الهيئة السعودية للتخصصات الصحية
Saudi Commission for Health Specialties

Adult Cardiology Fellowship


بسم الله الرحمن الرحيم

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WHAT IS NEW IN THIS VERSION?

This version of the Adult Cardiology Training Program Curriculum follows the competency-based framework adopted by the Saudi Commission for Heath Specialties.

In addition, the following changes have been included in this version:

- All rotations of the training program, as well as educational activities, are described in a competency-based format and describe clear objectives that accord with the CanMEDS framework. Specifically, the competencies in question are: adult cardiology expert, communicator, collaborator, manager, health advocate, scholar, and professional. This means that the range of competencies has been expanded to include a balanced representation of knowledge, skills, and professionalism.
- Changes have been made to the timeframe of rotations: their durations are now represented in blocks instead of months.
- A list of the most important clinical topics and procedures in adult cardiology, as well as universal topics, has been added.
- Core Specialty Topics are described in detail, particularly in the areas of learning & learning objectives and knowledge & skills.
- Workshops/simulation/interpretation sessions have been listed.
- The methods of assessment for every rotation have been revised and extensively changed. Clearer demarcations of expected achievements for each stage of training are defined.
- In the evaluation process, a higher emphasis is placed on continuous assessment and balanced assessment methods, and a portfolio and logbook designed to support learning and individualized assessment have also been added.
- Promotion along with the end-of-year exam and final examination have been revised according to the new examination rules and regulations of the Saudi Commission.
- Evaluation forms and procedural logbook forms for each rotation have been added.
- Rules and regulations are referenced to throughout.

I. 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 Saudi Arabia. The World Health Organization (WHO) estimated that CVD was responsible for 46% of the 90,000 total deaths in Saudi Arabia in 2014. The economic burden to society resulting from lost productivity, healthcare costs, and costs of care for people disabled by CVD constitutes a considerable percentage of the health budget. With the population of Saudi Arabia currently standing at approximately 30 million and increasing rapidly, the need for an adequate number of cardiologists has intensified. Consequently, the Saudi Commission for Health Specialties (SCFHS) has established an adult-cardiology training program to satisfy this need. The Adult Cardiology Fellowship program was created in 1997 with five trainees based in three training centers in Riyadh. Over the years, the number of qualified adult cardiologists has grown, and there are currently 14 accredited training centers, with another awaiting accreditation. In 2014, 78 fellows were in training and 34 had been accepted for 2015.

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 Canadian Medical Education Directives for Specialists (CanMEDS) framework, which is applied in postgraduate training programs in many countries, offers a model of physician competencies that emphasizes not only medical expertise but also multiple additional nonmedical expert roles that aim to competently serve society's needs. Therefore, the Saudi Commission for Health Specialties (SCFHS) is adopting the CanMEDS framework to establish a core curriculum for all its training programs, including that of the Saudi Fellowship Certification in Adult Cardiology. Accordingly, the program will function within the seven CanMEDS roles, namely medical expert, communicator, collaborator, manager, health advocate, scholar, and professional.

The Saudi Fellowship 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 Saudi Fellowship program in Adult Cardiology, a training institution must be accredited by the SCFHS. 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 "Saudi Fellowship 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.

II. PROGRAM STRUCTURE

Admission requirements

In addition to the SCFHS general training policy, which requires classification from SCFHS 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 SCFHS certification in internal medicine or be enrolled in a SCFHS-approved training program in internal medicine. All candidates must be certified in their primary specialty in order to be eligible to sit the SCFHS 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 SCFHS.
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 SCFHS.
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 Saudi Fellowship 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 (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))
- 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.

	General Cardiology (ward/ consults)	Coronary-care Unit (CCU)	Electro-physiology (EP)	Pediatric/Adult CHD	Cardiac Cath Lab	Echo Lab	Cardiac Imaging	Stress/ Nuclear Cardiology	Research	Elective	Vacation	Total (blocks)
1st Yr	4	2	1	0	1	2	0	1	1	0	1	13
2nd Yr	3	2	1	1	1	2	0	1	0	2	1	13
3rd Yr	2	1	1	0	1	2	1	1	1	2	1	13
Total	9	5	3	1	3	6	1	3	2	4	3	39

NOTES:
The experiences outlined in items 1.3, 1.5, 2.2, 2.4, and 3 can occur longitudinally (e.g., electrocardiogram (ECG) interpretation, ambulatory clinics).

A Saudi Fellowship in Adult Cardiology certification FROM the SCFHS requires all of the following:

1) A certification in internal medicine;
2) Successful completion of a three-year SCFHS program in adult cardiology;
3) Successful completion of the certification examination in adult cardiology;
4) Successful completion of a scholarly project related to adult cardiology, as evaluated by the program director.

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.

III. TEACHING AND LEARNING

Learning opportunities in Cardiology

Cardiology has the highest competition ratio of all medical specialties. To obtain the best chance of gaining knowledge and skills, the fellow must take advantage of all of the potential learning experiences available. To do so, he must assess his learning needs and identify the areas on which he must devote most focus.

The role of the educational supervisor is to help guide the education of fellows, but it should be noted that fellows are primarily in control of furthering their own learning. As a result, before beginning a rotation fellow will find it useful to create a professional development plan with specific, measurable, and achievable objectives.

In the ward, if a fellow is not leading the ward round or clerking new admissions, he should question seniors about their decisions and management plans in order to gain more benefit from his ward experience. He should observe his seniors and the manner by which they manage patients and their relatives, as well as how they break bad news; he should then endeavor to incorporate the positive aspects of these interactions into his own discussions with patients and their relatives. In addition, he should learn practical measurement skills relevant to diagnosis and interpretation in echocardiography, as this is essential for diagnosing different cardiac diseases and guiding disease management.

While working in the coronary care unit, the fellow should take time to reflect on his current clinical performance and how he can improve or do things differently in the future. He should consider things that could have been conducted differently and whether he made any mistakes. If he is uncertain, it is worth having a discussion with his seniors or educational supervisor, as this reflection is crucial for improving future practice. As he progresses in his career, this will give him confidence in regard to the management of patients with similar presentations.

Although ward-based learning covers acute cardiovascular medicine, outpatient clinics will help the fellow gain greater insight into the management of chronic cardiovascular conditions. Specialist clinics, such as those for heart failure, hypertension, cardiomyopathy, and pacemakers are definitely worth attending. The fellow should clerk new patients and present his findings to a senior, along with a provisional management plan. This will help him learn more about the pathophysiology, investigation, and management of these patients.

The time that the fellow spends on the ward or in clinic is the perfect opportunity to have workplace-based assessments signed off. The benefit of doing these assessments properly is that the supervisor can provide formal feedback on all your clinical skills and knowledge. A workplace-based assessment should include a senior observing the fellow taking a history, examining the patient, formally presenting a case, and being questioned on it. He should tell his senior that he would like an acute-care-assessment tool completed before the ward round or before he presents his cases. For multisource feedback, it is always worth requesting feedback from people that the fellow believes do not like him; such people generally provide the harshest criticisms, meaning that the fellow can use this to determine additional means of improving his clinical performance.

The learning opportunities in cardiology are vast and there for the fellow to take. He should be keen, enthusiastic, and proactive towards making the most of his cardiology rotation. The best advice one can offer him is to enjoy his learning experience.

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 fellowsents 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) four-week 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 non-invasive 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.

Research

In order to allow the trainee to identify research principles and undertake research projects, he shall spend two (2) four-week blocks in research.

CanMEDS Cardiology competencies

Upon completion of training, the fellow will have acquired the following competencies and will function effectively as a:

Medical expert

Definition: As medical experts, cardiologists integrate all of the Saudi Fellowship roles, applying medical knowledge, clinical skills, and professional attitudes in their provision of patient-centered care. Medical expert is the central physician role in the Saudi Fellowship framework.

Key and Enabling Competencies: Cardiologists can

1) Function effectively as consultants, integrating all of the Saudi Fellowship roles to provide optimal, ethical, and patient-centered medical care
   - Perform consultations, including the presentation of well-documented assessments and recommendations in written and/or verbal form, in response to a request from another health care professional
   - Demonstrate the use of all of the Saudi Fellowship competencies relevant to cardiology
   - Identify and appropriately respond to relevant ethical issues arising in patient care
   - Demonstrate the ability to prioritize professional duties when confronted with multiple patients and problems
   - Demonstrate compassionate and patient-centered care
   - Recognize and adhere to the ethical dimensions of medical decision-making
   - Demonstrate medical expertise in situations other than patient care, such as in regard to providing expert legal testimony or advising governments

2) Establish and maintain clinical knowledge, skills, and attitudes appropriate to cardiology
   - Apply knowledge of the clinical, socio-behavioral, and fundamental biomedical sciences relevant to cardiology, including:
     - Coronary Artery Disease
       - Normal coronary anatomy
       - Physiology of normal and abnormal coronary blood flow
       - Normal and abnormal endothelial function
       - Pathogenesis of atherosclerosis

- Risk factors for atherosclerosis and their management
- Pathophysiology of acute coronary syndromes
- Non-atherosclerotic causes of ischemia and infarction
- Diagnostic techniques for coronary disease, including their sensitivity and specificity
- Pharmacology1 of anti-ischemic, antiplatelet, anticoagulant, thrombolytic, and lipid-lowering agents
- Revascularization procedures: percutaneous coronary intervention (PCI) and coronary artery bypass graft (CABG), including their indications, contraindications, and benefits
- Non-pharmacologic management of end-stage coronary artery disease
- Differences in sex that are significant in regard to the presentation, diagnosis, and management of coronary artery disease
- Ethnic differences that are important in incidences of coronary artery disease

▫ Valvular Heart Disease
- Normal valve structure and function
- Pathology of valvular disease
- Pathophysiology and hemodynamics of valvular stenosis and regurgitation
- Diagnostic techniques
- Valve surgery: indications, including timing; contraindications; benefits; and outcomes
- Prosthetic valves: types, complications, and natural history

▫ Congenital Heart Disease
- Basic cardiac embryology
- Intracardiac shunting: hemodynamics, pathophysiologic effects
- Congenital lesions in which natural survival to adulthood is likely
- Congenital lesions in which post-operative survival to adulthood is likely

▫ Congestive Heart Failure and Cardiomyopathies
- Physiology of normal and abnormal ventricular systolic and diastolic function
- Hemodynamic abnormalities in heart failure
- Neurohormonal abnormalities in congestive heart failure
- Ventricular remodeling
- Etiology, prognosis, and natural history of congestive heart failure
- Pharmacology of medications commonly used in patients with congestive heart failure
- Non-pharmacologic management options (e.g., resynchronization, surgery)

▫ Hypertension
- Definition of hypertension
- Diagnosis of hypertension
- Effect of hypertension on target organs
- Effect of treatment on mortality and complications
- Secondary causes: screening, diagnosis, and management
- Pharmacology of antihypertensive agents

▫ Pulmonary Vascular Disease
- Normal pulmonary vascular physiology
- Hemodynamics of pulmonary hypertension
- Pharmacology of pulmonary vasodilator agents

▫ Pericardial Disease
- Normal pericardial anatomy and function
- Effect of pericardial disease on cardiac hemodynamics and function

- Pathology and etiology of pericardial diseases

- Vascular Medicine
  - Cerebrovascular disease: etiology and risk factors, presentations, cardiac causes of stroke and transient ischemic attack (TIA), and treatment options
  - Pathology and etiology of aortic disease
  - Peripheral vascular disease: risk factors, clinical presentations, and treatment options
- Acute Cardiac Care
  - Hemodynamics: normal and abnormal systemic and pulmonary flows, pressures, and resistances
  - Ventilation in patients with primary cardiac disease: indications and principles of management
  - Pharmacology of inotropes, vasopressors, vasodilators
  - Systemic and non-cardiac complications in critically ill patients
  - Non-pharmacologic, mechanical support devices
- Electrophysiology
  - Normal cellular electrophysiology
  - Normal sinoatrial (SA) node, atrioventricular (AV) node, and conducting system function
  - Mechanisms of arrhythmogenesis
  - Mechanisms of conduction abnormalities
  - Pharmacology of antiarrhythmic agents
  - Temporary and permanent cardiac pacing: techniques, indications, and follow-ups
  - Implantable cardiovertor/defibrillators (ICDs)
  - Resynchronization devices
  - Invasive electrophysiology studies: indications, techniques, and complications
  - Invasive ablative techniques for tachyarrhythmias: indications, and complications
- Pregnancy in Patients with Cardiovascular Disease
  - 2.1.11.1. Normal cardiovascular physiologic changes during pregnancy and their effect in patients with heart disease
  - 2.1.11.2. Use of cardiovascular drugs during pregnancy and the peripartum period
  - 2.1.11.3. Assessment of the cardiac risks of pregnancy
  - 2.1.11.4. Preconception genetic counseling with respect to cardiac disease

- Describe the Saudi Fellowship framework of competencies relevant to cardiology
- Apply lifelong learning skills obtained from the “scholar” role to implement a personal program that allows the fellow to maintain and enhance areas of their professional competence
- Contribute to the enhancement of quality care and patient safety in cardiology, integrating the best available evidence and best practices

3) Perform a complete and appropriate assessment of a cardiac patient

- Effectively identify and explore issues to be addressed during a patient encounter, including the patient’s context and preferences
- Obtain a history that is relevant, concise, and accurate in regard to context and preferences for the purposes of prevention, health promotion, diagnosis, and/or management

- Perform a focused physical examination that is relevant and accurate for the purposes of prevention, health promotion, diagnosis, and/or management
- Select medically appropriate investigative methods in a resource-effective and ethical manner
- Demonstrate effective clinical problem-solving and judgment in regard to addressing patient problems, including interpreting available data and integrating information to generate differential diagnoses and management plans

4) Use preventive and therapeutic interventions effectively

- Implement a management plan in collaboration with a patient and their family
- Demonstrate the appropriate and timely application of preventive and therapeutic interventions relevant to cardiology
- Ensure appropriate informed consent is obtained for therapies
- Ensure patients receive appropriate end-of-life care

5) Demonstrate proficient and appropriate use of procedural skills, both diagnostic and therapeutic

- 5.1. Demonstrate the effective, appropriate, and timely interpretation and application of the results and technical performance of the following diagnostic and therapeutic procedures:
  - Clinical Electrophysiology
    - Electrocardiography
    - Exercise (stress) testing
    - Ambulatory monitors (Holter and loop recorders)
  - Echocardiography (M-mode, 2D, and Doppler)
    - Transthoracic
    - Cardiac Catheterization
    - Right heart catheterization and hemodynamics
    - Left heart catheterization and hemodynamics
    - Angiography and coronary arteriography
  - Therapeutic Procedures
    - Temporary transvenous pacemakers
    - DC cardioversion and defibrillation
    - Pericardiocentesis
- Demonstrate the effective, appropriate, and timely interpretation and application of the results of the following diagnostic and therapeutic procedures:
  - Clinical Electrophysiology
    - Permanent pacemakers and implanted devices
    - Invasive electrophysiology studies
  - Echocardiography (M-mode, 2D, and Doppler)
    - Transesophageal
    - Stress
  - Nuclear Cardiology Imaging
    - Rest and stress perfusion imaging and radionuclide angiography
  - Other Cardiac-imaging Modalities
    - Chest X-rays
  - Therapeutic Procedures
    - Intra-aortic balloon counterpulsation
- Demonstrate the effective, appropriate, and timely application of the results of the following diagnostic and therapeutic procedures:

- Other Cardiac-imaging Modalities
  - Positron Emission Tomography (PET)
  - Computed Tomography (CT)
  - Magnetic Resonance Imaging (MRI)
- Therapeutic Procedures
  - Percutaneous cardiac interventions

- Ensure appropriate informed consent is obtained for procedures
- Document and disseminate information related to procedures performed and their outcomes
- Ensure adequate follow-up is arranged for procedures performed

6) Seek appropriate consultation from other health professionals, recognizing the limits of their expertise

- Demonstrate an awareness of their own limitations in regard to expertise
- Demonstrate the ability to conduct effective, appropriate, and timely consultation with other health professionals as needed in order to provide optimal patient care
- Arrange appropriate follow-up care services for patients and their families

Communicator

Definition: As communicators, cardiologists effectively facilitate the doctor-patient relationship and the dynamic exchanges that occur before, during, and after the medical encounter.

Key and Enabling Competencies: Cardiologists can:

1) Develop rapport, trust, and ethical therapeutic relationships with patients and families

- Recognize that being a good communicator is a core clinical skill for physicians, and that effective physician-patient communication can foster patient satisfaction, physician satisfaction, adherence to treatment practices, and improved clinical outcomes
- Establish positive therapeutic relationships with patients and their families that are characterized by understanding, trust, respect, honesty, and empathy
- Respect patient confidentiality, privacy, and autonomy
- Listen effectively
- Show an awareness of, and be responsive to, nonverbal cues
- Effectively facilitate a structured clinical encounter

2) Accurately obtain and synthesize relevant information from, as well as the perspectives of, patients and their families, colleagues, and other professionals

- Gather information on diseases and suffering patients' beliefs, concerns, expectations, and illness experience
- Obtain and synthesize relevant information from other sources, such as patients' families, caregivers, and other professionals

3) Convey relevant information and explanations accurately to patients and their families, colleagues, and other professionals

- Deliver information to a patient and their family, colleagues, and other professionals in a humane manner and in such a way that it is understandable and encourages discussion and participation in decision-making

4) Develop a common understanding on issues, problems, and plans with patients, their families, and other professionals in order to develop a shared plan of care

- From a patient encounter, identify and explore problems that must be effectively addressed by considering the patient's context, responses, concerns, and preferences
- Respect diversity and difference including, but not limited to, the impact of gender, religion, and cultural beliefs on decision-making and the ability to comply with a therapeutic program
- Encourage discussion, questions, and interaction during encounters with patients
- Engage patients, families, and relevant health professionals in shared decision-making in order to develop a plan of care
- Address challenging communication issues effectively, such as obtaining informed consent, delivering bad news, and addressing anger, confusion, and misunderstanding

5) Convey effective oral and written information concerning a medical encounter

- Maintain clear, accurate, and appropriate records (e.g., written or electronic) of clinical encounters and plans
- Present verbal reports of clinical encounters and plans
- Present medical information to the public or media concerning cardiology-related medical issues

Collaborator

Definition: As collaborators, cardiologists effectively work within a health care team to achieve optimal patient care.

Key and Enabling Competencies: Cardiologists can

1) Participate effectively and appropriately in an interprofessional healthcare team

- Describe the specialist's roles and responsibilities to other professionals
- Describe the roles and responsibilities of other professionals within the health care team
- Recognize and respect the diversity of roles, responsibilities, and competences of other professionals in relation to their own
- Work with others to assess, plan, provide, and integrate care for individual patients (or groups of patients)
- Work with others to assess, plan, provide, and review other tasks, such as research problems, educational work, program reviews, or administrative responsibilities
- Participate in interprofessional team meetings
- Enter into interdependent relationships with other professions for the provision of quality care
- Describe the principles of team dynamics
- Respect team ethics, including confidentiality, resource allocation, and professionalism
- Demonstrate leadership, as appropriate, when operating as a member of a healthcare team

2) Work effectively with other health professionals to prevent, negotiate, and resolve interprofessional conflict

- Demonstrate a respectful attitude towards other colleagues and members of an interprofessional team
- Work with other professionals to prevent conflicts
- Employ collaborative negotiation to resolve conflicts
- Respect differences and address other professionals' misunderstandings and limitations
- Recognize one's own differences, misunderstandings, and limitations, which may contribute to interprofessional tension
- Reflect on the functions of an interprofessional team

Manager

Definition: As managers, cardiologists are integral participants in healthcare organizations, organizing sustainable practices, making decisions about allocating resources, and contributing to the effectiveness of the health care system.

Key and Enabling Competencies: Cardiologists can:

1) Participate in activities that contribute to the effectiveness of their health care organizations and systems
   - Work collaboratively with others within their organization
   - Participate in systemic quality process evaluation and improvement, such as patient-safety initiatives
   - Describe the structure and function of the health care system in regard to its relation to cardiology, including the roles of physicians
     - Describe the advantages and disadvantages of cardiac care in a variety of settings, including hospitals, ambulatory care clinics, offices, homecare, and chronic care and rehabilitation facilities
   - Describe the principles of health care financing in regard to its relation to cardiology, including physician remuneration, budgeting, and organizational funding

2) Manage their practice and career effectively
   - Set priorities and manage time so that they can effectively balance patient care, practice requirements, outside activities, and their personal lives
   - Manage a cardiology practice, including finances and human resources
   - Implement processes to ensure personal practice improvement
   - Appropriately employ information technology for patient care

3) Appropriately allocate finite cardiac care resources
   - Recognize the importance of the just allocation of health care resources, balancing effectiveness, efficiency, and access with optimal patient care
   - Apply evidence and management processes for cost-appropriate care

4) Serve administration and leadership roles, as appropriate
   - Chair or participate effectively in committees and meetings
   - Lead or implement changes in health care
   - Plan relevant elements of health care delivery (e.g., work schedules)

Health advocate

Definition: As health advocates, cardiologists use their expertise and influence responsibly to advance the health and well-being of individual patients, communities, and populations.

Key and Enabling Competencies: Cardiologists can:

1) Respond to individual patient health needs and issues as part of patient care
   - Identify the health needs of an individual patient
   - Identify opportunities for to perform advocacy, health promotion, and disease prevention with individuals to whom they provide care

2) Respond to the health needs of the communities that they serve
   - Describe the communities that their practice serves
   - Identify opportunities for advocacy, health promotion, and disease prevention in communities that are at risk in regard to cardiovascular disease and its complications

- Apply knowledge of primary and secondary prevention of cardiovascular disease
- Appreciate the possibility of competing interests existing between the communities served and other populations

3) Identify the determinants of health for the populations that they serve
   - Identify the biologic, psychosocial, environmental, and economic determinants of the health of the population they serve, including barriers to access to care and resources
     - Utilize this information in a management and prevention plan, and ensure access to appropriate health and social services when managing the health of individual patients
   - Identify vulnerable or marginalized populations within those served and respond appropriately

4) Promote the health of individual patients, communities, and populations
   - Describe an approach to implementing a change in a determinant of the health of the population they serve
   - Describe how public policy impacts the cardiovascular health of the populations served
   - Identify points of influence in the healthcare system and its structure
   - Describe the ethical and professional issues inherent in health advocacy, including altruism, social justice, autonomy, integrity, and idealism
   - Appreciate the possibility that, in their role as health advocates for a patient or community, conflicts mat arise with individuals operating as managers or gatekeepers
   - Describe the role of the medical profession in collectively advocating for health and patient safety

Scholar

Definition: As scholars, cardiologists demonstrate a lifelong commitment to reflective learning, as well as to the creation, dissemination, application, and translation of medical knowledge.

Key and Enabling Competencies: Cardiologists can:

1) Maintain and enhance professional activities through ongoing learning
   - Describe the principles required for maintaining competence
   - Describe the principles and strategies for implementing a personal-knowledge-management system
   - Recognize and reflect on learning issues that arise in practice
   - Conduct a personal practice audit
   - Pose appropriate learning questions
   - Access and interpret relevant evidence
   - Integrate new learning into practice
   - Evaluate the impact of any change made in regard to practice
   - Document learning processes

2) Critically evaluate medical information and its sources, and apply this appropriately to practice decisions
   - Describe the principles of critical appraisal
   - Critically appraise retrieved evidence in order to address a clinical question
   - Integrate conclusions of critical appraisals into clinical care

3) Facilitate the learning of patients, families, students, residents, other health professionals, the public and others, as appropriate

- Describe principles of learning that are relevant to medical education
- Collaboratively identify the learning needs and desired learning outcomes of others
- Select effective teaching strategies and content that can facilitate others' learning
- Effectively deliver lectures or presentations
- Assess and reflect on teaching encounters
- Provide effective feedback
- Describe the principles of ethics with respect to teaching

4) Contribute to the development, dissemination, and translation of new knowledge and practices
   - Describe the principles of research and scholarly inquiry
   - Describe the principles of research ethics
   - Pose scholarly questions
   - Conduct a systematic search for evidence
   - Select and apply appropriate methods to address questions
   - Disseminate the findings of studies through presentation or publication

Professional

Definition: As professionals, cardiologists are committed to the health and well-being of individuals and society through ethical practice, profession-led regulation, and high personal standards of behavior.

Key and Enabling Competencies: Cardiologists can:

1) Demonstrate a commitment to their patients, profession, and society through ethical practice
   - Exhibit appropriate professional behaviors in practice, including honesty, integrity, commitment, compassion, respect, and altruism
     - Understand the nature of professional interpersonal relationships and boundaries with patients, co-workers, and students
   - Demonstrate a commitment to delivering the highest-quality care and maintaining competences
   - Recognize and appropriately respond to ethical issues encountered in practice
   - Manage conflicts of interest
   - Recognize the principles and limits of patient confidentiality as defined by professional practice standards and the law
   - Maintain appropriate relations with patients

2) Demonstrate a commitment to their patients, profession and society through participation in profession-led regulation
   - Demonstrate knowledge and an understanding of the professional, legal, and ethical codes of practice
   - Fulfill the regulatory and legal obligations required of current practice
   - Demonstrate accountability to professional regulatory bodies
   - Recognize and respond to others' unprofessional behaviors in practice
   - Participate in peer reviews

3) Demonstrate a commitment to physician health and sustainable practice
   - Balance personal and professional priorities to ensure personal health and sustainable practice
   - Strive to heighten personal and professional awareness and insight
   - Recognize other professionals in need and respond appropriately

Universal Topics

Intent

These are high value, interdisciplinary topics of outmost importance to the trainee. These topics are delivered centrally in order to ensure that every trainee receives high-quality teaching and develops essential core knowledge. These topics are common to all specialties.

Topics included here meet one or more of the following criteria:

- Impactful: these are topics that are common or concern life-threatening conditions
- Interdisciplinary: topics that are difficult to teach through a single discipline
- Orphan: topics that are poorly represented in the undergraduate curriculum
- Practical: topics that trainees will encounter in hospital practice

Development and Delivery

Core topics for the PG curriculum will be developed and delivered centrally by the commission through an e-learning platform. A set of preliminary learning outcomes for each topic will be developed. Content experts, in collaboration with the central team, may modify the learning outcomes.

These topics will be didactic in nature, with a particular focus on practical aspects of care. These topics will be more content-heavy than workshops and other planned face-to-face interactive sessions.
The suggested duration of each topic is 1.30 hours.

Assessment

The topics will be delivered in a modular fashion. At the end of each learning unit there will be an on-line formative assessment. After completion of all topics there will be a combined summative assessment in the form of context-rich MCQ. All trainees must attain minimum competency in the summative assessment. Alternatively, these topics can be assessed in a summative manner along with specialty examination.

Some ideas may include case studies, high quality images, worked examples of prescribing drugs in disease states, and internet resources.

Module 1: Introduction (F1)

1) Prescribing drugs safely
2) Antibiotic stewardship
3) Blood transfusion

1) Prescribing drugs safely: At the end of the learning unit, you should be able to:
   - Recognize the importance of prescribing drugs safely in health care
   - Describe various adverse drug reactions by giving examples of commonly prescribed drugs that can cause such reactions
   - Apply principles of drug-drug interactions, drug-disease interactions, and drug-food interactions in common situations
   - Apply principles of prescribing drugs in special situations, such as renal or liver failure
   - Apply principles of prescribing drugs in elderly and pediatric age-group patients, as well as during pregnancy and lactation
   - Promote evidence-based, cost-effective prescription
   - Discuss the ethical and legal frameworks governing safe drug-prescription in Saudi Arabia

2) Antibiotic Stewardship: At the end of the learning unit, you should be able to:
   - Recognize antibiotic resistance as one of the most pressing public health threats globally
   - Describe the mechanism of antibiotic resistance

- Determine the appropriate and inappropriate use of antibiotics
- Develop a plan for a safe and proper antibiotic usage, taking appropriate indications, duration, types of antibiotic, and discontinuation into account.
- Appraise local guidelines in regard to the prevention of antibiotic resistance

3) Blood Transfusion: At the end of the learning unit, you should be able to:
- Review the different components of blood products available for transfusion
- Recognize the indications and contraindications of blood-product transfusion
- Discuss the benefits, risks, and alternatives to transfusion
- Obtain consent for specific blood-product transfusion
- Perform the necessary steps for safe transfusion
- Develop an understanding of the special precautions and procedures necessary during massive transfusions
- Recognize transfusion-associated reactions and provide immediate management

Module 2: Diabetes and metabolic disorders (F2)

1) Management of diabetic complications
2) Comorbidities of obesity
3) Abnormal ECG

1) Management of Diabetic Complications: At the end of the learning unit, you should be able to:
- Describe the pathogenesis of important complications of Type 2 diabetes mellitus
- Screen patients for such complications
- Provide preventive measures for such complications
- Treat such complications
- Counsel patients and families, with a special emphasis on prevention

2) Comorbidities of Obesity: At the end of the learning unit, you should be able to:
- Screen patients for the presence of common and important comorbidities of obesity
- Manage obesity-related comorbidities
- Provide dietary and lifestyle advice concerning the prevention and management of obesity

3) Abnormal ECG: At the end of the learning unit, you should be able to:
- Recognize common and important ECG abnormalities
- Institute immediate management, if necessary

Module 3: Medical and surgical emergencies (F3)

1) Medical and surgical emergencies

1) Medical and surgical emergencies: At the end of the learning unit, you should be able to:
- Triage and categorize patients
- Identify patients who require prompt medical and surgical attention
- Generate preliminary diagnoses-based history and physical examination
- Order and interpret urgent investigations
- Provide appropriate immediate management to patients
- Refer patients to next level of care, if needed

Module 4: Acute care (F3)

1) Acute-pain management
2) Management of fluid in hospitalized patients
3) Management of electrolyte imbalances

1) Acute-pain Management: At the end of the learning unit, you should be able to:
   - Review the physiological basis of pain perception
   - Proactively identify patients who may be experiencing acute pain
   - Assess a patient with acute pain
   - Apply various pharmacological and non-pharmacological modalities available for acute-pain management
   - Provide adequate pain relief for uncomplicated patients suffering from acute pain
   - Identify and refer patients with acute pain who may benefit from specialized pain services

2) Management of Fluid in Hospitalized Patients: At the end of the learning unit, you should be able to:
   - Review the physiological basis of water balance in the body
   - Assess a patient in regard to his/her hydration status
   - Recognize patients with over or under hydration
   - Organize fluid therapy (oral as well as intravenous) for hospitalized patients
   - Monitor fluid status and response to therapy through history-taking, performing physical examinations, and by implementing selected laboratory investigations

3) Management of Acid-Base Electrolyte Imbalances: At the end of the learning unit, you should be able to:
   - Review the physiological basis of electrolyte and acid-base balance in the body
   - Identify diseases and conditions that are likely to cause or are associated with acid/base or electrolyte imbalances
   - Correct electrolyte and acid-base imbalances
   - Perform careful calculations, checks, and other safety measures while correcting acid-base and electrolyte imbalances
   - Monitor responses to therapy through history-taking, performing physical examinations, and by implementing selected laboratory investigations

Module 5: Frail, elderly persons (F2)

1) Assessment of frail, elderly persons
2) Prescribing drugs to the elderly

1) Assessment of Frail, Elderly persons: At the end of the learning unit, you should be able to:
   - Enumerate the differences and similarities between the comprehensive assessment of elderly persons and the assessment of other patients
   - Perform a comprehensive assessment, in conjunction with other members of the health care team, of a frail, elderly person, with a special emphasis on social factors, functional status, quality of life, diet and nutrition, and medication history
   - Develop individual problem lists based on assessments of elderly persons

2) Prescribing Drugs to the Elderly: At the end of the learning unit, you should be able to:
   - Discuss the principles of prescribing drugs to the elderly
   - Recognize poly-pharmacy, prescription cascade, inappropriate dosage, inappropriate drugs, and deliberate drug exclusion as major causes of morbidity in the elderly

- Describe the physiological and functional decline in the elderly that contributes to increased drug-related adverse events
- Discuss drug-drug interactions and drug-disease interactions in the elderly
- Demonstrate familiarity with Beers criteria
- Develop a rational prescribing habit for the elderly
- Counsel elderly patients and their families on safe medication usage

Module 6: Ethics and healthcare (F1)

1) Patient advocacy
2) Ethical issues: transplantation/organ harvesting; withdrawal of care
3) Ethical issues: treatment refusal; patient autonomy
4) Role of doctors in death and dying

1) Patient Advocacy: At the end of the learning unit, you should be able to:
   - Define patient advocacy
   - Recognize patient advocacy as a core value of medical practice
   - Describe the role of patient advocates in regard to the care of patients
   - Boast a positive attitude towards patient advocacy
   - Be a patient advocate when confronted with conflicting situations
   - Be familiar with local and national patient-advocacy groups

2) Ethical issues: transplantation/organ harvesting; withdrawal of care: At the end of the learning unit, you should be able to:
   - Apply the key ethical and religious principles governing organ transplantation and withdrawal of care
   - Exhibit familiarity with the legal and regulatory guidelines regarding organ transplantation and withdrawal of care
   - Counsel patients and families in regard to applicable ethical and religious principles
   - Guide patients and families in making informed decisions

3) Ethical issues: treatment refusal; patient autonomy: At the end of the Learning Unit, you should be able to:
   - Predict situations where a patient or family is likely to decline prescribed treatment
   - Describe the concept of a “rational adult” in the context of patient autonomy and treatment refusal
   - Analyze key ethical, moral, and regulatory dilemmas in regard to treatment refusal
   - Recognize the importance of patient autonomy in the decision-making process
   - Counsel patients and families who are declining medical treatment in regard to the best interests of the patients in question

4) Role of doctors in death and dying: At the end of the Learning Unit, you should be able to:
   - Recognize the important role a doctor can play during the process of death
   - Provide emotional as well as physical care to dying patients and their families
   - Provide appropriate pain management for a dying patient
   - Identify suitable patients and refer the patient to palliative-care services

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 co-morbidity 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	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
• Describe the following for common heart conditions and diseases: ✓ 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: ✓ Indications ✓ Limitations ✓ Risks ✓ Benefits ✓ Predictive values • Explain the pharmacology of drugs used in various treatments	• 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
• Discuss groups of clinical-research studies, including: ✓ Case reports	• Critically review published research through the department journal club and presentations

✓ 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 • 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	• Participate in clinical research projects during the training period
c. Basic and Advanced Life Support Fellows should be able to:	
KNOWLEDGE	**SKILLS**
• 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	• 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. Cardiovascular Disorders a. Clinical Presentations of Cardiovascular Disease **i. Managing patients presenting with chest pain** Fellows should be able to:	
KNOWLEDGE	**SKILLS**
• Explain the causes of chest pain • Recognize the importance of individual risk-factor profiles • Describe the effect of chronic pain syndrome	• Take patient history and conduct clinical examinations • Select and interpret appropriate investigations • Formulate differential diagnoses
2. Cardiovascular Disorders a. Clinical Presentations of Cardiovascular Disease **ii. Managing patients presenting with acute shortness of breath** Fellows should be able to:	
KNOWLEDGE	**SKILLS**
• 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	• Assess and treat urgent clinical presentations of shortness of breath, including: ✓ Acute pulmonary edema ✓ Major pulmonary thromboembolism

• Describe the indications for and methods of use of assisted ventilation, e.g., continuous/bi-level positive airway pressure (CPAP/BiPAP)	✓ 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. Cardiovascular Disorders a. Clinical Presentations of Cardiovascular Disease **iii. Managing patients presenting with chronic shortness of breath** Fellows should be able to:	
KNOWLEDGE	**SKILLS**
• 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	• Diagnose and manage patients with chronic shortness of breath • Refer patients for lung function tests, such as: ✓ Spirometry ✓ Flow-velocity measurements • Interpret the results of these tests
2. Cardiovascular Disorders b. Clinical Manifestations of Cardiovascular Disease **i. Managing patients with acute heart failure** Fellows should be able to:	
KNOWLEDGE	**SKILLS**
• 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	• 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**

• 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: ✓ 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	• 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**
• 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	• Recognize life-threatening cardiac causes of syncope • Perform examinations, including carotid sinus massages • Select and interpret appropriate investigations, including: ✓ 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
• 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.	• 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**
• 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	• 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**
• 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	• Assess, manage, and give advice to critically ill patients • Recognize and manage acute conditions, including: ✓ 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: ✓ Echocardiography ✓ Pulmonary artery catheterization ✓ Hemodynamic measurements

	• 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**
• 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 post-coronary syndromes • Explain the indications, interpretation, and management of: ✓ Hemodynamic monitoring ✓ Left ventricular assist devices ✓ Intra-aortic balloon pumps • Discuss the indications for: ✓ Thrombolysis ✓ Drug therapy ✓ Urgent angioplasty • Recognize when to refer patients for angiography • Manage complications such as arrhythmias, heart failure, and shock	• 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
2. Cardiac Diseases & Disorders c. Heart Diseases and Disorders **vi. Managing patients with cardiac murmurs and valvular heart disease** Fellows should be able to:	
KNOWLEDGE	**SKILLS**
• 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.	• 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: ✓ Left heart catheterization ✓ Right heart catheterization ✓ Hemodynamic measurements.

2. Cardiac Diseases & Disorders
c. Heart Diseases and Disorders
v. Managing patients with endocarditis
Fellows should be able to:

KNOWLEDGE	SKILLS
• 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: ✓ 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	• 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
• 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: ✓ Temporary pacemakers ✓ Single-chamber permanent pacemakers ✓ Dual-chamber permanent pacemakers ✓ Electrophysiological studies ✓ Radiofrequency ablation ✓ ICDs	• 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
• 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: ✓ 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)	• Select and interpret appropriate investigations, including: ✓ Echocardiography ✓ Magnetic resonance imaging (MRI) ✓ Exercise testing ✓ Cardiac catheterization and angiography ✓ EP studies • Manage patients with a genetic susceptibility for cardiomyopathy, including: ✓ 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
• Describe the pathology, presentation, and natural history of cardiac tumors • Recognize the indications of, and timeframe for, surgical intervention in regard to specific tumors	• 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
• Describe the pathogenesis, natural history, and prognosis of pericardial diseases	• Select and interpret appropriate investigations, including echocardiography and right heart catheterization

• 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	• 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**
• 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	• Assess patients with cardiac disease undergoing non-cardiac surgery, including the performing of risk assessments of: ✓ Anesthesia ✓ Surgery • Provide risk-assessment advice to patients, anesthetists, 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**
• 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: ✓ Cardiomyopathies ✓ Connective tissue diseases (e.g., Marfan Syndrome) ✓ Channelopathies and/or inherited rhythm disturbances • Recognize features of given inherited conditions: ✓ Brugada syndrome	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

✓ 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**
• Describe the fundamentals of embryology of the heart • Describe the following features of common congenital heart diseases: ✓ 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	• 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
2. Cardiac Diseases & Disorders e. Conditions Affecting the Circulation **i. Managing patients with hypertension** Fellows should be able to:	
KNOWLEDGE	**SKILLS**
• 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	• 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
2. Cardiac Diseases & Disorders e. Conditions Affecting the Circulation **ii. Managing patients with lipid abnormalities** Fellows should be able to:	

KNOWLEDGE	SKILLS
• 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	• 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
2. Cardiac Diseases & Disorders e. Conditions Affecting the Circulation **iii. Managing patients with acute and chronic thromboembolic disease** Fellows should be able to:	
KNOWLEDGE	**SKILLS**
• 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	• Select appropriate forms of investigations and interpret their results; for example: ✓ ECGs ✓ Duplex scans ✓ Lung ventilation/perfusion (VQ) scans ✓ CT pulmonary angiography ✓ Cardiac MR • Perform and interpret: ✓ 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**
• 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	• Select and interpret appropriate non-invasive imaging, including: ✓ Echocardiography ✓ CT ✓ MRI • Assess, manage, and give advice

• 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**
• Describe the following features of pulmonary hypertension, including primary and secondary pulmonary hypertension: ✓ 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	• Perform and interpret: ✓ Hemodynamic measurements ✓ Right heart catheterization • Select drug therapy and interventions for patients with pulmonary hypertension
2. Cardiac Diseases & Disorders e. Conditions Affecting the Circulation **vi. Managing patients with systemic vascular disease** Fellows should be able to:	
KNOWLEDGE	**SKILLS**
• Describe the pathophysiology of arterial and venous diseases • Describe the natural history and clinical presentations of: ✓ 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	• 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: ✓ Doppler ultrasound imaging and flow studies ✓ Peripheral angiography investigations ✓ CT and MR angiograms

2. Cardiac Diseases & Disorders
f. Individuals and Groups at Risk
i. Managing heart disease during pregnancy
Fellows should be able to:

KNOWLEDGE	SKILLS
• 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	• 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

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

KNOWLEDGE	SKILLS
• 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	• Perform appropriate examinations on elderly persons • Discuss management strategies with patients and their family members • Work with, and contribute to, a multidisciplinary healthcare team

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

• Describe epidemiology of ischemic heart disease • Describe the investigation and management options for patients with: ✓ 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	• 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**
• 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	• 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

• 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**
• 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: ✓ 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 non-invasive cardiac- imaging modalities, including: ✓ 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	• Perform and interpret: ✓ Unsupervised transthoracic examinations ✓ Supervised transesophageal echocardiographic examinations • Apply the following modalities: ✓ 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: ✓ 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**
• Describe the indications and reporting methods for the following investigations:	• Explain correct electrode placement for rest and exercise ECGs and ambulatory ECGs

✓ 12-lead electrocardiograms ✓ Ambulatory ECG	• 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**
• 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	• 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**
• 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 cardioverter-defibrillators (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	• 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

• Describe the principles of pacemaker interrogation and programming • Discuss the importance of radiation protection • Recognize the properties of the different pacing systems used.	
3. Clinical Procedures and Investigations f. Percutaneous Coronary Intervention (PCI **i. Selecting and managing patients in regard to percutaneous coronary intervention** Fellows should be able to:	
KNOWLEDGE	**SKILLS**
• Describe the indications for percutaneous coronary intervention • Discuss current coronary intervention technologies	• Select patients for referral • Manage patients pre–procedure • Manage patients post–procedure
3. Clinical Procedures and Investigations g. Cardioversion **i. Performing chemical and direct-current cardioversion** Fellows should be able to:	
KNOWLEDGE	**SKILLS**
• Describe indications for cardioversion • Identify the requirements for anticoagulation	• Perform cardioversion safely
3. Clinical Procedures and Investigations h. Pericardiocentesis **i. Performing pericardiocentesis** Fellows should be able to:	
KNOWLEDGE	**SKILLS**
• 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	• 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.
3. Clinical Procedures and Investigations i. Ambulatory Care **i. Assessing and managing patients in the outpatient setting** Fellows should be able to:	
KNOWLEDGE	**SKILLS**
• 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	• Assess and manage patients presenting with a spectrum of symptoms • Formulate a diagnostic pathway • Identify the pharmacological treatment of cardiovascular diseases

	• Explain the implications of illnesses for patients and family members
3. Clinical Procedures and Investigations j. Cardiac Surgery **i. Assessing and managing patients before and after cardiac surgery** Fellows should be able to: should be able to:	
KNOWLEDGE	**SKILLS**
• 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: ✓ Arrhythmia management ✓ Management of hemodynamic instability ✓ Post-operative emergencies. ✓ Management of ventilated patients	• 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

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
• 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	• 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
• 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	• 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**
• 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	• 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.

Workshops/Simulations/Interpretation Sessions

Provided by the training institution or registered for by the fellow to be taken in other institutions.

Mandatory workshops/Simulations/Interpretation Sessions

1) Basic ECG-interpretation workshop (F1/F2)
2) Basic transthoracic-echo workshop (F1/F2)
3) Basic life-support course (F1/F2)
4) Advanced life-support course (F1/F2)
5) Evidence-based workshop (F1/F2)
6) Research methodology course (F1/F2)
7) Invasive hemodynamic workshop (F1/F2)
8) Cardiac imaging workshop (F3)
9) Intubation course (F3)

Recommended extra workshops/Simulations/Interpretation Sessions

1) Cardiac catheterization workshop
2) Pacemakers and AICD workshop
3) Advanced electrophysiology workshop
4) Advanced echocardiogram workshop
5) Cardiology review courses workshop
6) Basic computer-skills license workshop
7) Heart sounds and murmurs workshop
8) Echocardiogram simulation
9) Cardiac catheterization simulation
10) Arterial and venous access simulation
11) Transvenous pacemaker placement simulation
12) Pericardiocentesis simulation
13) Rhythm recognition and management simulation

14) Hemodynamic management simulation
15) Cardiac arrest simulation

Educational activities

Teaching and learning activities linked to CanMEDS—Adult Cardiology

Regular meetings

ACTIVITY	OBJECTIVES	CanMED COMPETENCIES
Morning report and case presentation	• 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	Manager, Medical expert, Professional Scholar
Morbidity and mortality report	• 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	Professional Manager, Medical expert
Grand rounds	• 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	Medical expert, Professional
Journal clubs, critical appraisal	• 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	Medical expert, Scholar, Health advocate

Half day release course (HDRC)

This course should be presented through a weekly, four-hour session. Fellows should to be released from their commitments in regard to rotations or block courses during the periods during which this course is provided.

Objectives

1) To link adult cardiology to hospital medicine
2) To enable trainees to acquire up-to-date knowledge, as well as exchange information and experiences with their colleagues and trainers

3) To incorporate the adult cardiology approach into clinical problem management
4) To acquire skills that are important for cardiologists (e.g., problem solving, team work, consultation
5) skills, negotiation skills, presentation skills)
6) To alleviate fellows' stress and allow them to socialize with colleagues of various levels

Guidelines for HDRC

1) Main Themes (60–80% of the sessions): Presentations by trainees and small groups, along with workshops facilitated by trainers. These presentations should be given in conformance with the problem-solving approach of adult cardiology, with the information provided being as evidence-based as possible.
2) To ensure maximum benefit from these sessions, the trainer must actively contribute to the session.
3) Open activity: One to two sessions per year of HDRC are set aside to facilitate free activities, in which both trainees and trainers can meet socially; this allows those involved to reduce their stress levels
4) Elective sessions per year: These sessions aim to improve certain skills of fellows in an enjoyable way. Priorities and selection in regard to the skills focused on is based on trainees' needs.
5) HDRC content should take into consideration that HDRCs are run on a four-year cycle, which is designed to accommodate learning needs (identified from feedback) as well as curriculum requirements.

Regulations

The Academic Half-Day program is a mandatory component of the fellowship program. It is designed to complement the clinical experience that fellows gain during their clinical rotations. Substantial effort should be made into making these sessions interesting and relevant.

1) For each session, there will be one fellow and one trainer responsible for conducting and organizing the entire class. The fellows should work under trainer supervision.
2) The entire group should actively participate in the preparation for, as well as during, the activities.
3) Details of each HDRC should be sent to all fellows at least one week before the presentations.
4) A trainer should supervise each trainee during the preparation of their presentation (the HDRC schedule details the supervisors' and fellows' names with corresponding dates).
5) Trainees should contact their supervisors at least two–three weeks before the presentation in order to discuss the timetable, presentation(s), methods of learning, and topics for discussion. (If the trainees have any difficulty contacting their supervisors, they should contact the program secretary.)
6) The supervising trainer should attend the presentation with the trainees in order to facilitate the entire session.
7) Educational activities should contain different educational methods and strategies, but passive learning methods such as lecturing should be avoided. These methods include, but are not restricted to, the following: problem solving, case discussion, interactive mini lectures, group discussion, role play, tutorials, workshops, and assignments.
8) In all educational sessions, emphasis should be placed on important issues relating to ethics, evidence-based medicine, practice management, disease prevention, health promotion, proper communication skills, and professionalism. Please adhere to the training preprogram mission and the Saudi Commission manual.

Trainees' Attendance

1) Attendance should be registered and a copy of the attendance record will be retained for report and documentation.
2) Each trainee must attend 100% of the HDRC sessions. During the first three months of the academic year, trainees with poor attendance shall receive a reminder or warning letter concerning their unjustified absences. Trainees who continue to show poor attendance without providing an acceptable reason will be sent a second warning letter. Further action will be taken according to the Saudi Commission rules and regulations in this regard.

HDRC table linked to CanMEDS—Adult Cardiology

Academic half days are supervised educational activities that should be conducted by the program on a weekly basis. Two trainers should supervise and monitor these activities, and each should last at least three hours. Formal assessment and evaluation of tutors should be conducted, and this feedback should be used to modify the content and tutoring of the learning and teaching activities.

ACTIVITY	OBJECTIVES	CanMEDS COMPETENCIES
Communication skills	• Develop patient-centered therapeutic communication through shared decision-making and effective dynamic interactions with patients, families, other professionals, and other important individuals • Counsel and educate patients and their parents on the role of early diagnosis and prophylaxis • Master basic interviewing skills and demonstrate competence in certain advanced interviewing skills • Exhibit professional behavior, including demonstrating respect for patients, colleagues, faculty, and others in all settings • Apply ethical knowledge in clinical care • Describe the process of informed healthcare decision-making • Discuss surrogate decision-making for incapacitated patients, including describing who can and should act as a proxy decision maker and the standards they should follow when making health care choices for another. • DNR orders, community-based DNR orders, and advance directives • Describe the legal, ethical, and emotional issues surrounding withholding and withdrawing medical therapies • Describe the legal issues related to refusals to treat patients, discharges that contravene medical advice, etc.	Manager, Medical expert, Professional Scholar
MCQs/Slides	• Train and teach fellows in regard to the manner in which this mode of assessment should be conducted • Identify weaknesses and strengths in knowledge and practice • Acquire further confidence in attending such examinations	Medical expert Scholar

ACTIVITY	OBJECTIVES	CanMEDS COMPETENCIES
Data interpretation	• Describe the different investigational tools used in adult cardiology • Improve the interpretation of different investigational data • Improve the utilization of investigational tools in both common and uncommon conditions • Recognize the limitations of various investigation tools	Medical expert Scholar
Research methodology & preparation	• Acquire basic knowledge of research design, including study design, abstract writing skills, and presentation skills • Gain competence in performing literature reviews, data synthesis, data analysis, and interpretation • Develop a viable research proposal with the help of faculty mentors • Conduct research on a topic broadly related to pediatric and pediatric subspecialties • Communicate research findings through oral presentations, poster presentations, abstract preparation, or article publication	Professional Manager Scholar
Approaches to common conditions	• Demonstrate diagnostic and therapeutic skills • Access and apply relevant information to clinical practice • Practice contemporary, evidence-based, and cost-effective medicine • Avoid unnecessary or harmful investigations or management	Medical expert Scholar Health advocate
Clinical teaching	• Practice history taking, and demonstrate competence in certain advanced interviewing skills • Master basic skills in physical examination and gain the ability to perform and interpret focused examinations • Exhibit professional behavior, including the demonstration of respect for patients, colleagues, faculty, and others in all settings • Prepare fellows for the clinical exams	Medical expert Scholar Communicator Professional

Work-based learning

ACTIVITY	OBJECTIVES	CanMEDS COMPETENCIES
Clinic-based learning (CBL)	• 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	Medical expert, Communicator, Health advocate

	• 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-round-based learning (during specialty training)	• 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	Medical expert, Communicator, Health advocate
On-call duty-based learning	• 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	Medical expert, Scholar, Communicator, Professional
Self-directed learning	• 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	Medical expert, Scholar

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.

Example of a weekly program:

	Morning activity		Midday activity	Afternoon activity	
Day	**07:45-08:00**	**08:00-08:45**	**12:00-13:00**	**13:00-16:00**	**16:00-17:00**
Sunday	Morning report	Scientific update	Imaging rounds		Focused rounds
Monday	Morning report	Cardio-surgical meeting	Lecture from an invited speaker		Echo rounds
Tuesday	Morning report	Grand round /journal club	Cath lab rounds	Core Curriculum, academic half day	
Wednesday	Morning report	Evidence-based case discussion	Research rounds		Echo rounds
Thursday	Morning report	Cardio-surgical meeting	None		None
Friday					
Saturday	Joint educational activities, workshops and courses				

- 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.

IV. ASSESSMENT

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. In order to fulfil the CanMEDS competencies based on the end-of-rotation evaluation, 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 CanMEDS-based competencies end-of-rotation evaluation form (Appendix A-K) must be completed, with the signatures of at least two consultants, within two weeks from the end of each rotation. The program director shall discuss evaluations with fellows as necessary. The evaluation form shall be submitted to the SCFHS 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 (Appendix M–S). 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) (20%)
2) Research activity (10%)
3) Academic assignments (10%)
4) 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 format

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(Appendix-T). This covers all cardiology-related topics, as shown in the blueprint outlines (Appendix-U).

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).

Suggested References for the Saudi Fellowship 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
3) Textbook of Clinical Echocardiography, by C. Otto
4) Textbook of Interventional Cardiology, by Topol

Additional references:

1) Cardiology, by M. Crawford, J. DiMarco and W. Paulus
2) Feigenbaum's Echocardiography
3) The Echo Manual, by J. Oh
4) ASE's Comprehensive Echocardiography
5) Hemodynamic Rounds, by M. Kern
6) The Art and Science of Bedside Diagnosis, by Sapira
7) Interventional Cardiology, by Singer

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 (20%)
3) Research activity (10%)
4) Academic assignments (10%)
5) Logbook (10%)

Examples

	Evaluation Item					Total
	End-of-year written examination **(50%)**	Average score for In-Training Evaluation Reports (ITERS) **(20%)**	Research activity **(10%)**	Academic assignments **(10%)**	Logbook **(10%)**	
Trainee-1	25	10	5	5	10	55/**Fail**
Trainee-1	35	8	10	8	10	71/**Fail**
Trainee-1	37	18	Did not submit	10	8	73/**Fail**
Trainee-1	30	15	6	5	5	61/**Pass**

Final Adult Cardiology Fellowship Examination (Saudi Fellowship 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, research, 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 Fellowship Examination (Saudi Fellowship Examination)

1) The Saudi Fellowship final examination in cardiology specialty for F-3 will be held once each year on a date published on the SCFHS website (usually towards the end of the calendar year).
2) There shall be no resit exam.
3) Candidates may remain eligible for the Saudi Fellowship 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 Saudi Fellowship examination consists of two parts, a written and a clinical

exam: **Written examination (accounting for 50% 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 blueprint outlines (Appendix-U).
   - **2- Paper-2:** Data interpretations/3 hours. This will be distributed as shown in the blueprint outlines(Appendix-U).

3) Suggested References for the Saudi Fellowship 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
     - Textbook of Clinical Echocardiography, by C. Otto
     - Textbook of Interventional Cardiology, by Topol

   - Additional references:
     - Cardiology, by M. Crawford, J. DiMarco and W. Paulus
     - Feigenbaum's Echocardiography
     - The Echo Manual, by J. Oh
     - ASE's Comprehensive Echocardiography
     - Hemodynamic Rounds, by M. Kern
     - The Art and Science of Bedside Diagnosis, by Sapira
     - Interventional Cardiology, by Singer

Clinical examination (accounting for 50% 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 70%; however, if the percentage of candidates passing the examination is less than 70%, the passing score can be lowered by one mark at a time until a 70% passing rate or 65% passing score is achieved, whichever comes first. Under no circumstances can the passing score be reduced below 65%.

Negative marking is NOT allowed.

Exemption

At present, SCFHS has no reciprocal arrangement with respect to this examination or qualification with any other college or board, in any specialty.

Certification

A certificate acknowledging training completion will only be issued to fellows upon successful fulfilment of all program requirements. Candidates passing all components of the final specialty examination are awarded the “Saudi Fellowship of Adult Cardiology” certificate.

V. RULES AND REGULATIONS

For additional and detailed rules and regulations, please refer to the Regulations of Training for Saudi Board Specialties:
https://www.scfhs.org.sa/MESPS/TrainingProgs/TrainingProgsStatement/Pages/index.aspx

VI. APPENDICES

Appendix A

Saudi Fellowship of Adult Cardiology In-Training Evaluation Reports (ITERS)

Form **Coronary Care Unit Rotation**

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Assessor's name: .....

Training Center: .....

CanMED Competencies (Points/selection)	Meeting Expectations			
	Rarely (1)	Usually (2)	Always (3)	N/A
A. Medical Expert				
1. Understands the pathophysiology and emergency assessment and management (pharmacological and mechanical) of patients with myocardial infarction (MI) and acute coronary syndrome (ACS).				
2. Recognizes principles of treatment of MI, as well as complications that may follow, such as: • Infarct extension • Pericarditis • Brady- & Tachy-arrhythmias • Mechanical events (acute ventricular septal defect, acute mitral regurgitation, infarct expansion and extension, pseudoaneurysm formation, and myocardial rupture with tamponade) • Hemodynamic problems unrelated to mechanical complications (left and right ventricular failure, high output states, etc.)				
3. Understands indications, and the timeframe, of specific CCU techniques, such as: • Arterial-line insertion • Central-venous-line insertion & Swan-Ganz catheter insertion • Intra-aortic balloon-pump insertion and cardiac catheterization in cases of acute MI and unstable angina • Brady- & Tachy-arrhythmias • Pericardiocentesis (under ECG, fluoroscopic, or echo guidance) • Temporary pacemaker insertion • Emergency and elective cardioversion				
4. Understands indications for, and techniques of, endotracheal intubation, ventilator management, and indications for, and techniques of, ventilator weaning.				
5. Understands the pathophysiology and management of congestive heart failure and cardiogenic shock, including appropriate pharmacologic agents and indications for intra-aortic balloon-pump insertion.				
6. Provides treatment for patients with other disorders that frequently present to the coronary care unit, such as those suffering from: • Cardiopulmonary arrest of uncertain etiology				

• Acute pulmonary embolism • Acute pericarditis without tamponade • Hypertensive crisis • Syncope of suspected cardiac origin • Aortic dissection				
B. Communicator				
1. Establishes therapeutic relationships with patients and families.				
2. Obtains and synthesizes relevant history from patients and families.				
3. Discusses appropriate information with patients and families, such as giving bad news and engaging in end-of-life discussions.				
4. Involves all appropriate health care team members (other medical, nursing and allied health care staff) in the treatment process in order to ensure accurate, effective patient management.				
5. Maintains clear, accurate, and appropriate records (written &/or electronic).				
C. Collaborator				
1. Describes the roles and responsibilities of the members of the health care team.				
2. Effectively consults with other physicians, CCU nursing staff, and other health care professionals in order to provide effective patient care.				
3. Contributes effectively to other interdisciplinary team activities, including daily CCU rounds and family conferences.				
D. Manager				
1. Works effectively and efficiently in regard to health care organization – acts as a CCU team leader (organizing junior residents and medical students).				
2. Effectively utilizes resources to balance patient care, learning needs, and outside activities.				
3. Allocates finite health care resources wisely, including the triage of patients and the prioritizing of patient assessment and admission.				
4. Utilizes information technology to help optimize patient care, life-long learning, and other activities.				
5. Demonstrates the ability to manage a CICU, including bed utilization.				
E. Health Advocate				
the important determinants of health that affect patients – in s includes providing appropriate advice regarding secondary of heart disease.				
2. Effectively contributes to improving the health of patients and communities.				
3. Recognizes and responds to issues where advocacy is appropriate.				
F. Scholar				
1. Develops, implements, and monitors a personal, continuing education strategy, along with attending and contributing to rounds, seminars, and other learning events.				
2. Critically appraises sources of medical information and appropriately applies this knowledge to health care decisions.				
3. Facilitates the learning of patients, junior residents, students, and other health professionals.				
4. Contributes to the development of new knowledge.				

G. Professional				
1. Delivers the highest-quality care with integrity, honesty, and compassion (reports facts accurately, including personal errors, and maintains appropriate boundaries between work and learning situations).				
2. Exhibits appropriate personal and interpersonal professional behavior.				
3. Practices medicine in a manner that is ethically consistent with the obligations of physicians.				
H. Rotation-specific Skills#				
1. Central venous cannulation and PA line insertion.				
2. Arterial cannulation, both radial and femoral.				
3. Temporary pacing, including transvenous/transcutaneous.				
4. Intra-aortic balloon usage.				
5. Mechanical ventilation.				
6. Echocardiography in emergent situations.				
7. Electrical cardioversion.				
I. Overall Evaluation				
1. Overall Competence = **Total # of scored points** =				
2. Overall Evaluation Score (%) = [(# of scored points) / (# of applicable items x 3)] x 100 =				
J. Comments				
Provide a general impression of the trainee's development during this rotation, including general competence, motivation, and consultant skills. Please emphasize strengths and areas that require improvement:				
K. Signatures				

..... (*I certify that I have read all of the parts of this evaluation report and that I have discussed it with the evaluators*)

Fellow name: _____

Signature: _____Date: _____

Evaluator name: _____

Signature: _____Date: _____

Program director: _____

Signature: _____Date: _____

MAH/A1/16

Appendix B

Saudi Fellowship of Adult Cardiology In-Training Evaluation Reports (ITERS)
Form Cardiac Catheterization Laboratory Rotation

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Assessor's name: .....

Training Center: .....

CanMED Competencies (Points/selection)	Meeting Expectations			
	Rarely (1)	Usually (2)	Always (3)	N/A
A. Medical Expert				
1. Knows the indications for cardiac catheterization and percutaneous and surgical revascularization.				
2. Knows the rationale of the pharmacotherapy available in the cardiac catheterization laboratory for the treatment of angina and unstable coronary syndromes.				
3. Knows the indications for urgent catheterization and intervention in unstable coronary syndromes.				
4. Knows the indications for urgent cardiac catheterization for left ventricular dysfunction, valvular heart disease, and infective endocarditis.				
5. Demonstrates diagnostic skills at the bedside, which affords accurate diagnosis and assessment of underlying cardiac pathology.				
6. Understands the clinical presentations, natural histories, and prognosis of various forms of valvular heart disease, congenital heart disease, as well as pericardial disease determined based on hemodynamic findings				
7. Knows the indications for cardiac catheterization and the appropriate timeframe for surgical intervention in various forms of valvular, coronary, congenital, and pericardial diseases.				
8. Demonstrates the confidence to perform right heart catheterization, pericardiocentesis, and insert transvenous pacemakers.				
9. Knows how to manage, and the potential complications of, cardiac catheterization, pacemaker insertion, and coronary intervention.				
10. Demonstrates confidence in obtaining arterial hemostasis following arterial sheath removal and the ability to address complications relating to arterial cannulation.				
11. Knows how to calculate intracardiac shunts, valve areas, vascular resistance, and transpulmonary gradients.				
12. Recognizes basic coronary angiographic anatomy, including major coronary arteries and their branches and common anomalies.				
13. Recognizes and can grade the angiographic severity of valvular heart disease.				
14. Recognizes and can grade left ventricular function.				
15. Recognizes and can treat acute cardiac and non-cardiac complications of cardiac catheterization.				
B. Communicator				
1. Obtains and synthesizes relevant history from patients and their families presents the history to attending physicians prior to the patients' cardiac catheterizations.				

2. Informs a patient and their family about the patient's cardiac condition, its prognosis, management, and plans for follow-ups.				
3. Writes a report of the procedure results on the chart.				
4. Writes consultation and discharge letters to referring physicians that Include angiographic findings and recommendations.				
5. Reviews angiographic findings with junior residents.				
C. Collaborator				
1. Works with the attending physician, nurses, and cardiopulmonary and X-ray technicians in the cardiac catheterization laboratory.				
2. Works appropriately with nurses in the Pre-admission Unit, the Pre and Post area, and wards prior to cardiac catheterization.				
3. Collaborates with other members of the health care team, including junior residents.				
D. Manager				
1. Utilizes catheterization laboratory equipment and time in an efficient manner – works closely with the booking and triage offices in order to implement appropriate scheduling.				
2. Respects and adheres to both the laboratory schedule and patients' needs for timely examination.				
3. Understands the indications and contraindications of cardiac catheterization.				
E. Health Advocate				
1. Helps patients identify risk factors and implement strategies for secondary prevention.				
2. Reviews the triage system for patients undergoing cardiac catheterization and prioritizes patients based on clinical details.				
3. Understands the importance of measuring the outcomes of invasive procedures including attending quarterly morbidity and mortality rounds.				
F. Scholar				
1. Recognizes gaps in his/her knowledge base and uses appropriate materials (i.e., textbooks, journals, web-based systems) to bridge this gap presents articles on invasive cardiology in the journal club).				
2. Provides instruction to other health care professionals, including referring physicians, on the results of hemodynamic testing.				
3. Contributes to the development of new knowledge				
4. Contributes to the education of patients, house staff/students, and other health care professionals.				
G. Professional				
1. Delivers care with integrity, honesty, and compassion – follows role models and the mentoring of senior attending physicians and their interactions with patients.				
2. Understands the professional, legal, and ethical codes to which physicians are bound.				
3. Recognizes limitations and seeks advice and consultation when needed.				
4. Exercises his/her own initiative, within the limits of their knowledge and training.				
5. Reports facts accurately, including personal errors.				
6. Maintains appropriate boundaries between work and learning situations.				

H. Rotation Specific Skills #				
- Technical Skills				
1. Arterial puncture, arterial cannulation, and sheath placement, including flushing.				
2. Selective intubation of left and right coronary arteries.				
3. Selective intubation of saphenous vein bypass grafts and left and right internal mammary arteries.				
4. Injection of contrast material by hand.				
5. Performance of left ventricular and aortic angiography using power injection.				
6. Techniques of right heart catheterization.				
7. Specialized procedures (i.e., insertion of an intra-aortic balloon pump).				
8. Removal of intra-arterial sheath, achievement of hemostasis, and management of complications of sheath removal.				
- Interpretive Skills				
1. Understands coronary anatomy, including its variations and anomalies.				
2. Characterizes and assesses coronary flow and collaterals and describes lesion morphology.				
3. Interprets left ventriculography and assesses left ventricular function and valvular regurgitation.				
4. Understands the hemodynamics of AS, AI, MS, MR, and LV dysfunction and congenital heart disease.				
5. Understands the oximetry of shunts.				
6. Calculates cardiac output and mitral and aortic valve areas.				
I. Overall Evaluation				
1. Overall Competence = **Total # of scored points** =				
2. Overall Evaluation Score (%) = [(# of scored points) / (# of applicable items x 3)] x 100 =				

J. Comments

Provide a general impression of the trainee's development during this rotation, including general competence, motivation and consultant skills. Please emphasize strengths and areas that require improvement:

_____

_____

K. Signatures

…… (*I certify that I have read all of the parts of this evaluation report and that I have discussed it with the evaluators*)

Fellow name: _____

Signature: _____Date: _____

Evaluator name: _____

Signature: _____Date: _____

Program director: _____

Signature: _____Date: _____

MAH/A2/16

Appendix C

Saudi Fellowship of Adult Cardiology In-Training Evaluation Reports (ITERS)

Form **Echocardiography Rotation**

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Assessor's name: .....

Training Center: .....

.

CanMED Competencies (Points/selection)	Meeting Expectations			
	Rarely (1)	Usually (2)	Always (3)	N/A
A. Medical Expert				
1. Demonstrates an understanding of cardiac anatomy, physiology, hemodynamics, and pathology.				
2. Demonstrates a thorough understanding of the principles of image formation and blood-flow-velocity measurement using ultrasound.				
3. Demonstrates familiarity with echocardiographic equipment and an understanding of its safe, effective use.				
4. Relates knowledge of the echocardiographic methods used to evaluate cardiac anatomy and function in the clinical arena.				
5. Demonstrates, when indicated, the ability to perform an excellent M-mode/2D echocardiographic examination himself/herself using all standard views and ancillary views.				
6. Demonstrates the ability to obtain accurate measurements of chamber size, wall thicknesses, valve motion, and orifice size using M-mode and 2D techniques.				
7. Discusses the echo criteria for the diagnosis of all types of valvular heart disease, myocardial disease, pericardial disease, and diseases of the great arteries.				
8. Demonstrates the ability to identify, semiquantitate, and quantitate regional and global abnormalities in ventricular function.				
9. Discusses the Doppler methods for determining flow velocities, calculating pressure gradients, determining the severity of valvular stenoses and regurgitation, measuring cardiac output, and detecting intracardiac shunts.				
10. Demonstrates the ability to reliably differentiate between normal and abnormal images and blood-flow patterns.				
B. Communicator				
1. Effectively communicates with echocardiographic technologists to ensure appropriate patient care.				
2. Obtains and synthesizes relevant history from patients and families				
3. Discusses appropriate information with patients and families, such as giving bad news and engaging in end-of-life discussions.				
4. Involves all appropriate health care team members (other medical, nursing and allied health care staff) in the treatment process in order to ensure accurate, effective patient management.				

C. Collaborator				
1. Consults effectively with attending physicians and echocardiographic technologists.				
2. Contributes effectively to other interdisciplinary team activities.				
D. Manager				
1. Effectively utilizes resources to balance patient care, learning needs, and outside activities.				
2. Allocates finite health care resources wisely.				
3. Works effectively and efficiently in health care organizations.				
4. Utilizes information technology to optimize patient care, life-long learning, and other activities.				
E. Health Advocate				
1. Uses echocardiography to help patients understand their cardiovascular illness.				
2. Uses information from echocardiography to help patients modify their cardiac-risk factors.				
3. Understands the role of echocardiography in diagnosing cardiovascular disease.				
4. Recognizes important social, environmental, and biological determinants of health.				
5. Demonstrates an interest in ensuring that patients have access to appropriate support, information, and services.				
6. Offers advocacy on behalf of patients at both practice and general population levels				
F. Scholar				
1. Develops, implements, and monitors a personal continuing education strategy, and attends and contributes to rounds, seminars, and other learning events				
2. Critically appraises sources of medical information and appropriately applies this knowledge to health care decisions.				
3. Facilitates the learning of patients, junior residents, students, and other health care professionals.				
4. Contributes to the development of new knowledge.				
G. Professional				
1. Delivers the highest-quality care with integrity, honesty, and compassion (accurately reports facts, including personal errors, and maintains appropriate boundaries in work and learning situations.				
2. Exhibits appropriate personal and interpersonal professional behaviors.				
3. Practices medicine in a manner that is ethically consistent with the obligations of a physician.				
4. Recognizes limitations and seeks advice and consultation when needed.				
5. Exercises his/her own initiative, within the limits of their knowledge and training.				
6. Accurately reports facts, including personal errors.				
7. Maintains appropriate boundaries in work and learning situations.				
H. Rotation Specific Skills #				
1. Can perform (transthoracic 2D-echo/Doppler) during rotation.				
2. Can interpret (transthoracic 2D-echo/Doppler) during rotation.				
3. Can position and direct ultrasound transducers and obtain a complete standard examination, including all desired tomographic images & Doppler flow velocity signals.				

4. Can distinguish between an adequate and an inadequate echocardiographic examination.				
5. Can perform quantitative analysis of echocardiographic study and produce a written report.				
6. Exercises proper use and care of equipment.				
I. Overall Evaluation				
1. Overall Competence = **Total # of scored points** =				
2. Overall Evaluation Score (%) = [(# of scored points) / (# of applicable items x 3)] x 100 =				
J. Comments				
Provide a general impression of the trainee's development during this rotation, including general competence, motivation, and consultant skills. Please emphasize strengths and areas that require improvement:				
K. Signatures				
..... (*I certify that I have read all of the parts of this evaluation report and that I have discussed it with the evaluators*)				
Fellow name: _____				
Signature: _____ Date: _____				
Evaluator name: _____				
Signature: _____Date: _____				
Program director: _____				
Signature: _____Date: _____				

MAH/A3/16

Appendix D

Saudi Fellowship of Adult Cardiology In-Training Evaluation Reports (ITERS)
Form Electrophysiology/ECG/Ambulatory ECG Monitoring Rotation

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Assessor's name: .....

Training Center: .....

CanMED Competencies (Points/selection)	Meeting Expectations			
	Rarely (1)	Usually (2)	Always (3)	N/A
A. Medical Expert				
1. Understands the basic mechanisms of cardiac arrhythmias.				
2. Knows the nomenclature of simple and more complex arrhythmias and the criteria for their electrocardiographic diagnosis.				
3. Knows the consequences and natural history of simple and more complex cardiac arrhythmias.				
4. Knows the principles of specialized diagnostic procedures for arrhythmia diagnosis (exercise testing, ambulatory ECGs, trans-telephonic monitoring, intracardiac electrograms, programmed stimulation, pharmacologic provocation studies).				
5. Knows the diagnostic utility, indications for, and management of maneuvers that alter autonomic tone in the treatment of arrhythmias (valsalva, carotid sinus massage, cold pressor, dive reflex).				
6. Knows how to classify antiarrhythmic drugs.				
7. Knows the relevant basic and clinical pharmacology of antiarrhythmic drugs.				
8. Knows the value and limitations of therapeutic drug monitoring in regard to its application to antiarrhythmic drug therapy.				
9. Recognizes the availability of non-pharmacologic therapies for tachyarrhythmias (catheter ablation, implanted devices).				
10. Understands the principles of and indications for bradycardia cardiac pacing, along with the general types of available devices and their uses, limitations, and complications.				
11. Understands basic pacemaker malfunction diagnoses from the ECG.				
12. Understands the indications for ICD implantation and the mechanisms of defibrillation and antitachycardia pacing.				
13. Knows the indications for tilt-table testing.				
B. Communicator				
1. Obtains and synthesizes relevant history from patients and their families presenting the history to attending physicians prior to the patient's procedure.				
2. Informs the patient and their family about the patient's cardiac condition, along with its prognosis, management, and plans for follow-ups.				
3. Writes a report of the procedure results on the chart.				
4. Writes consultation and discharge letters to referring physicians, including angiographic findings and recommendations in the correspondence.				
5. Reviews angiographic findings with junior residents.				

C. Collaborator				
1. Works effectively in a team environment.				
2. Participates in the performance of an EP study.				
3. Consults effectively with other physicians and health care providers.				
D. Manager				
1. Utilizes laboratory equipment and time in an efficient manner - works closely with the booking and triage offices in order to implement appropriate scheduling.				
2. Respects and adheres to both the laboratory schedule and patients' needs for timely examination.				
3. Understands the indications and contraindications of EP and cardiac-device implantations.				
4. Understands the cost-benefit ratio of cardiac-device implantations, particularly ICD's.				
E. Health Advocate				
1. Advocates for device implantation in appropriate patients				
2. Reviews the triage system for patients undergoing device implantation and EP studies and prioritizes patients based on clinical details.				
3. Identifies and educates patients with inherited arrhythmias.				
4. Provides vocational counseling for patients with complex or life-threatening arrhythmias.				
F. Scholar				
1. Recognizes simple and more complex arrhythmias by analyzing their ECG manifestations.				
2. Performs and analyzes maneuvers that alter autonomic tone.				
3. Assesses the hemodynamic significance of arrhythmias in patients.				
4. Knows how to administer commonly used antiarrhythmic medications.				
5. Shows familiarity with the techniques used, electrograms obtained, and clinical interpretations of invasive electrophysiologic studies.				
6. Performs consultations in regard to patients referred for assessment and writes a consultation note under the supervision of a staff electrophysiologist.				
7. Attends the arrhythmia clinic, EP studies, and pacemaker and ICD implantations.				
G. Professional				
1. Delivers the highest-quality care with integrity, honesty, and compassion (reports facts accurately, including personal errors, and maintains appropriate boundaries in work and learning situations.				
2. Exhibits appropriate personal and interpersonal professional behaviors.				
3. Practices medicine in a manner that is ethically consistent with the obligations of a physician.				
4. Recognizes his/her limitations and seeks advice and consultation when required.				
5. Exercises his/her own initiative, within the limits of their knowledge and training.				
6. Reports facts accurately, including personal errors.				

7. Maintains appropriate boundaries between work and learning situations.				
H. Rotation Specific Skills #				
1. Interpretation of ECGs.				
2. Interpretation of Holter monitor recordings.				
3. Arterial and venous cannulation, femoral.				
4. Temporary pacing, including transvenous (atrial and ventricular), transcutaneous, overdrive, and burst pacing.				
5. EP studies attended ± placement of catheters for (CS, His bundle, etc.).				
4. Electrical cardioversion.				
I. Overall Evaluation				
1. Overall Competence = **Total # of scored points** =				
2. Overall Evaluation Score (%) = [(# of scored points) / (# of applicable items x 3)] x 100 =				

J. Comments

Provide a general impression of the trainee's development during this rotation, including general competence, motivation, and consultant skills. Please emphasize strengths and areas that require improvement:

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K. Signatures

…… (*I certify that I have read all of the parts of this evaluation report and that I have discussed it with the evaluators*)

Fellow name: _____

Signature: _____Date: _____

Evaluator name: _____

Signature: _____Date: _____

Program director: _____

Signature: _____Date: _____

MAH/A4/16

Appendix E

Saudi Fellowship of Adult Cardiology In-Training Evaluation Reports (ITERS)

Form **Nuclear Cardiology/ Stress Testing Rotation**

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Assessor's name: .....

Training Center: .....

CanMED Competencies (Points/selection)	Meeting Expectations			
	Rarely (1)	Usually (2)	Always (3)	N/A
A. Medical Expert				
1. Describes normal hemodynamics at rest and normal physiological changes caused by upright or supine exercise.				
2. Demonstrates competence in the supervision of exercise stress tests and nuclear cardiology exercise procedures.				
3. Describes the determinants of coronary blood flow at rest and with exercise in patients with normal coronary arteries sufferers of coronary artery disease.				
4. Demonstrates a detailed understanding of the indications, contraindications, completion, and interpretation of cardiac exercise stress testing (including indications for pharmacological stress).				
5. Describes the basic principles of radiation physics and radiation safety as they relate to radiopharmaceutical administration in nuclear cardiology.				
6. Exhibits a basic understanding of, and describes, the principles of nuclear cardiology instrumentation and the basic structure and operation of a gamma camera.				
7. Discusses his/her understanding of the indications, contraindications, technical aspects and limitations of myocardial perfusion imaging, gated blood pool scintigraphy, and infarct avid imaging.				
8. Participates in the interpretation of all nuclear cardiology procedures.				
9. Demonstrates an understanding of probability analysis for the noninvasive detection of coronary artery disease.				
B. Communicator				
1. Establishes therapeutic relationships with patients and families.				
2. Effectively communicates with nuclear technologists and cardiac technologists (during stress testing).				
3. Obtains and synthesizes relevant history concerning patients and families				
4. Discusses appropriate information with patients and families, such as giving bad news and engaging in end-of-life discussions.				
5. Involves all appropriate health care team members (other medical, nursing, and allied health care staff) in the treatment process in order to ensure accurate, effective patient management.				
C. Collaborator				
1. Consults effectively with attending physicians and echocardiographic technologists.				

2. Contributes effectively to other interdisciplinary team activities.				
D. Manager				
1. Effectively utilizes resources to balance patient care, learning needs, and outside activities.				
2. Allocates finite health care resources wisely.				
3. Works effectively and efficiently within a health care organization.				
4. Utilizes information technology to optimize patient care, life-long learning, and other activities.				
E. Health Advocate				
1. Uses nuclear cardiology and stress testing to help patients understand their cardiovascular illness.				
2. Uses the information from nuclear cardiology and stress testing to help patients modify their cardiac risk factors.				
3. Understands the role of nuclear cardiology and stress testing in diagnosing cardiovascular disease.				
4. Recognizes important social, environmental, and biological determinants of health.				
5. Demonstrates an interest in ensuring that patients have access to appropriate support, information, and services.				
6. Offers advocacy on behalf of patients at both practice and general population levels				
F. Scholar				
1. Develops, implements, and monitors a personal continuing education strategy, attending and contributing to rounds, seminars, and other learning events				
2. Critically appraises sources of medical information and appropriately applies this knowledge to health care decisions.				
3. Facilitates the education of patients, junior residents, students and other health professionals.				
4. Contributes to the development of new knowledge.				
G. Professional				
1. Delivers the highest-quality care with integrity, honesty, and compassion (reports facts accurately, including personal errors, and maintains appropriate boundaries in work and learning situations.				
2. Exhibits appropriate personal and interpersonal professional behaviors.				
3. Practices medicine in a manner that is ethically consistent with the obligations of a physician.				
4. Recognizes his/her limitations and seeks advice and consultation when needed.				
5. Exercises his/her own initiative, within the limits of their knowledge and training.				
6. Reports facts accurately, including personal errors.				
7. Maintains appropriate boundaries in work and learning situations.				
H. Rotation Specific Skills #				
1. Ability to perform exercise and pharmacologic stress tests during rotation.				
2. Ability to interpret perfusion and angiographic results during rotation.				
3. Interpretative skills and the ability to appreciate pitfalls in diagnosis				

4. Ability to distinguish between an adequate and an inadequate examination.				
5. Ability to perform quantitative analyses of studies and to produce written reports based on these analyses.				
6. Proper use and care of equipment.				
I. Overall Evaluation				
1. Overall Competence = **Total # of scored points** =				
2. Overall Evaluation Score (%) = [(# of scored points) / (# of applicable items x 3)] x 100 =				
J. Comments				
Provide a general impression of the trainee's development during this rotation, including general competence, motivation, and consultant skills. Please emphasize strengths and areas that require improvement: _____ _____ _____ _____ _____ _____ _____				
K. Signatures				
..... (*I certify that I have read all of the parts of this evaluation report and that I have discussed it with the evaluators*) Fellow name: _____ Signature: _____Date: _____ Evaluator name: _____ Signature: _____Date: _____ Program director: _____ Signature: _____Date: _____				

Appendix F

Saudi Fellowship of Adult Cardiology In-Training Evaluation Reports (ITERS)

Form **Cardiac CT/MRI Rotation**

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Assessor's name: .....

Training Center: .....

CanMED Competencies (Points/selection)	Meeting Expectations			
	Rarely (1)	Usually (2)	Always (3)	N/A
A. Medical Expert				
1. Understands physical principles of CT/MRI in cardiovascular imaging.				
2. Understands the physical principles and instrumentation of cardiac CT and MRI.				
3. Understands the indications, contraindications, strengths, weaknesses, and clinical utility of cardiac CT and MRI				
4. Knows the normal variants and CT/MRI appearance of cardiac structures, including cardiac chambers, valves, and major blood vessels.				
5. Demonstrates a familiarity with the abnormal cardiac CT and MRI appearance of cardiac structures during disease.				
6. Understands safety issues and contraindications related to contrast.				
7. Understands the limitations of CT/MRI and diagnostic alternatives.				
B. Communicator				
1. Establishes therapeutic relationships with patients and families.				
2. Effectively communicates with nuclear technologists and cardiac technologists (during stress testing).				
3. Obtains and synthesizes a relevant history from patients and their families.				
4. Discusses appropriate information with patients and families, such as giving bad news and engaging in end-of-life discussions.				
5. Involves all appropriate health care team members (other medical, nursing, and allied health care staff) in the treatment process in order to ensure accurate, effective patient management.				
C. Collaborator				
1. Consults effectively with attending physicians and cardiac CT/CMR laboratory technologists.				
2. Contributes effectively to other interdisciplinary team activities.				
3. Works closely with the staff in the cardiac CT/CMR laboratory, including technologists, to assist in study preparation and performance, as well as patient discharge from the laboratory.				
4. Interacts and works with other physicians or allied health care professionals when performing or interpreting the cardiac CT/CMR examinations.				

D. Manager				
1. Utilizes resources effectively to balance patient care, learning needs, and outside activities.				
2. Allocates finite health care resources wisely.				
3. Works effectively and efficiently within a health care organization.				
4. Utilizes information technology to optimize patient care, life-long learning, and other activities.				
E. Health Advocate				
1. Uses cardiac CT/MRI testing to help patients understand their cardiovascular illness.				
2. Uses the information from nuclear Cardiac CT/MRI testing to help patients modify cardiac risk factors.				
3. Understands the role of Cardiac CT/MRI testing in diagnosing cardiovascular disease.				
4. Recognizes important social, environmental, and biological determinants of health.				
5. Demonstrates interest in ensuring that patients have access to appropriate support, information, and services.				
6. Offers advocacy on behalf of patients at both practice and general population levels				
F. Scholar				
1. Develops, implements, and monitors a personal continuing education strategy, attending and contributing to rounds, seminars, and other learning events concerning cardiac CT/CMR				
2. Critically appraises sources of medical information and appropriately applies this to health care decisions.				
3. Facilitates the learning of patients, junior residents, students, and other health professionals.				
4. Contributes to the development of new knowledge on cardiac CT/CMR.				
5. Critically appraises sources of medical information concerning cardiac CT/CMR and appropriately applies this to health care decisions.				
G. Professional				
1. Delivers the highest-quality care in relation to cardiac CT/CMR with integrity, honesty, and compassion (reports facts accurately, including personal errors, and maintains appropriate boundaries between work and learning situations).				
2. Exhibits appropriate personal and interpersonal professional behaviors.				
3. Practices medicine in a manner that is ethically consistent with obligations of a physician.				
4. Recognizes his/her limitations and seeks advice and consultation when needed.				
5. Exercises his/her initiative, within limits of their knowledge and training.				
6. Reports facts accurately, including personal errors.				
7. Maintains appropriate boundaries between work and learning situations.				
H. Rotation Specific Skills #				
1. Ability to perform CT/MRI tests during rotation.				
2. Ability to interpret CT/MRI tests during rotation.				

3. Technical proficiency in regard to the performance of CT/MRI protocols.				
4. Ability to distinguish between an adequate and an inadequate examination.				
5. Ability to perform quantitative analysis of a study and to produce a written report.				
6. Proper use and care of equipment.				
I. Overall Evaluation				
1. Overall Competence = **Total # of scored points** =				
2. Overall Evaluation Score (%) = [(# of scored points) / (# of applicable items x 3)] x 100 =				

J. Comments

Provide a general impression of the trainee's development during this rotation, including general competence, motivation, and consultant skills. Please emphasize strengths and areas that require improvement:

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K. Signatures

…… (*I certify that I have read all of the parts of this evaluation report and that I have discussed it with the evaluators*)

Fellow name: _____

Signature: _____Date: _____

Evaluator name: _____

Signature: _____Date: _____

Program director: _____

Signature: _____Date: _____

MAH/A6/16

Appendix G

Saudi Fellowship of Adult Cardiology In-Training Evaluation Reports (ITERS)

Form **Consultation Rotation**

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Assessor's name: .....

Training Center: .....

CanMED Competencies (Points/selection)	Meeting Expectations			
	Rarely (1)	Usually (2)	Always (3)	N/A
A. Medical Expert				
1. Obtains a history that is accurate, concise, and relevant to the patient's potential cardiac problems in the context of other medical problems that may be present.				
2. Diagnoses acute cardiac syndromes and their complications, and shows skill in regard to history-taking, conducting physical examinations, ECG interpretation, biochemical diagnosis, and the use of ancillary testing.				
3. Manages acute coronary syndromes, including through the use of appropriate pharmacologic agents, indications for invasive monitoring, and coronary angiography.				
4. Collects and organizes previous, relevant cardiological investigations.				
5. Formulates and prioritizes a problem list, placing an emphasis on the relative role of the cardiac problem in question to other problems.				
6. Initiates further investigations in a cost effective, ethical, and useful manner, placing an emphasis on acquiring information that will influence treatment and outcomes.				
7. Understands the indications for pacemaker insertion (both temporary and permanent).				
8. Obtains a history that is accurate, concise, and relevant to the patient's potential cardiac problems in the context of other medical problems that may be present.				
9. Recognizes and manages post-operative complications, including acute coronary syndromes, arrhythmias, and congestive heart failure.				
10. Develops a management plan for cardiac problems that takes into account the possible effects treatment will have on other compromised systems.				
11. Investigates and estimates cardiac risks in non-cardiac surgery and initiates strategies to reduce those risks.				
12. Understands common valvular disorders (aortic, mitral, tricuspid, pulmonic stenosis, and insufficiency).				
13. Understands common adult congenital heart disorders (ASD, VSD, Tetralogy of Fallot).				

B. Communicator				
1. Uses scarce resources appropriately.				
2. Shows knowledge of the cost effectiveness of valuable second- and third-line agents.				
3. Organizes a schedule that allows him/her to see new patients for consultation and review previously consulted patients in a time-efficient manner.				
4. Organizes and utilizes appropriate testing, especially pre-operative valuation.				
5. Understands the need to pursue cost-effectiveness when testing and treating complex patients with multi-system disease.				
6. Manages time effectively.				
7. Allocates health care resources effectively.				
8. Utilizes information technology effectively.				
9. Works effectively within a health care organization.				
10. Practices evidence-based medicine.				
C. Collaborator				
1. Works with allied health staff, such as the attending physician, nurses, and cardiopulmonary and X-ray technicians.				
2. Develops a management plan for patients' cardiac conditions in collaboration with members of the primary health care team.				
3. Coordinates the care of complex medical and surgical patients with the referring service, including the organization of investigations and other cardiac therapies.				
4. Participates in inter-disciplinary meetings and respects the opinions of others and their expertise, being cognizant of the consultative process.				
D. Manager				
1. Organizes a schedule that allows him/her to see new patients for consultation and review previously consulted patients in a time-efficient manner.				
2. Organizes and utilizes appropriate testing, especially pre-operative evaluation.				
3. Understands the need to pursue cost-effectiveness when testing and treating complex patients with multi-system disease.				
4. Manages time effectively.				
5. Allocates health care resources effectively.				
6. Utilizes information technology effectively.				
7. Works effectively within a health care organization.				
8. Practices evidence-based medicine.				
E. Health Advocate				
1. Educates patients in regard to healthy behaviors.				
2. Reviews risk factors and risk-factor modification with patients and patients' families.				
3. Encourages public policies that promote health.				
4. Is attentive to preventive measures.				
5. Is attentive to issues relating to public policy concerning health.				

6. Demonstrates interest in ensuring that patients have access to appropriate services.				
7. Offers advocacy on behalf of patients at both practice and general population levels.				
F. Scholar				
1. Recognizes the interplay of the cardiovascular system with other systems relating to health and disease and seeks to expand his/her knowledge in regard to areas that overlap.				
2. Teaches a large number of junior staff.				
3. Contributes to the development of new knowledge				
4. Contributes to the education of patients, house staff/students, and other health professionals.				
5. Intensively researches patient cases and takes an evidence-based approach to management problems.				
6. Accepts and acts on constructive feedback				
G. Professional				
1. Delivers evidence-based care with integrity, honesty, and compassion.				
2. Understands the professional, legal, and ethical codes to which physicians are bound.				
3. Develops appropriate patient-doctor relationships.				
4. Recognizes his/her limitations and seeks advice and consultation, when required.				
5. Exercises his/her own initiative, within the limits of their knowledge and training.				
6. Reports facts accurately, including personal errors.				
I. Overall Evaluation				
1. Overall Competence = **Total # of scored points** =				
2. Overall Evaluation Score (%) = [(# of scored points) / (# of applicable items x 3)] x 100 =				
J. Comments				
Provide a general impression of the trainee's development during this rotation, including general competence, motivation, and consultant skills. Please emphasize strengths and areas that require improvement: _____				
K. Signatures				
(*I certify that I have read all of the parts of this evaluation report and that I have discussed it with the evaluators*)				
Fellow name: _____				
Signature: _____ Date: _____				
Evaluator name: _____				
Signature: _____ Date: _____				
Program director: _____				
Signature: _____ Date: _____				

Appendix H

Saudi Fellowship of Adult Cardiology In-Training Evaluation Reports (ITERS)

Form **Cardiology Ward Rotation**

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Assessor's name: .....

Training Center: .....

CanMED Competencies (Points/selection)	Meeting Expectations			
	Rarely (1)	Usually (2)	Always (3)	N/A
A. Medical Expert				
1. Obtains a history that is accurate, concise, and relevant to the patient's potential cardiac problems in the context of other medical problems that may be present.				
2. Diagnoses acute cardiac syndromes and their complications, including skills in regard to history-taking, conducting physical examinations, ECG interpretation, biochemical diagnosis, and the use of ancillary testing				
3. Manages acute coronary syndromes, including through the use of appropriate pharmacologic agents, indications for invasive monitoring, and coronary angiography.				
4. Collects and organizes previous, relevant cardiological investigations				
5. Understands the pathophysiology and management of congestive heart failure, including appropriate pharmacologic agents and indications for cardiac transplantation.				
6. Understands pathophysiology and the treatment of common heart rhythm disturbances (including heart blocks bradyarrhythmias and tachyarrhythmias and their treatments).				
7. Understands the indications for pacemaker insertion (both temporary and permanent)				
8. Shows skills in cardiac physical diagnosis.				
9. Shows skills in electrocardiographic interpretation.				
10. Understands management strategies for patients post MI.				
11. Understands the role and issues surrounding secondary prevention in patients with coronary artery disease.				
12. Understands common valvular disorders (aortic, mitral, tricuspid, pulmonic stenosis, and insufficiency).				
13. Understands common adult congenital heart disorders (ASD, VSD, Tetralogy of Fallot).				
B. Communicator				
1. Communicates appropriately with patients.				
2. Communicates with other medical, nursing, and allied healthcare staff.				
3. Prepares concise discharge and transfer summaries that include all relevant information.				
4. Establishes therapeutic relationships with patients/families.				

5. Delivers comprehensible information to patients/families.				
6. Provides effective counseling to patients/ families.				
7. Allocates health care resources effectively.				
8. Maintains professional relationships with other health care providers.				
9. Provides clear and complete records and reports (including oral reports).				
10. Practices evidence-based medicine.				
C. Collaborator				
1. Works with the attending and other medical staff.				
2. Works with nursing and allied health staff.				
D. Manager				
1. Organizes a schedule that allows him/her to see new patients for consultations and to review previously consulted patients in a time-efficient manner.				
2. Organizes and utilizes appropriate testing, especially pre-operative evaluation.				
3. Manages bed availability in order to allow the admission of new patients.				
4. Manages time effectively.				
5. Allocates health care resources effectively.				
6. Utilizes information technology effectively.				
7. Works effectively within a health care organization.				
8. Practices evidence-based medicine.				
E. Health Advocate				
1. Educates patients in regard to healthy behaviors.				
2. Reviews risk factors and risk-factor modification with patients and their families.				
3. Encourages public policies to promote health.				
4. Is attentive to preventive measures.				
5. Is attentive to issues of public policy for health.				
6. Demonstrates interest in ensuring that patients have access to appropriate services.				
7. Offers advocacy on behalf of patients at both practice and general population levels.				
F. Scholar				
1. Recognizes the interplay of the cardiovascular system with other systems relating to health and disease and seeks to expand his/her knowledge in regard to areas that overlap.				
2. Teaches a large number of junior staff.				
3. Contributes to the development of new knowledge				
4. Contributes to the education of patients, house staff/students, and other health professionals.				

5. Intensively researches patient cases and takes an evidence-based approach to the management of problems.				
6. Accepts and acts on constructive feedback				
G. Professional				
1. Delivers evidence-based care with integrity, honesty, and compassion.				
2. Understands the professional, legal, and ethical codes to which physicians are bound.				
3. Develops appropriate patient-doctor relationships.				
4. Recognizes his/her limitations and seeks advice and consultation, when it is required.				
5. Exercises his/her initiative, within the limits of their knowledge and training.				
6. Reports facts accurately, including personal errors.				
I. Overall Evaluation				
1. Overall Competence = **Total # of scored points** =				
2. Overall Evaluation Score (%) = [(# of scored points) / (# of applicable items x 3)] x 100 =				

J. Comments

Provide a general impression of the trainee's development during this rotation, including general competence, motivation, and consultant skills. Please emphasize strengths and areas that require improvement:

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K. Signatures

…… (*I certify that I have read all of the parts of this evaluation report and that I have discussed it with the evaluators*)

Fellow name: _____

Signature: _____Date: _____

Evaluator name: _____

Signature: _____Date: _____

Program director: _____

Signature: _____Date: _____

MAH/A8/16

Appendix I

Saudi Fellowship of Adult Cardiology In-Training Evaluation Reports (ITERS)

Form **Adult Congenital Heart Disease Rotation**

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Assessor's name: .....

Training Center: .....

CanMED Competencies (Points/selection)	Meeting Expectations			
	Rarely (1)	Usually (2)	Always (3)	N/A
A. Medical Expert				
1. Understands cardiac embryology and the embryologic development of the cardiovascular system.				
2. Understands simple congenital heart defects (isolated ASD, VSD, ductus arteriosus, pulmonary valve stenosis/regurgitation, mitral valve defects, tricuspid valve defects, bicuspid aortic valve, isolated aortic coarctation, and repaired partial anomalous pulmonary venous connection).				
3. Diagnoses adults with simple congenital heart disease, and also shows skills in regard to history-taking, conducting physical examinations, ECG interpretation, chest x-ray interpretation and other radiographic interpretation (CXR/MRI), and the use of ancillary testing.				
4. Manages adult patients with simple congenital heart defects, employing the appropriate use of diagnostic testing, pharmacologic agents, indications for surgical intervention, percutaneous intervention, and coronary angiography.				
5. Understands the long-term outcomes and complications that can arise in adults with complex, congenital heart defects and who have the ability to develop common clinical conditions related to congenital heart conditions, i.e., congestive heart failure.				
6. Understands the common surgical procedures for patients with congenital heart disease.				
7. Understands the indications for pacemaker insertion and electrophysiologic interventions.				
8. Understands the effects of common congenital cardiac conditions in pregnancy.				
9. Shows skills in regard to electrocardiographic interpretation, which pertains to patients with congenital heart disease.				
10. Shows skills in regard to echocardiographic interpretation, which pertains to patients with simple congenital heart disease.				
B. Communicator				
1. Obtains a history of patients and their families, as this is particularly important in regard to the congenital heart disease population.				
2. Understands the effects of congenital heart disease on the family.				

3. Establishes therapeutic relationships with patients/families.				
4. Delivers understandable information concerning simple congenital heart defects to patients/families.				
5. Provides effective counseling to patients/ families.				
6. Allocates health care resources effectively.				
7. Maintains professional relationships with other health care providers.				
8. Provides clear and complete records and reports (including oral reports).				
9. Practices evidence-based medicine.				
C. Collaborator				
1. Works effectively with other physicians involved in patient care.				
2. Works effectively in a team environment.				
3. Consults effectively with other physicians and other health care providers				
D. Manager				
4. Manages time effectively.				
5. Allocates health care resources effectively.				
6. Utilizes information technology effectively.				
7. Works effectively within a health care organization.				
8. Practices evidence-based medicine.				
4. Manages time effectively.				
E. Health Advocate				
1. Educates patients on healthy behaviors.				
2. Reviews risk factors and risk-factor modification with patients and their families.				
3. Encourages public policies to promote health.				
4. Is attentive to preventive measures.				
5. Is attentive to issues of public policy for health.				
6. Demonstrates interest in ensuring that patients have access to appropriate services.				
7. Offers advocacy on behalf of patients at both practice and general population levels.				
F. Scholar				
1. Recognizes the interplay of the cardiovascular system with other systems relating to health and disease and seeks to expand his/her knowledge in regard to areas that overlap.				
2. Teaches a large number of junior staff.				
3. Contributes to the development of new knowledge				
4. Contributes to the education of patients, house staff/students, and other health professionals.				

5. Intensively researches patient cases and takes an evidence-based approach to the management of problems.				
6. Accepts and acts on constructive feedback				
G. Professional				
1. Delivers evidence-based care with integrity, honesty, and compassion.				
2. Understands the professional, legal, and ethical codes to which physicians are bound.				
3. Develops appropriate patient-doctor relationships.				
4. Recognizes his/her limitations and seeks advice and consultation, when it is required.				
5. Exercises his/her own initiative, within the limits of their knowledge and training.				
6. Reports facts accurately, including personal errors.				
I. Overall Evaluation				
1. Overall Competence = **Total # of scored points** =				
2. Overall Evaluation Score (%) = [(# of scored points) / (# of applicable items x 3)] x 100 =				
J. Comments				
Provide a general impression of the trainee's development during this rotation, including general competence, motivation, and consultant skills. Please emphasize strengths and areas that require improvement:				
K. Signatures				
..... (*I certify that I have read all of the parts of this evaluation report and that I have discussed it with the evaluators*)				
Fellow name: _____				
Signature: _____ Date: _____				
Evaluator name: _____				
Signature: _____ Date: _____				
Program director: _____				
Signature: _____ Date: _____				

Appendix J

Saudi Fellowship of Adult Cardiology In-Training Evaluation Reports (ITERS)

Form **Research Rotation**

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Assessor's name: .....

Training Center: .....

CanMED Competencies (Points/selection)	Meeting Expectations			
	Rarely (1)	Usually (2)	Always (3)	N/A
A. Medical Expert				
1. Understands the different types of research, ethical issues, legal issues, and statistical knowledge involved in the design of a research project, and can develop the rationale/access feasibility of the proposal.				
2. Critically appraises literature.				
B. Communicator				
1. Writes research proposals, ethics, submissions, and consent forms as required.				
2. Writes interim research reports.				
3. Presents of data in oral, abstract, and manuscript form.				
4. Presents at peer reviewed meetings.				
C. Collaborator				
1. Shows the ability to collaborate with all health care professionals and scientists involved in research				
D. Manager				
1. Show skill in setting a budget for proposed or ongoing research.				
2. Shows time-management skills in regard to balancing research with ongoing clinical commitments.				
E. Health Advocate				
1. Evaluates research initiatives with patients' best interests in mind.				
2. Evaluates all research initiatives using ethics principles as a primary basis.				
F. Scholar				
1. Shows knowledge of basic skills, including literature-searching and grant-proposalwriting skills.				
2. Reviews drafts with his/her supervisor and presents at meetings.				
G. Professional				
1. Conducts all research with the primary objective of maintaining the highest level of professional conduct.				
2. Develops insights into presenting their personal strengths and weakness in the research arena.				
3. Understands ethical codes of behavior.				

I. Overall Evaluation				
1. Overall Competence = **Total # of scored points** =				
2. Overall Evaluation Score (%) = [(# of scored points) / (# of applicable items x 3)] x 100 =				
J. Comments				
Provide a general impression of the trainee's development during this rotation, including general competence, motivation, and consultant skills. Please emphasize strengths and areas that require improvement: _____				
K. Signatures				
..... *(I certify that I have read all of the parts of this evaluation report and that I have discussed it with the evaluators)*				
Fellow name: _____				
Signature: _____ Date: _____				
Evaluator name: _____				
Signature: _____ Date: _____				
Program director: _____				
Signature: _____ Date: _____				

Appendix K

Saudi Fellowship of Adult Cardiology In-Training Evaluation Reports (ITERS)

Form **Ambulatory Care (Outpatient Department) Rotation**

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Assessor's name: .....

Training Center: .....

CanMED Competencies (Points/selection)	Meeting Expectations			
	Rarely (1)	Usually (2)	Always (3)	N/A
A. Medical Expert				
1. Understands the clinical presentation, natural history, and prognosis of out-patient cardiac conditions found in various general and subspecialty clinics.				
2. Knows the diagnostic tools available to investigate cardiac conditions.				
3. Understands the indications and pharmacology for the use of cardiac medications.				
4. Knows the indications and contraindications for cardiac diagnostic tests and interprets these tests in the context of their patient's cardiac condition.				
5. Enhances his/her cardiac history and physical examination skills as well as their pathophysiology correlation.				
B. Communicator				
1. Informs patients and their families about their problem, prognosis, management and follow-ups using non-medical terminology.				
2. Dictates concise and informative letters to referring physicians.				
C. Collaborator				
1. Works with nurses and other clinic staff.				
2. Performs tasks reliably.				
D. Manager				
1. Pursues precise, cost-effective, evidence-based medicine.				
2. Organizes time effectively to remain on schedule in regard to patient appointments.				
E. Health Advocate				
1. Prioritizes patient appointments based on clinical factors.				
2. Identifies and treats cardiac risk factors.				
3. Educates patients in regard to heart-healthy lifestyles.				
4. Provides vocational counseling for patients with cardiac illnesses.				
F. Scholar				
1. Recognizes gaps in knowledge regarding patient problems and develops strategies to fill these gaps through reading and consultation with other health care team members.				
2. Schedules a reading timetable and complies with schedules for lifelong learning.				

3. Familiarizes themselves with tools such as Medline.				
G. Professional				
1. Delivers care with integrity, honesty, and compassion.				
2. Understands the professional, legal, and ethical codes to which physicians are bound.				
3. Is prepared for constructive criticism.				
I. Overall Evaluation				
1. Overall Competence = **Total # of scored points** =				
2. Overall Evaluation Score (%) = [(# of scored points) / (# of applicable items x 3)] x 100 =				
J. Comments				
(I certify that I have read all of the parts of this evaluation report and I have discussed it with the evaluators) Fellow name: _____ Signature: _____Date: _____ Evaluator name: _____ Signature: _____ Date: _____ Program director: _____ Signature: _____Date: _____				

Appendix L

Saudi Fellowship of Adult Cardiology **Final in-Training Evaluation Report (FITER) Form**					
CanMED Competencies		**Expectations**			
		Rarely meets	**Inconsistently meets**	**Generally, meets**	**Exceeds**
A. Medical Expert					
At a consultant level:					
1. Demonstrates expertise and applies basic scientific knowledge relevant to adult cardiology.					
2. Demonstrates expertise and applies clinical knowledge relevant to adult cardiology.					
3. Obtains and records a complete, accurate, and organized cardiovascular history.					
4. Performs and records a complete, accurate, and organized cardiovascular physical examination.					
5. Integrates pertinent information to assist him/her in making appropriate clinical decisions, including differential diagnoses and management plans.					
6. Orders appropriate laboratory investigations, interprets the results accurately, and modifies patient management accordingly.					
7. Applies the principles of cardiovascular pharmacology and therapeutics to the care of the adult patients.					
8. Recognizes and manages emergency conditions and acutely ill or unstable patients promptly, effectively, and efficiently (includes acute cardiac care in CCU/ICU).					
9. Demonstrates expertise in the basic principles of cardiac surgery and extracorporeal cardiac support					
10. Delivers appropriate peri-operative care to cardiac patients undergoing cardiac or non-cardiac surgery.					
Procedures and Clinical Skills					
1. Demonstrates the effective, appropriate, and timely interpretation of images, application of results, and technical performance of the following diagnostic and therapeutic procedures:					
a. Clinical Electrophysiology	• Electrocardiography.				
	• Exercise (stress) testing.				
	• Ambulatory monitors (Holter/loop recorders).				
b. Echocardiography (M-mode, 2D, & Doppler) ...	• Transthoracic echocardiography (TTE).				
c. Cardiac Catheterization	• Right heart catheterization and hemodynamics.				
d. Therapeutic Procedures	• Temporary transvenous pacemakers.				
	• DC cardioversion and .defibrillation.				
	• Pericardiocentesis.				
2. Demonstrates the effective, appropriate, and timely interpretation of images and application of results of the following diagnostic and therapeutic procedures:					
a. Clinical Electrophysiology	• Permanent pacemakers and implanted devices.				
	• Invasive electrophysiology studies.				

b. Echocardiography (M-mode, 2D, & Doppler) ...	• Transesophageal.				
	• Stress echocardiography.				
c. Nuclear Cardiology Imaging	• Rest and stress perfusion imaging and radionuclide angiography.				
d. Cardiac Catheterization	• Left heart catheterization and hemodynamics.				
	• Angiography and coronary arteriography.				
e. Other Cardiac Imaging Modalities	• Chest X-rays.				
f. Therapeutic Procedures.	• Intra-aortic balloon counterpulsation.				
A. Medical Expert					
Procedures and Clinical Skills:					
3. Demonstrates the effective, appropriate, and timely application of results relating to the following diagnostic and therapeutic procedures:					
a. Other Cardiac Imaging Modalities	• PET, CT, and MRI.				
b. Therapeutic Procedures	• Percutaneous cardiac interventions.				
4. Minimizes risks and discomfort for the patient					
5. Overall, is proficient in regard to clinical and procedural skills					
B. Communicator					
1. Establishes a therapeutic relationship with adult patients and families, listens effectively, and provides clear and thorough explanations.					
2. Prepares documentation (records and reports) that is accurate, appropriately detailed, organized, and timely.					
C. Collaborator					
1. Collaborates effectively and constructively with other members of the cardiac care team and contributes effectively to team activities.					
2. Consults effectively with other physicians and health professionals.					
3. Interacts effectively with other health professionals in the cardiac team by recognizing and acknowledging their roles and expertise.					
4. Establishes good relationships with peers and other health professionals. Provides and receives information effectively.					
D. Manager					
1. Implements the cost effective use of health care resources.					
2. Sets realistic priorities and uses time and resources effectively					
3. Demonstrates leadership skills in organizing, delegating, and coordinating the work of the health care team.					
4. Describes the principles of quality assurance and improvement programs and their application in improving patient care.					
5. Demonstrates expertise in and makes effective use of information technology (e.g., searching medical databases) as a means of enhancing patient care.					
E. Health Advocate					
1. Identifies the determinants of cardiovascular health in individual patients.					
2. Identifies patients and patient groups who are at increased risk of developing cardiovascular disease and implements appropriate prevention strategies					
3. Recognizes and acts upon issues and opportunities for health advocacy.					
F. Scholar					
1. Develops and implements an ongoing, effective learning strategy.					
2. Applies the principles of evidence-based standards of care.					
3. Completes a research project to the satisfaction of the Fellowship Program Committee.					

4. Critically appraises and integrates medical information from different sources.				
5. Helps others learn by providing guidance, teaching, and constructive feedback.				
6. Demonstrates awareness of the importance of research to the advancement of medical knowledge and supports and participates in scientific inquiry.				
7. Provides verbal communications (case presentations, rounds, conferences etc.) that are lucid, appropriately detailed, and well organized.				
G. Professional				
1. Practices with integrity, honesty, compassion, and respect for diversity.				
2. Fulfills the medical, professional, and legal obligations of a specialist.				
3. Describes and applies the principles of medical ethics, including informed consent.				
4. Demonstrates an awareness of personal limitations, seeking and accepting advice when necessary.				
5. Observes appropriate boundaries in regard to professional relationships with patients, families, colleagues, and students.				

H. Overall Evaluation

In the opinion of the Fellowship Program Committee, this fellow has acquired the competencies of the specialty/subspecialty as prescribed in the Objectives of Training and is sufficiently competent to practice as a specialist.

YES ☐ **NO** ☐

The following sources of information were used for this evaluation:

- ☐written examinations
- ☐clinical observations (e.g., ITERs) by faculty members
- ☐completion of a scholarly project
- ☐feedback from health care professionals
- ☐logbook
- ☐oral examinations
- ☐Structured Assessment of a Clinical Encounter (STACER)
- ☐OSCEs
- ☐other evaluations_____

I. Signatures

…… (*I certify that I have read all of the parts of this evaluation report and that I have discussed it with the evaluators*)

Fellow name: _____

Signature: _____ Date: _____

Program director: _____

Signature: _____ Date: _____

Director of Academic Affairs: _____

Signature: _____Date: _____

Appendix M

Saudi Fellowship of Adult Cardiology - Interpretation and Procedural Logbook Coronary Care Unit Rotation

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Program director: .....

Training Center: .....

Required competencies	Minimum required number			Actual number obtained during this rotation
	F1	F2	F3	
1. Central venous cannulation and PA line insertion	10	10	5	
2. Arterial cannulation, both radial and femoral	10	10	5	
3. Temporary pacing, including transvenous and transcutaneous	4	4	2	
4. Intra-aortic balloon management	6	6	3	
5. Mechanical ventilation management	8	8	4	
6. Performance or interpretation of echocardiography in the CCU	10	10	5	
7. Electrical cardioversion	4	4	2	

#	Study date	Hospital MRN	Study type	Diagnosis	Supervisor's signature
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Appendix N

Saudi Fellowship of Adult Cardiology - Interpretation and Procedural Logbook

Cardiac Catheterization Laboratory Rotation

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Program director: .....

Training Center: .....

Required competencies	Minimum required number			Actual number obtained during this rotation
	F1	F2	F3	
1. Arterial puncture, arterial cannulation, and sheath placement	20	30	40	
2. Selective intubation of left and right coronary arteries	10	20	40	
3. Performance of right heart catheterizations	10	10	10	
4. Selective intubation of bypass grafts and internal mammary arteries	0	10	10	
5. Participated in performing PCI and special procedures (e.g., IABP)	0	10	10	

#	Study date	Hospital MRN	Study type	Diagnosis	Supervisor's signature
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Appendix O

Saudi Fellowship of Adult Cardiology - Interpretation and Procedural Logbook Echocardiography Rotation

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Program director: .....

Training Center: .....

Required competencies	Minimum required number			Actual number obtained during this rotation
	F1	**F2**	**F3**	
1. Partial transthoracic echo study	50	30	10	
2. Complete transthoracic echo study	30	50	70	
3. Attendance of transesophageal echo studies	10	10	10	
4. Performance of dobutamine stress echocardiogram	10	10	10	
5. Participation in the interpretation	50	40	30	
6. Completion of a preliminary report	50	80	100	

#	Study date	Hospital MRN	Study type	Diagnosis	Supervisor's signature
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					

Appendix P

Saudi Fellowship of Adult Cardiology - Interpretation and Procedural Logbook Electrophysiology/ECG/Ambulatory ECG Monitoring Rotation

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Program director: .....

Training Center: .....

Required competencies	Minimum required number			Actual number obtained during this rotation
	F1	**F2**	**F3**	
1. 12-lead ECG interpretation	1000	1500	1500	
2. Ambulatory ECG (Holter monitor) interpretation	50	50	50	
3. Femoral arterial and venous cannulation	10	15	20	
4. Placement of intracardiac electrodes	5	10	15	
5. Attending of EP studies	10	15	20	
6. Attending/performing temporary pacing	10	10	10	
7. Attending/conducting electrical cardioversion	5	5	5	

#	Study date	Hospital MRN	Study type	Diagnosis	Supervisor's signature
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Appendix Q

Saudi Fellowship of Adult Cardiology - Interpretation and Procedural Logbook

Nuclear Cardiology/ Stress Testing Rotation

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Program director: .....

Training Center: .....

Required competencies	Minimum required number			Actual number obtained during this rotation
	F1	F2	F3	
1. Treadmill stress test	60	60	60	
2. Pharmacological stress test	20	20	20	
3. Interpretation of stress-test result	80	80	80	
4. Interpretation of nuclear-scan findings	40	40	40	

#	Study date	Hospital MRN	Study type	Diagnosis	Supervisor's signature
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

Appendix R

Saudi Fellowship of Adult Cardiology - Interpretation and Procedural Logbook

Cardiac CT/MRI Rotation

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Program director: .....

Training Center: .....

Required competencies	Minimum required number			Actual number obtained during this rotation
	F1	F2	F3	
1. Participated in performing CT	-	-	10	
2. Participated in performing MRI	-	-	10	
3. Participated in CT interpretation	-	-	20	
4. Participated in MRI interpretation	-	-	20	

#	Study date	Hospital MRN	Study type	Diagnosis	Supervisor's signature
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

Appendix S

Saudi Fellowship of Adult Cardiology - Interpretation and Procedural Logbook

Adult Congenital Heart Disease Rotation

Fellow's Name: .....

Level of Training: ☐F1 ☐F2 ☐F3 **Rotation period**: from ..... to .....

Program director: .....

Training Center: .....

Required competencies	Minimum required number			Actual number obtained during this rotation
	F1	F2	F3	
1. CHD cases seen and managed	-	100	-	
2. CHD Echo performed or interpreted	-	200	-	
3. CHD, CT, or MRI interpreted	-	50	-	

#	Study date	Hospital MRN	Study type	Diagnosis	Supervisor's signature
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					

Appendix T

Example MCQ Questions

Q1
Answer: B

Section	Hypertension
Domain	Treatment
Level	Part 1
Cognition	K1

In the emergency treatment of accelerated hypertension:

A. Intravenous sodium nitroprusside is usually necessary to control severe hypertension
B. Parenteral therapy is preferable to oral therapy
C. Vasodilator therapy to reduce the afterload should be used
D. ACE inhibitors are indicated if renal artery stenosis is suspected

Q2
Answer: A

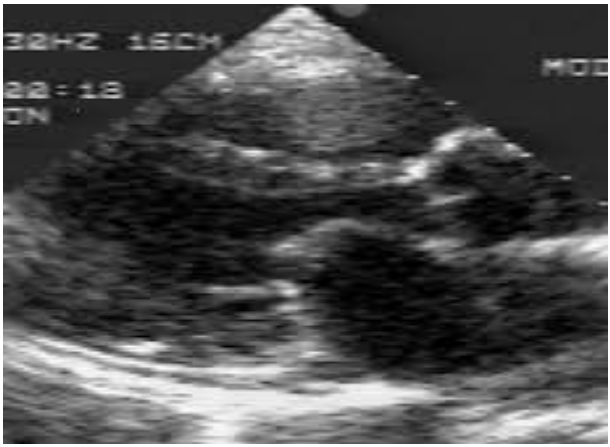
Section	Cardiac Pharmacology
Domain	Treatment
Level	Part 1
Cognition	K 1

Which of the following is not a side effect of ACE inhibitors?

A. A. Hypokalemia
B. B. Coughing
C. C. Agranulocytosis
D. D. Hypotension

Q3
Answer: D

Section	Valvular diseases
Domain	Diagnosis
Level	Part 1
Cognition	K2



This two-dimensional echocardiogram was most likely recorded in which of the following patients?

A. A 54-year-old man with syncopal episodes who is bending forward
B. A previously healthy 68-year-old man with sudden onset of pulmonary edema and a new holosystolic murmur
C. A 17-year-old girl with atypical chest pain and a midsystolic click
D. A 42-year-old woman with palpitations, exertional dyspnea, and episodes of hemoptysis

Q4 (Item ID)
Answer: C

Section	Arrhythmias
Domain	Pathophysiology
Level	Part 1
Cognition	K2

In a patient with a recurrent AV nodal re-entry tachycardia:

A. Adenosine is the first-choice prophylactic therapy
B. The cardiac rate is often 160–220 beats per minute
C. Polyuria is characteristic after a prolonged episode
D. Transient bundle branch block on the ECG indicates coexistent myocardial ischemia

Appendix U

Blueprint outlines for Paper-1

Topic	Number of questions	Diagnosis	Pathogenesis	Treatment	Epidemiology	range % (Optional)
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%

Appendix V

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	