization therapy 	<ul style="list-style-type: none"> • Select drug therapy and interventions for individual patients with heart failure

2.1 Cardiac Diseases & Disorders

b. Clinical Manifestations of Cardiovascular Disease iii. Assessing and treating patients with pre-syncope and syncope Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe causes of syncope and presyncope • Identify cardiac and noncardiac causes of syncope • Describe autonomic causes of hypotension • Discuss the medical management of postural hypotension • Describe indications for cardiac pacing and the use of ICDs 	<ul style="list-style-type: none"> • Recognize life-threatening cardiac causes of syncope • Perform examinations, including carotid sinus massages • Select and interpret appropriate investigations, including: <ul style="list-style-type: none"> ✓ Holter monitoring ✓ Tilt-table testing ✓ Implantable electrocardiogram (ECG) monitoring devices ✓ Coronary angiography ✓ Electrophysiology (EP) studies ✓ Assessments for implantable cardioverter-defibrillators (ICD) • Construct a management plan for syncopal patients • Insert temporary cardiac-pacing systems • Investigate and manage patients who have been resuscitated from sudden death

2. Cardiac Diseases & Disorders

b. Clinical Manifestations of Cardiovascular Disease iv. Assessing patients presenting with cardiovascular manifestations of sleep disorders Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Discuss the physiology of sleep • Recognize types of sleep apnea • Describe the cardiovascular manifestations of sleep apnea • Explain the effect of sleep disorders in cardiovascular diseases. 	<ul style="list-style-type: none"> • Select and refer patients for appropriate investigations • Refer patients for specialist assessment and treatment, where required.

2. Cardiac Diseases & Disorders

c. Heart Diseases and Disorders

i. Managing patients with stable angina Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the pathogenesis of atherosclerosis and the importance of different risk factors • Explain the natural history, pathophysiology, and presentations of coronary artery disease • Describe the pharmacology of drugs currently used in the treatment of stable angina • Recognize the indications for further investigation and intervention • Describe the role of revascularization procedures, including angioplasty and coronary artery bypass surgery 	<ul style="list-style-type: none"> • Diagnose angina and differentiate between chronic non-cardiac pain • Explain to a patient the risks and benefits of an intervention • Provide appropriate treatment options • Recognize and manage risk factors for further coronary heart disease

2. *Cardiac Diseases & Disorders*

c. Heart Diseases and Disorders **ii. Managing critically ill patients with hemodynamic disturbances** Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the pathogenesis, presentation, and natural history of critical illness caused by hemodynamic disturbance • Explain the medical management of a shocked patient • Explain the indications and complications of intra-aortic balloon-pump counterpulsation • Explain the indications for ventricular assist devices • Explain the indications for, and hemodynamic consequences of, positive pressure ventilation • Explain the indications for urgent surgical and coronary intervention 	<ul style="list-style-type: none"> • Assess, manage, and give advice to critically ill patients • Recognize and manage acute conditions, including: <ul style="list-style-type: none"> ✓ Myocarditis ✓ Acute pericarditis ✓ Cardiac tamponade ✓ Aortic dissection ✓ Pulmonary embolism ✓ Cardiac rupture ✓ Cardiogenic shock ✓ Postinfarction ventricular septal defect and mitral regurgitation ✓ Circulatory collapse ✓ Septic shock • Select and use appropriate investigations to assess hemodynamics, including: <ul style="list-style-type: none"> ✓ Echocardiography ✓ Pulmonary artery catheterization ✓ Hemodynamic measurements
	<ul style="list-style-type: none"> • Identify the indications and limitations of inotropic drugs • Perform urgent pericardiocentesis • Insert and manage intra-aortic balloon pumps

2. *Cardiac Diseases & Disorders*

c. Heart Diseases and Disorders **iii. Managing patients with acute coronary syndromes** Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the pathophysiology of acute coronary syndromes • Explain the diagnosis and management of acute coronary syndromes • Explain the pharmacology of drugs currently used in the treatment of acute and postcoronary syndromes • Explain the indications, interpretation, and management of: <ul style="list-style-type: none"> ✓ Hemodynamic monitoring ✓ Left ventricular assist devices ✓ Intra-aortic balloon pumps • Discuss the indications for: <ul style="list-style-type: none"> ✓ Thrombolysis ✓ Drug therapy 	<ul style="list-style-type: none"> • Select and manage cardiovascular medication • Initiate and perform cardiopulmonary resuscitation and life support • Evaluate individual patient risk and prioritize patients for urgent intervention • Perform angiography during the acute phase, if indications show this to be necessary • Insert and manage an intra-aortic balloon pump under supervision • Manage the clinical and administrative aspects of a coronary care unit

<ul style="list-style-type: none"> ✓ Urgent angioplasty • Recognize when to refer patients for angiography • Manage complications such as arrhythmias, heart failure, and shock 	
<p>2. <i>Cardiac Diseases & Disorders</i> c. Heart Diseases and Disorders vi. Managing patients with cardiac murmurs and valvular heart disease Fellows should be able to:</p>	
KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the pathological processes that are responsible for valvular heart disease • Describe the natural history of valve disorders • Explain the indications for surgical intervention, including valve repair • Understand the different types of prosthetic valves available for clinical use • Describe anticoagulation regimes for patients with valve disease and prostheses • Describe the role of percutaneous intervention in valvular heart disease. 	<ul style="list-style-type: none"> • Perform an examination to diagnose valve lesions • Understand physical signs that can indicate the severity of valvular heart disease • Perform and interpret transthoracic echocardiograms • Perform and interpret: <ul style="list-style-type: none"> ✓ Left heart catheterization ✓ Right heart catheterization ✓ Hemodynamic measurements.
<p>2. <i>Cardiac Diseases & Disorders</i> c. Heart Diseases and Disorders v. Managing patients with endocarditis Fellows should be able to:</p>	
KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the pathogenesis, presentation, and natural history of infective endocarditis • Identify common pathogens associated with endocarditis • Explain the indications and limitations of investigations used in the diagnosis and management of endocarditis, including: <ul style="list-style-type: none"> ✓ Trans–thoracic echocardiography ✓ Transesophageal echocardiography • Explain the possible complications of endocarditis • Recognize the indications for surgical intervention, as well as the associated timeframes • Recognize current guidelines for endocarditis prophylaxis • Explain the investigation and management of prosthetic valve endocarditis. • Explain the investigation and management of device–related infection 	<ul style="list-style-type: none"> • Diagnose, evaluate, and treat patients with endocarditis • Manage patients with native and prosthetic valve endocarditis • Integrate information and advice from clinical microbiologists and cardiac surgeons

2. *Cardiac Diseases & Disorders*
 c. Heart Diseases and Disorders **vi.**
Managing patients with arrhythmia
 Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the etiology and pathogenesis of arrhythmias • Describe the natural history, presentation, clinical signs, prognosis, and management options of arrhythmia • Recognize the normal electrophysiology of the heart and the basis of arrhythmogenesis • Identify the pharmacology of drugs currently used in the treatment of arrhythmia • Describe the indications for, and management properties of: <ul style="list-style-type: none"> ✓ Temporary pacemakers ✓ Single-chamber permanent pacemakers ✓ Dual-chamber permanent pacemakers ✓ Electrophysiological studies ✓ Radiofrequency ablation ✓ ICDs 	<ul style="list-style-type: none"> • Select pharmacological & interventional therapies for arrhythmias • Interpret and evaluate the results of ECGs • Identify the indications of, and perform, cardioversion • INSERT temporary cardiac-pacing systems.

2. *Cardiac Diseases & Disorders*
 c. Heart Diseases and Disorders **vii.**
Managing patients with cardiomyopathy
 Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the genetic basis, pathogenesis, natural history, and prognosis of cardiomyopathy, including hypertrophic cardiomyopathy • Recognize different types of cardiomyopathy • Recognize the cardiac complications of viral infections • Explain the role of the following in the management of patients with cardiomyopathies: <ul style="list-style-type: none"> ✓ Screening ✓ Medical therapy ✓ ICDs ✓ Pacemakers ✓ CRT/resynchronization therapy ✓ Catheter-based treatment ✓ Surgical-based treatments • Discuss the indications for cardiac transplantation • Recognize the effect cardiomyopathy can have on lifestyle activities (e.g., participation in competitive sport) 	<ul style="list-style-type: none"> • Select and interpret appropriate investigations, including: <ul style="list-style-type: none"> ✓ Echocardiography ✓ Magnetic resonance imaging (MRI) ✓ Exercise testing ✓ Cardiac catheterization and angiography ✓ EP studies • Manage patients with a genetic susceptibility for cardiomyopathy, including: <ul style="list-style-type: none"> ✓ Counseling family members ✓ Giving advice when genetic testing is recommended

2. *Cardiac Diseases & Disorders*
 c. Heart Diseases and Disorders **viii.**
Managing patients with cardiac tumors
 Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> Describe the pathology, presentation, and natural history of cardiac tumors Recognize the indications of, and timeframe for, surgical intervention in regard to specific tumors 	<ul style="list-style-type: none"> Select and interpret appropriate investigations, including computed tomography (CT) and cardiac MR Perform and interpret transthoracic echocardiograms Form differential diagnoses based on the results of investigations

2. *Cardiac Diseases & Disorders*
 c. Heart Diseases and Disorders
xi. Managing patients with pericardial disease
 Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> Describe the pathogenesis, natural history, and prognosis of pericardial diseases 	<ul style="list-style-type: none"> Select and interpret appropriate investigations, including echocardiography and right heart catheterization
<ul style="list-style-type: none"> Recognize the modes of presentation of pericardial diseases Recognize the hemodynamics of constrictive pericarditis and tamponade Recognize the indications for further investigation into patients with pericardial disease Recognize medical and surgical management methods for patients with pericardial disease 	<ul style="list-style-type: none"> Recognize indications for, and perform, pericardiocentesis in appropriately selected patients Recognize and manage cardiac tamponade Recognize and manage pericardial constriction

2. *Cardiac Diseases & Disorders*
 c. Heart Diseases and Disorders
x. Managing patients with cardiovascular disease who are to undergo non-cardiac surgery
 Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> Recognize the effects of common anesthetic agents upon cardiovascular function Recognize issues relating to patients with devices such as pacemakers and ICDs who are to undergo non-cardiac surgery Recognize pre-operative, relevant cardiac investigations Explain indications for, and principles of, antibiotic prophylaxis against infective endocarditis Explain the need for cardiac follow-ups after surgery Recognize pre-operative cardio-vascular pharmacological interventions in patients undergoing noncardiac surgery 	<ul style="list-style-type: none"> Assess patients with cardiac disease undergoing non-cardiac surgery, including the performing of risk assessments of: <ul style="list-style-type: none"> ✓ Anesthesia ✓ Surgery Provide risk-assessment advice to patients, anesthesiologists, and surgeons

2. *Cardiac Diseases & Disorders*

d. Congenital and Inherited Heart Disease

i. Diagnosing and managing patients with inherited heart disease Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the fundamentals of human inheritance • Recognize the principles of molecular genetics, genetic testing, and the genetics of common inherited heart diseases • Describe clinical presentations concerning, the natural history of, and screening for common inherited heart diseases, including: <ul style="list-style-type: none"> ✓ Cardiomyopathies ✓ Connective tissue diseases (e.g., Marfan Syndrome) ✓ Channelopathies and/or inherited rhythm disturbances • Recognize features of given inherited conditions: <ul style="list-style-type: none"> <input type="checkbox"/> Brugada syndrome 	<ul style="list-style-type: none"> Obtain detailed family and clinical history in order to develop a pedigree for disease • Perform a specific systemic physical examination that has the capability to detect noncardiac features • Manage patients with congenital heart disease, including during the post-surgery period • Counsel patients who are at risk of developing inherited heart disease
<ul style="list-style-type: none"> ✓ Long QT syndrome ✓ Channelopathies ✓ Cardiomyopathies 	

2. *Cardiac Diseases & Disorders*

d. Congenital and Inherited Heart Disease **ii. Diagnosing and managing patients with congenital heart disease** Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the fundamentals of embryology of the heart • Describe the following features of common congenital heart diseases: <ul style="list-style-type: none"> ✓ Epidemiology ✓ Natural history ✓ Clinical presentations • Recognize the principles of molecular genetics and genetic testing • Recognize the role of screening for common congenital heart diseases in at-risk individuals • Explain management principles of common congenital heart disease • Recognize the management options for cyanotic and non-cyanotic congenital heart disease • Recognize the role of endocarditis prophylaxis • Recognize the natural history of common and rare congenital conditions in patients who have and have not had previous cardiac surgery • Recognize the physical and psychological problems that may arise in adults with congenital heart disease 	<ul style="list-style-type: none"> • Produce and document a detailed family and clinical history in order to develop a pedigree for disease • Perform systemic physical examinations and detect noncardiac features • Interpret the results of genetic tests • Perform ECGs and interpret the results • Evaluate common congenital heart conditions using echocardiography • Manage adolescents and adults with complex congenital heart diseases • Work in conjunction with pediatric cardiologists and congenital heart disease specialists

<p>2. <i>Cardiac Diseases & Disorders</i> e. Conditions Affecting the Circulation i. Managing patients with hypertension Fellows should be able to:</p>	
KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> Describe the causes of hypertension. Describe the role of non-pharmacological treatments Describe the pharmacology of drugs currently used in the treatment of hypertension Discuss management options for patients with resistant hypertension Explain protocol 	<ul style="list-style-type: none"> Assess patients with hypertension for end organ damage Investigate patients for secondary hypertension Interpret appropriate biochemical investigations and imaging modalities Interpret ambulatory blood pressure recordings Manage hypertensive emergency patients

<p>2. <i>Cardiac Diseases & Disorders</i> e. Conditions Affecting the Circulation ii. Managing patients with lipid abnormalities Fellows should be able to:</p>	
KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> Identify normal and abnormal lipid chemistry Recognize the epidemiology and pathophysiology of lipid disorders Demonstrate an awareness of current evidence supporting the role of pharmacological intervention as a means of both primary and secondary prevention. Recognize the common genetic abnormalities affecting lipid metabolism Describe methods of investigating and managing patients with lipid disorders Describe the pharmacology of drugs currently used in the treatment of lipid disorders 	<ul style="list-style-type: none"> Interpret lipid test results Identify and prescribe lipid-lowering medications Describe the basic principles of a healthy lifestyle and diet to patients. Describe the management of lipid disorders to patients

<p>2. <i>Cardiac Diseases & Disorders</i> e. Conditions Affecting the Circulation iii. Managing patients with acute and chronic thromboembolic disease Fellows should be able to:</p>	
KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> Describe the pathophysiology and epidemiology of pro-coagulant disorders Recognize causes of and predisposing factors for thromboembolic disease Recognize the risk profile of patients with thromboembolic disease Recognize the consequences of thromboembolic disease, such as pulmonary embolism Describe the medical management of thromboembolic disease Describe the management of recurrent thromboembolic disease Describe the condition of chronic thromboembolic pulmonary hypertension 	<ul style="list-style-type: none"> Select appropriate forms of investigations and interpret their results; for example: <ul style="list-style-type: none"> ✓ ECGs ✓ Duplex scans ✓ Lung ventilation/perfusion (VQ) scans ✓ CT pulmonary angiography ✓ Cardiac MR Perform and interpret: <ul style="list-style-type: none"> ✓ Hemodynamic measurements ✓ Right heart catheterization Develop a management plan for patients with acute and chronic thromboembolic disease Manage hemodynamically compromised patients with pulmonary embolisms

2. *Cardiac Diseases & Disorders*
 e. Conditions Affecting Circulation **iv. Managing patients with diseases of the aorta** Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the pathogenesis, presentation, and natural history of aortic aneurysms, including aortic dissection • Recognize familial disease of the aorta, including common genetic mutations • Recognize bicuspid aortic valve and associated aortic diseases 	<ul style="list-style-type: none"> • Select and interpret appropriate noninvasive imaging, including: <ul style="list-style-type: none"> ✓ Echocardiography ✓ CT ✓ MRI • Assess, manage, and give advice
<ul style="list-style-type: none"> • Recognize the natural history of corrected and uncorrected coarctation • Recognize medical therapy options for diseases of the aorta • Recognize the indications and limitations of antihypertensive drugs • Recognize the indications for percutaneous and surgical intervention, including open repair and stent procedures • Recognize the need for, and approaches to, long-term follow-up of patients with aortic disease 	

2. *Cardiac Diseases & Disorders*
 e. Conditions Affecting Circulation
v. Managing patients with pulmonary hypertension Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the following features of pulmonary hypertension, including primary and secondary pulmonary hypertension: <ul style="list-style-type: none"> ✓ Causes ✓ Epidemiology ✓ Natural history ✓ Symptoms and signs ✓ Current acute and chronic medical management ✓ The role of heart-lung transplantation • Describe indications for pulmonary angiography and for referral for consideration for pulmonary endarterectomy 	<ul style="list-style-type: none"> • Perform and interpret: <ul style="list-style-type: none"> ✓ Hemodynamic measurements ✓ Right heart catheterization • Select drug therapy and interventions for patients with pulmonary hypertension

<p>2. <i>Cardiac Diseases & Disorders</i> e. Conditions Affecting the Circulation vi. Managing patients with systemic vascular disease Fellows should be able to:</p>	
KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the pathophysiology of arterial and venous diseases • Describe the natural history and clinical presentations of: <ul style="list-style-type: none"> ✓ Cerebrovascular disease ✓ Renovascular disease ✓ Peripheral vascular disease • Recognize clinical manifestations of acute and chronic venous disease • Recognize management techniques for vascular disease, including stenting • Describe heritable, acquired connective tissue diseases, including their potential effects on the heart and circulation 	<ul style="list-style-type: none"> • Conduct an examination of the peripheral vasculature • Examine the musculoskeletal system and detect connective tissue disorders • Assess and manage vascular trauma, and recognize when to refer the patient to a vascular surgeon • Interpret the results of: <ul style="list-style-type: none"> ✓ Doppler ultrasound imaging and flow studies ✓ Peripheral angiography investigations ✓ CT and MR angiograms

<p>2. <i>Cardiac Diseases & Disorders</i> f. Individuals and Groups at Risk i. Managing heart disease during pregnancy Fellows should be able to:</p>	
KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the physiological changes that occur during pregnancy and the post-partum period, as well as their impact on cardiovascular disease • Recognize the implications and risks cardiac disorders have in regard to pregnancy • Recognize the implications of anticoagulation during pregnancy • Recognize the implications and risks of pregnancy and cardiac disorders • Recognize the issues involved in valvular surgery • Recognize the risks involved for a fetus when congenital heart disease is present in the mother • Recognize the principles of medical and interventional management of mothers with heart disease • recognize appropriate investigations for pregnant women with cardiac disease 	<ul style="list-style-type: none"> • Assess cardiac patients' risks in regard to becoming pregnant • Provide pre-pregnancy counseling and refer patients to professionals who can provide them with contraceptive advice • Manage patients with hypertension and heart disease throughout pregnancy, delivery, and the post-natal period • Explain the importance of adopting a multidisciplinary approach to treating patients with cardiac disease during the anti-partum, delivery, and post-partum periods

<p>2. <i>Cardiac Diseases & Disorders</i> f. At risk Individuals and Groups ii. Managing heart disease in elderly patients and in patients with co-morbidity Fellows should be able to:</p>	
KNOWLEDGE	SKILLS

<ul style="list-style-type: none"> • Describe the epidemiology of heart disease in elderly people • Recognize the clinical presentations of heart disease in elderly people • Recognize the interaction of heart disease with multi-system diseases, including renal impairment • Recognize the considerations required in regard to drug treatment for elderly people • Recognize the indications for cardiac surgery in elderly people 	<ul style="list-style-type: none"> • Perform appropriate examinations on elderly persons • Discuss management strategies with patients and their family members • Work with, and contribute to, a multidisciplinary healthcare team
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2. Cardiac Diseases & Disorders
f. At risk Individuals and Groups iii. Managing patients with risk factors for atherosclerotic vascular disease Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe epidemiology of ischemic heart disease • Describe the investigation and management options for patients with: <ul style="list-style-type: none"> ✓ Systemic hypertension (both primary and secondary) ✓ Lipid disorders ✓ Diabetes ✓ A history of smoking ✓ A family history of cardiovascular disease • Describe the impact of “metabolic syndrome” on vascular health • Calculate patients' absolute risk of developing cardiovascular disease on the basis of standard risk factors 	<ul style="list-style-type: none"> • Assess the prevalence of coronary heart disease in the community • Manage the risk factors of individual patients • Explain the basic principles of a healthy lifestyle and diet to patients

3. *Clinical Procedures and Investigations*

a. Cardiac Catheterization and Angiography

i. Performing and interpreting cardiac catheterization and angiography Fellows

should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe normal and abnormal coronary anatomy • Recognize normal and abnormal peripheral vascular anatomy • Recognize pericardial anatomy & disease state • Recognize common congenital abnormalities of the heart • Describe the indications for cardiac catheterization and coronary angiography • Recognize normal & abnormal hemodynamics of right and left sides of heart • Describe the pharmacology of drugs and agents used in the cardiac catheter laboratory • Identify complications and adverse events, including relative risks, associated with catheterization • Discuss patient-safety procedures • Explain the principles of radiography and radiation safety • Recognize radiographic projections and image analysis • Identify stent types, selection, and implantation • Describe the indications, procedures, and limitations of percutaneous interventions 	<ul style="list-style-type: none"> • Assess patients before they undergo the procedure • Obtain safe arterial and venous vascular access • Perform catheterization and pressure measurement of cardiac chambers and pulmonary vasculature • Perform safe catheterization and angiography of the right and left coronary arteries • Manipulate radiographic imaging planes to obtain multiple diagnostic images • Remove catheters and secure effective hemostasis • Manage common complications arising during and after catheterization and angiography • Interpret the results of angiography and manage patients accordingly, including in regard to their referral for PCI or cardiac surgery • Observe and assist with percutaneous coronary interventions • Identify and apply the technique of
<ul style="list-style-type: none"> • Discuss various techniques and their complications 	

3. *Clinical Procedures and Investigations*

b. Echocardiography

i. Performing and interpreting cardiac echocardiography Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe normal and abnormal cardiac anatomy, including common congenital lesions, physiology, hemodynamics, and abnormalities in these aspects that are relevant to echocardiography • Recognize the indications, techniques, limitations, and complications of echocardiographic modalities, including: <ul style="list-style-type: none"> ✓ Transthoracic echocardiography ✓ Transesophageal echocardiography ✓ Stress echocardiography • Describe the practical and technical aspects of these tests, as well as the complications involved • Describe the indications, techniques, limitations, and complications of other noninvasive cardiac-imaging modalities, including: <ul style="list-style-type: none"> ✓ Nuclear cardiology ✓ Cardiac MR ✓ Cardiac CT • Recognize physical principles behind ultrasound-image formation, Doppler imaging, and flow velocity measurement • Recognize factors influencing image quality and artefacts • Interpret the standard and additional echo windows and image planes for comprehensive transthoracic and transesophageal echocardiography • Describe conventional models of left ventricular segmentation • Explain the development of a quality-assurance program for an echo lab 	<ul style="list-style-type: none"> • Perform and interpret: <ul style="list-style-type: none"> ✓ Unsupervised transthoracic examinations ✓ Supervised transesophageal echocardiographic examinations • Apply the following modalities: <ul style="list-style-type: none"> ✓ M-mode imaging ✓ 2D imaging ✓ Pulsed wave Doppler ✓ continuous wave Doppler ✓ color-flow imaging • Generate echocardiography reports • Discuss echocardiographic findings with sonographers, patients, and consultants • Select and use appropriate probe, machine, and image settings to obtain and optimize image quality • Recognize the presence of artefacts and demonstrate the ability to differentiate them from true pathology • Perform and interpret agitated saline contrast echocardiography as a means of assessing intra-cardiac shunts and right ventricular function • Observe or participate in: <ul style="list-style-type: none"> ✓ Transesophageal echocardiography ✓ Exercise stress echocardiography ✓ Pharmacologic stress echocardiography • Observe 3-D and contrast echocardiography (left ventricular opacification and

3. *Clinical Procedures and Investigations*

c. Electrocardiography and Holter Monitoring

i. Performing and interpreting electrocardiography and Holter monitoring procedures Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the indications and reporting methods for the following investigations: <ul style="list-style-type: none"> ✓ 12-lead electrocardiograms ✓ Ambulatory ECG 	<ul style="list-style-type: none"> • Explain correct electrode placement for rest and exercise ECGs and ambulatory ECGs • Supervise, analyze, and monitor ECG recordings • Interpret results and communicate them to referring physicians.

3. *Clinical Procedures and Investigations*

d. Exercise Testing

i. Performing, supervising, and interpreting exercise testing

Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the indications and reporting methods for exercise testing • Describe the physiology of exercise, including cardiovascular and respiratory physiology • Identify causes of false positive and false negative exercise electrocardiograms • Explain the significance of hemodynamic responses during exercise • Recognize the effect drug therapy has on exercise testing 	<ul style="list-style-type: none"> • Supervise and analyze exercise ECG tests • Interpret the results of exercise tests • Perform cardiopulmonary resuscitation

3. *Clinical Procedures and Investigations*

e. Holter Electrophysiology (EP) and Pacing

i. Describing diagnostic and therapeutic electrophysiology and pacing procedures

Fellows should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the normal and abnormal electrophysiology of the heart, including fundamental cellular electrophysiology • Describe electrophysiology and cardiac anatomy relevant to pacing • Recognize the pharmacology of drugs affecting cardiac electrophysiology • Describe the indications for, and complications related to, cardiac electrophysiology studies, including ablation procedures • Explain the principles of action of cardiac pacemakers, including biventricular pacemakers and implantable cardioverterdefibrillators (ICDs) • Describe the indications for, and complications related to, the implantation of temporary and permanent cardiac pacemakers and ICDs • Describe the electrophysiological complications of pacemakers and common forms of pacemaker dysfunction 	<ul style="list-style-type: none"> • Safely obtain central venous access and place a temporary transvenous pacing wire in the right ventricle • Participate in decision-making concerning referrals for electrophysiology and ablation procedures • Observe the performance of electrophysiology and ablation procedures • Participate in ICD implant testing & follow-ups • Insert temporary pacing systems • Observe and participate in the implantation of permanent pacemakers • Monitor, interrogate, and program pacemakers • Recognize and manage complications relating to pacing systems
<ul style="list-style-type: none"> • Describe the principles of pacemaker interrogation and programming • Discuss the importance of radiation protection • Recognize the properties of the different pacing systems used. 	

<p>3. <i>Clinical Procedures and Investigations</i> f. Percutaneous Coronary Intervention (PCI) i. Selecting and managing patients in regard to percutaneous coronary intervention Fellows should be able to:</p>	
KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> Describe the indications for percutaneous coronary intervention Discuss current coronary intervention technologies 	<ul style="list-style-type: none"> Select patients for referral Manage patients pre–procedure Manage patients post–procedure
<p>3. <i>Clinical Procedures and Investigations</i> g. Cardioversion i. Performing chemical and direct-current cardioversion Fellows should be able to:</p>	
KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> Describe indications for cardioversion Identify the requirements for anticoagulation 	<ul style="list-style-type: none"> Perform cardioversion safely
<p>3. <i>Clinical Procedures and Investigations</i> h. Pericardiocentesis i. Performing pericardiocentesis Fellows should be able to:</p>	
KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> Describe normal and abnormal pericardial anatomy and surface relations Describe the common causes of pericardial effusions Define the indications for diagnostic and therapeutic pericardiocentesis Define the role of image guidance in pericardiocentesis 	<ul style="list-style-type: none"> Recognize when pericardiocentesis is indicated Explain the risks and benefits of pericardiocentesis to patients and their family members Perform pericardiocentesis Manage cardiac tamponade Arrange for investigations to be performed in relation to pericardial aspirate.
<p>3. <i>Clinical Procedures and Investigations</i> i. Ambulatory Care i. Assessing and managing patients in the outpatient setting Fellows should be able to:</p>	
KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> Identify and describe the clinical features of all cardiovascular diseases Explain the clinical indications for cardiovascular pharmacological treatment Recognize the indications, roles, and pathways of non-invasive and 	<ul style="list-style-type: none"> Assess and manage patients presenting with a spectrum of symptoms Formulate a diagnostic pathway Identify the pharmacological treatment of cardiovascular diseases
	<ul style="list-style-type: none"> Explain the implications of illnesses for patients and family members
<p>3. <i>Clinical Procedures and Investigations</i> j. Cardiac Surgery i. Assessing and managing patients before and after cardiac surgery Fellows should be able to: should be able to:</p>	
KNOWLEDGE	SKILLS

<ul style="list-style-type: none"> • Explain the principles of patient management in cardiac surgery • Identify the indications for surgery • Describe the nature of cardiac surgery, as well as the management of patients before, during, and after cardiac surgery • Recognize the importance of the collaboration between cardiologists and cardiac surgeons in regard to providing effective patient management • Explain the theoretical basis behind major types of cardiac surgery for valvular and coronary heart disease, as well as how individual patients are selected for these procedures. • Describe post-operative surgical care, including: <ul style="list-style-type: none"> ✓ Arrhythmia management ✓ Management of hemodynamic instability ✓ Post-operative emergencies. ✓ Management of ventilated patients 	<ul style="list-style-type: none"> • Assess the risks and likely benefits of cardiac surgery for individual patients and explain these to the patients in question • Refer patients to cardiac surgeons who specialize in coronary or valvular heart disease • Prepare patients for cardiac surgery, including pre-operative cardiac investigations • Assess patients, as well as their pre-operative investigations • Participate in the immediate and long-term postoperative management of patients
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3. *Clinical Procedures and Investigations*
k. Cardiac Imaging
i. Using radiation equipment in the diagnosis, assessment, & treatment of patients with cardiac disease
Fellows should be able to: should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Explain to patients and staff the physics and hazards of ionizing radiation • Identify current statutory requirements concerning the medical use of ionizing radiation • Describe the operation of the equipment involved in the use of ionizing radiation • Identify factors that affect both patients and staff in regard to radiation exposure • Describe the physics of commonly used medical radioisotopes, including nuclear cardiology • Explain the principles and practical implementation of protective measures that are designed to limit patients' and staff's exposure to ionizing radiation • Discuss important aspects of cardiac radiology 	<ul style="list-style-type: none"> • Measure radiation exposure • Utilize radiation equipment safely and effectively

3. *Clinical Procedures and Investigations*
 k. Cardiac Imaging **ii. Defining the indications for nuclear cardiology and interpreting the results of common cardiac nuclear medicine investigations**
 Fellows should be able to: should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Describe the radionuclides and radiopharmaceuticals used in nuclear cardiology • Describe the physics of commonly used medical radioisotopes • Describe the principles of operation of the gamma camera and methods of computerized image-acquisition and processing • Describe the indicators for obtaining radionuclide imagery for investigating the heart at rest and during exercise • Identify different types of stress testing • Discuss the importance of radiation protection • Describe the equipment used for nuclear cardiology imaging 	<ul style="list-style-type: none"> • Interpret the results of nuclear investigations • Identify important sources of errors and artifacts in image interpretation • Explain image findings in conjunction with other clinical information concerning patients

3. *Clinical Procedures and Investigations*
 k. Cardiac Imaging **iii. Explaining the applications and limitations of cardiac CT & MR imaging**
 Fellows should be able to: should be able to:

KNOWLEDGE	SKILLS
<ul style="list-style-type: none"> • Identify principles of cardiac CT and MR imaging • Recognize normal CT and MR imaging findings concerning the heart • Recognize major abnormal CT and MR imaging findings concerning the heart • Describe the limitations of imaging technology, including spatial and temporal resolution • Describe the indications and contra-indications for the use of CT and MR imaging • Recognize the role and limitations of CT coronary imaging • Discuss the importance of radiation protection 	<ul style="list-style-type: none"> • Review and discuss cardiac CT and MR images • Identify important sources of errors in image interpretation • Synthesize image findings with other clinical information for the patient • Explain the application and limitation of cardiac CT and MR imaging to patients and their families.

Educational activities

Teaching and learning activities in Adult Cardiology

Regular meetings

ACTIVITY	OBJECTIVES
Morning report and case presentation	<ul style="list-style-type: none">• To monitor patient care and management decisions, along with their outcomes• To develop competence in presenting cases in a concise and an informative manner• To develop the ability to perform appropriate differential diagnoses and proper management plans• To develop appropriate presentation skills
Morbidity and mortality report	<ul style="list-style-type: none">• To identify areas that can be improved in regard to clinical care• To prevent future medical errors by learning from previous incidents• To recognize system issues, such as outdated policies and patient-identification procedures• To understand the confidentiality of cases discussed and colleagues involved
Grand rounds	<ul style="list-style-type: none">• To increase medical knowledge and skills• To learn about the latest advances in medical research• To identify and discuss controversial topics in the medical field
Journal clubs, critical appraisal	<ul style="list-style-type: none">• To promote continuing professional development• To remain abreast of current medical research• To disseminate information and debate good practice• To learn and practice efficient searching strategies and critical appraisal skills• To implement and apply acquired knowledge and skills in clinical practice

Work-based learning

ACTIVITY	OBJECTIVES
Clinic-based learning (CBL)	<ul style="list-style-type: none">• Obtain focused histories and perform physical examinations under the supervision of the consultant/senior fellow• Present clinical findings to the attending consultant/senior fellow in a concise manner
	<ul style="list-style-type: none">• Discuss differential diagnoses and management plans with the attending consultant/senior fellow• Write patients' assessments and differential diagnoses, as well as management plans• Develop communication skills by observing the attending consultant/senior fellow

Daily-roundbased learning (during specialty training)	<ul style="list-style-type: none"> • Present focused histories and physical-examination findings to the team • Document historical and physical-examination findings according to accepted formats, including a complete written database, problem list, and a focused SOAP note • Develop patient-management plans in consultation with others • Conduct complete, concise, informative follow-ups on previous patients
On-call dutybased learning	<ul style="list-style-type: none"> • Obtain comprehensive histories and perform complete physical examinations on admission, clearly note patient assessments and differential diagnoses of medical problems, and initiate management plans • Discuss management plans, including investigations and treatment plans, with seniors • Communicate plans to nurses assigned to patients • Perform the basic procedures necessary for diagnosis and management • Attend to consultations within and outside the department, including emergency consultations, and participate in the outpatient clinic once or twice a week
Self-directed learning	<ul style="list-style-type: none"> • Maintain a personal portfolio (self-assessment, reflective learning, personal development plan) • Identify a good starting point for one's learning task, obtaining assistance from colleagues or one's mentor, if required • Acquire the ability to identify one's own learning needs and objectives. • Gather examples of acceptable learning outcomes • Encourage critical-thinking skills • Locate appropriate learning resources • Develop confidence and independence in regard to learning • Develop a habit of reading journals

Self-directed learning (SDL)

SDL refers to a learning experience that is planned and organized by the fellow. SDL is used to advance learning in a particular topic/area or to meet a personal learning objective.

Fellows should be encouraged to:

- 1) Engage in a variety of SDL activities
- 2) Perform activities relating to higher levels of learning: from knowledge, to application, to impact
- 3) Collaborate with others or work in teams to achieve a common goal

Rules

- 1) The fellow must document the SDL he/she conducted.
- 2) The mentor or supervisor will review SDL activities during the supervisory meeting and shall accordingly evaluate the level of achievement and the score on the portfolio-evaluation sheet.

Examples of SDL activities

- 1) Journal-article reading
- 2) Searching the Internet for the answer to a certain clinical question (PICO)
- 3) Attendance of accredited conferences/courses

- 4) Case presentation
- 5) Small-group activities
- 6) Practical Evidence Applied in Real Life Situations (PEARLS)
- 7) Practice guidelines (summarizing)
- 8) Journal clubs
- 9) Teaching other fellows and medical students
- 10) Quality improvement/patient-safety activity (mini project)
- 11) Participating in research or departmental projects
- 12) Performing a literature review on certain topics

Journal-article reading:

The trainee chooses and reads interesting an article independently and then discusses it with the clinical supervisor during a supervision meeting. During the discussion, the trainee should:

- Write a brief description of the research
- Identify the most important aspects of the article
- Define the research question
- Discuss the methodology used by the authors
- Describe the results
- List the main ideas presented in the article
- Summarize the conclusions

Searching the Internet for the answer to a certain clinical question (PICO)

Based on the trainee's clinical duties, he/she shall be instructed to discern the answer to a clinical query related to cases seen. The trainee should print the result of the search performed and bring it to the supervision meeting for discussion.

Attendance of accredited conferences

Trainees are allocated seven educational days each academic year to attend non-mandatory courses; for example, a Pediatric Update or an OB U/S course can be considered SDL. Trainees should provide copies of their attendance certificates.

Case presentation

The presentation of a clinical case in a department or through group activity can be considered SDL. The presentation should be evaluated by one of the clinical trainers.

Small-group activities

Trainees from the same center (of the same or different fellowship levels) can jointly engage in group activities, such as choosing a simulated scenario session (history taking/physical examination/ consultation), that is evaluated and discussed with one of the clinical trainers. All attendees of the session will be considered to have performed one SDL activity.

Practical Evidence Applied in Real Life Situations (PEARLS)

Trainees can choose one of aspect of PEARLS and discuss it during supervision meetings or present it as part of a department activity (e.g., providing a summary on whether a treatment is effective).

Practice guidelines

Trainees can choose one of the practice guidelines and discuss it during the supervision meeting or present it as part of a department activity.

Journal clubs

Trainees should, with the assistance of a clinical supervisor, select a journal article and prepare it for presentation in a journal club activity that shall be attended by all trainees.

Teaching other fellows and medical students

This involves the clinical teaching or lecturing of junior fellows, or involvement in undergraduate teaching (demonstrator)

Quality improvement/patient-safety activity (mini project)

Trainees can involve themselves in mini projects concerning quality/patient safety, which can help them learn additional practical principles.

Such activities can be either individual or group projects conducted through family-medicine rotation (as a result of time factors, this is more applicable for R4).

Participate in research or departmental projects

Depending on department/training-center needs, trainees may be involved in studies from the commencement of their family-medicine rotation, either individually or in a group of a maximum of two persons. Findings should be submitted before the end of the rotation in question.

Performing a literature review for certain topics

The clinical trainer can assign trainees certain topics and request that they perform literature reviews in regard to that area.

Designing an e-learning object: patient education/educational activities (podcasts, audiotapes, videotapes, etc.)

Trainees can design e-learning objects related to field practice in family medicine (e.g., health education or lectures for trainees/students in the form of videotapes, audiotapes, or podcasts). The material should be evaluated in regard to topic, content, design, and presentation.

- Journal club alternates with grand rounds on a weekly basis.
- Focused rounds: The ECG/EP, angiogram, and hemodynamic rounds alternate with each other.
- Joint activities are arranged between the local training centres in each geographic area.

- Workshops and courses can link with local programs in each area or nationwide programs.
- Distribution of the program sessions can be customized depending on the overall training center schedule.

Examination

Assessment Schedule for F1 and F2 levels

Throughout the program, the assessment of trainees is undertaken in accordance with the commission's training and examination rules and regulations. This includes the following:

Annual assessment

Continuous appraisal

This assessment is conducted towards the end of each training rotation throughout the academic year and also at the end of each academic year; this constitutes a continuous means of both formative and summative evaluation.

Continuous formative evaluation

This type of evaluation helps trainees identify their strengths and weaknesses and allows them to target specific areas; further, it helps faculty members recognize areas where fellows are struggling and to address problems immediately. fellows' performance will be evaluated jointly by relevant staff members, who will assess the following competencies:

- Trainee's performance during daily work
- Performance and participation in academic activities (see the "evaluation of the presenter by staff supervisor" form below)
- Performance during 10 to 20 minutes of directly observed trainee–patient interaction. Trainers are encouraged to perform at least one assessment per clinical rotation, preferably near the end of the rotation. Trainers should provide timely and specific feedback to the trainee following each assessment of trainee–patient encounters (Mini Clinical Evaluation Exercise [Mini-CEX], case-based discussions [CBDs], direct observation of practical skills [DOPS], and multisource feedback [MSF]). outcomes of these tools (mini-CEX, CBDs, MSF) can be integrated in the In-Training Evaluation Reports (ITERS).
- Trainees' performance of diagnostic and therapeutic procedural skills. The provision of timely and specific feedback from trainer to the trainee following each procedure (direct observation of procedural skills) is mandatory.
- The program director shall discuss evaluations with fellows as necessary. The evaluation form shall be submitted to the SBOMS Regional Training Supervisory Committee within four weeks of the end of the rotation.
- Academic and clinical assignments should be documented in a logbook on an annual basis. Evaluations are based on trainees' level of accomplishment in regard to the minimum requirements for the procedures and clinical skills, as determined by the program.

Summative continuous evaluation

A summative continuous evaluation report (CER) is prepared for each fellow at the end of each academic year and accounts for **50%** of the final average score; this will be distributed as follows:

- 1) Average score for ITERS (end-of-rotation evaluation reports) (**30%**)
- 2) Academic assignments (**10%**)
- 3) Logbook (**10%**)

End-of-year written examination (accounting for 50% of the final average score):

The end-of-year examination will be limited to F1 and F2 fellows. The number of examination items, eligibility, and passing score are established in accordance with the commission's training and examination rules and regulations.

Written end-of-year examination

- 1) This is a one-day exam.
- 2) Separate, different papers are provided for each level (F1 & F2).
- 3) The examination consists of two parts (accounting for **50%** of the written end-of-year examination):

Paper-1: 120 MCQs/2.5 hours, choose the single correct answer from four options. This covers all cardiology-related topics, as shown in the blueprint outlines (Appendix-U).

Blueprint outlines for Paper-1

Topic	# Question	%
Basic sciences/HTN	6	5-7
Clinical examination	6	5-7
Coronary artery disease/pre-op assessment	24	22-26
Valvular disease/pregnancy	18	16-20
Cardiomyopathies/Heart failure	18	16-20
Pericardial/systemic diseases	6	5-7
Aortic diseases	6	5-7
Arrhythmias	18	16-20
Adult congenital heart diseases/Pulmonary HTN	6	5-7
Cardiac pharmacology	6	5-7
Cardiac biostatic/ethics	6	5-7
Total	120	100%

Paper-2: Data interpretations/3 hours. This will be distributed as shown in the blueprint outlines (Appendix-V) (accounting for 50% of the written end-of-year examination).

Blueprint outlines for Paper-2

Topic	#	Format
Echo studies	5	Special answer sheet
Coronary angiograms	5	MCQs-based
Nuclear studies	6	MCQs-based
Hemodynamic tracings	2	MCQs-based
ECGs	25	Special answer sheet
CT–angio	1	MCQs-based
Total	44	

Suggested References for the Syria Board’s Final Written Examination of Cardiology

Strongly suggested references

- 1) Heart Disease: A textbook of cardiovascular medicine, by Braunwald, Zipes and Libby
- 2) Mayo Clinic Cardiovascular Board Review, by J. Murphy and M. Lloyd

Annual Promotion

Annual promotion depends on obtaining a satisfactory evaluation in rotation in the year in question, in addition to passing the end-of-year exam. An average of 60% in the end-of-year examination and continuous assessment and a minimum of 50% in each aspect of the evaluation is required to pass each evaluation item. The specific weighting of each aspect is as follows:

- 1) End-of-year written examination (50%)
- 2) Average score for ITERS (30%)
- 3) Academic assignments (10%)
- 4) Logbook (10%)

Final Adult Cardiology Board Examination (Syria Board Examination)

Eligibility

- 1) Successful completion of the required period of fellowship training (three years).
- 2) Possession of a training completion certificate issued by the local supervisory committee and based on a satisfactory FITER report, in addition to the local supervising committee's approval of the completion of the clinical requirements (via the fellow's logbook, etc.). The program directors prepare a FITER for each fellow at the end of the final year of fellowship (F3).
- 3) Registered for the examination at least one month before the exam date.

Final Adult Cardiology Board Examination (Syria Board Examination)

- 1) The Syria Board's final examination in cardiology specialty for F-3 will be held once each year on a date published on the SBOMS website (usually towards the end of the calendar year).
- 2) There shall be no resit exam.
- 3) Candidates may remain eligible for the Syria Board's cardiology specialty final examination for F-3 for a period not longer than three years, provided they can prove that they have been clinically active; if proven, a renewal of exam eligibility then requires scientific council approval.

Examination format

The final Syria board examination consists of two parts, a written and a clinical exam:

Written examination (accounting for 60% of the final score)

- 1) This examination assesses trainees' theoretical knowledge base (including recent advances) and problem-solving capabilities in the adult cardiology specialty.
- 2) The examination consists of two parts:
 - 1- **Paper-1:** 120 MCQs/2.5 hours (choose a single correct answer from four options). This covers all cardiology-related topics, as shown in the last blueprint outlines .
 - 2- **Paper-2:** Data interpretations/3 hours. This will be distributed as shown in the last blueprint outlines .
- 3) Suggested References for the Syria Board's Final Written Examination of Cardiology:
 - Strongly suggested references
 - Heart Disease- A textbook of cardiovascular medicine, by Braunwald, Zipes, and Libby
 - Mayo Clinic Cardiovascular Board Review, by J. Murphy and M. Lloyd

Clinical examination (accounting for 40% of the final score)

- 1) This examination assesses a broad range of high-level clinical skills, including data gathering, patient management, communication, and counselling.
- 2) The examination is held as an objective structured clinical examination (OSCE) and features patient-management problems (PMPs), DATA interpretation, and bedside clinical evaluation (SHORT CASES).

Passing score

The passing score is 60%; however

THE END