



الهيئة السعودية للتخصصات الصحية
Saudi Commission for Health Specialties

Vascular and Interventional Radiology Fellowship



سَبَّحَ لِلَّهِ الْمِجْدُ

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DISCLAIMER

The primary goal of this document is to enrich the training experience of postgraduate trainees by outlining the learning objectives to become competent and proficient future practitioners.

This curriculum may contain sections outlining some training regulations. However, such rules need to comply with the most updated “General Bylaws” and “Executive Policies” of the Saudi Commission for Health Specialties (SCFHS), which can be accessed online through the official SCFHS website(<https://www.scfhs.org.sa/MESPS/TrainingProgs/RegulationBoard/Pages/default.aspx>).

As this curriculum is subjected to continuous development, please refer to the electronic version posted on-line for the most updated version.

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FOREWARD

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Introduction

1.1. Overview

Vascular interventional radiology (VIR) is a clinical subspecialty in radiology. Vascular interventional radiologists are clinicians who utilize image guidance and technology to perform minimally invasive procedures. A wide diversity of IR procedures is carried out on a daily basis, including vascular, nonvascular, oncology, hepatobiliary, gastrointestinal, genitourinary, woman's health, musculoskeletal (MSK), emergency, dialysis, biopsies, and drainage procedures. Interventional neuroradiology and pediatric IR are separate radiological subspecialties. Teamwork and multidisciplinary collaboration are fundamental to IR practices. As of 2019, there are more than 100 vascular interventional radiologists in Saudi Arabia performing tens of thousands of IR procedures annually. The practice of IR occurs mostly in tertiary and specialist governments and private hospitals.

1.2. History of IR

In 1964, Charles Dotter, a pioneer interventional radiologist, considered by many as the father of IR, performed the first percutaneous angioplasty, which marked the establishment of IR. In 1953, Seldinger pioneered the introduction of a guidewire through a puncture needle, which was the foundation of IR. Over the past few decades, several breakthroughs have occurred, with the development of new cutting-edge technologies, all of which have made IR a cornerstone in many healthcare institutions.

2. Goal and Responsibility of Curriculum Implementation

2.1 Rationale

VIR is a growing major subspecialty in diagnostic radiology. Like diagnostic radiology, the interventional radiologist is concerned about medical conditions related to all medical specialties and covers the whole human body. It allows specialists to provide minimally invasive treatments that use imaging guidance, thus elevating the patient's quality of care and efficiency by potentially avoiding major open surgical procedures and providing a continuum of patient care in the form of inpatient and outpatient therapeutic and preventive services.

2.2 Overall Goal

VIR fellowship programs focus on the diagnostic and therapeutic aspects of patient care through training in diagnostic imaging and image-guided minimally invasive procedures and the evaluation and clinical management of patients with conditions amenable to these methods. The fellowship program in VIR adds to the quality medical educational experience in diagnostic imaging, as well as offers image-guided procedural training and pre- and postprocedural care of patients. The training program structure ensures development of mature technical skills and clinical judgment via the Canadian Medical Education Directives for Specialists (CanMEDS) framework. Upon completing the fellowship program, physicians will have achieved a strong foundation of knowledge and skills in noninvasive vascular diagnosis, as well as vascular and nonvascular interventions, showing competence in the specialty with sufficient expertise to act as independent providers of care as consultants.

3. What Is New in This Edition?

Adopting the CanMEDS framework is the major update in the current curriculum in comparison to its predecessor. Several other updates and improvements related to training, supervision, assessment, and evidence-based practice have also been adopted. In addition, a new clinical rotation was added to focus on clinical skills and practice. More details were added to the assessment measures and the required number of procedures for each clinical rotation.

4. Policies and Procedures

This curriculum represents the means and materials outlining learning objectives with which trainees and trainers will interact to achieve the identified educational outcomes. The Saudi Commission for Health Specialties (SCFHS) has a full set of “General Bylaws” and “Executive Policies” (published on the official SCFHS website) that regulate all processes related to training. General bylaws of training, assessment, and accreditation as well as executive policies on admission, registration, continuous assessment and promotion, examination, trainees’ representation and support, duty hours, and leaves are examples of regulations that need to be applied. Trainees, trainers, and supervisors need to apply this curriculum in compliance with the most updated bylaws and policies that can be accessed online (via the official SCFHS website).

5. Abbreviations Used in This Document

Abbreviation Description

SCFHS	Saudi Commission for Health Specialties
F (1)	first year of fellowship
F2	second year of fellowship
PT	progress test
OSCE	objective structured clinical examination
OSPE	objective structured practical examination
Mini-CEX	mini-clinical experience
DOPS	direct observation of procedural skills
CBD	case-based discussion
CBE	competency-based education
ITER	in-training evaluation report
COT	Consultation Observation Tool
FTC	Fellowship Training Committee

6. Program Structure

6.1 Program Entry Requirements

1. Successful completion of an accredited residency training program in diagnostic radiology and possession of the Saudi Specialty Certificate in Diagnostic Radiology or its equivalent
2. Successful completion of an interview
3. Providing three letters of recommendation from consultants with whom the candidate has recently worked with for a minimum period of two months
4. Providing written permission from the sponsoring institution of the candidate allowing him/her to participate on a full-time basis during the entire program
5. Payment of the annual registration fee to SCFHS

6.2 Program Duration

The duration of the IR fellowship training program under the umbrella of the SCFHS is two years (F1 and F2), during which the fellow will acquire several competencies in knowledge, skills, and attitude.

6.3 Program Rotations

The training structure should be based on the following general outline: The academic year consists of 13 blocks, and each block is a 4-week duration.

	Vascular	Nonvascular	External rotation*	Vacation	Elective**
F1	5	5	1	1	1
F2	7	3	1	1	1

* The time for this external rotation during the first year may be spread throughout the entire year in either general surgery or podiatry. The program director must attest to the successful completion of this requirement. External rotation during the second year must be spent in block in the ICU/ER.

** Elective rotations are preferably spent in MSK/neurointerventions or can be dedicated for research project or external rotation as specified above.

7. Learning and Competencies

7.1 Introduction to Learning Outcomes and Competency-Based Education

Training should be guided by well-defined “learning objectives” that are driven by targeted “learning outcomes” of a particular program to serve specific specialty needs. Learning outcomes are supposed to reflect the professional “competencies” that are aimed to be “entrusted” to trainees upon graduation. This will ensure that graduates meet the expected demands of the healthcare system in relation to their particular specialty. Competency-based education (CBE) is an approach of “adult learning” that is based on achieving predefined, fine-grained, and well-paced learning objectives that are driven from complex professional competencies.

Professional competencies related to healthcare are usually complex and entertain a mixture of multiple learning domains (knowledge, skills, and attitude). CBE is expected to change the traditional way of postgraduate education. For instance, the time of training, though a precious resource, should not be looked at as a proxy for competence (e.g., time of rotation in certain hospital areas is not the primary marker of competence achievement). Furthermore, CBE emphasizes the critical role of informed judgment of learners’ competency progress, which is based on a staged and formative assessment that is driven by multiple workplace-based observations. Several CBE models have been developed for postgraduate education in healthcare (e.g., CanMEDS by the Royal College of Physicians and Surgeons of Canada, the CBME-competency model by the Accreditation Council for Graduate Medical Education, Tomorrow’s Doctors in the UK, and multiple others). The following are concepts that enhance the implementation of CBE in this curriculum:

7.2 Training Outcomes and Competencies

VIR fellows will acquire a broad-based understanding of the principles, core knowledge, skills, and attitudes to practice as independent vascular interventional radiologists. By the end of their training, they should be able to have the following competencies:

7.2.1 Medical Expert (Knowledge and Skills)

As medical experts, VIR physicians combine a thorough understanding of diagnostic radiology, relevant anatomy, and clinical indications of all minimally invasive procedures in all aspects of VIR. This includes periprocedural care, contraindications, and potential complications of individual procedures.

Key Competencies

The training of safe VIR fellows is a key part of the training scheme. This includes dedicated training and education in the clinical and technical aspects of VIR.

Clinical judgment

- **Indications:** Perform complete assessment of patients to determine the appropriate procedure.
- **Medical, endoscopic, or surgical alternatives:** A VIR fellow should have a thorough understanding of alternatives that can be offered to patients.
- **Contraindications:** A fellow should have the required knowledge about the relative and absolute contraindications for each individual procedure and use their clinical skills to weigh the risks versus benefits for each patient.
- **Periprocedural care**
 - Management of complications: A fellow should be able to properly recognize procedural complications and manage them using medical or endovascular interventions, or by timely consulting proper services. This includes basic and advanced life support skills.
 - Periprocedural medication administration: A fellow should be knowledgeable about the pre-, intra-, and postprocedural medications potentially required for each procedure.
- **Post-procedure clinical follow-up:** A fellow should be able to deliver postprocedural care when needed as inpatient or outpatient.

Technical aspects

- **Anatomy relevant to each individual procedure:** A fellow should have thorough understanding of the radiologic and gross anatomy, including variants related to each procedure.
- **Basic technical skills:** This includes determining the type of image guidance needed and known techniques (access, drainage, biopsy cannulation, embolization, angioplasty, etc.).
- **Interventional tools:** A fellow should have thorough knowledge of the essential and advanced tools and equipment for VIR procedures to safely and effectively perform the required intervention.
- **Radiation safety:** Basic radiation safety principles are applied to protect patients and staff from potential radiation hazards.

Clinical Rotation Specific Objectives

- Vascular rotation specific objectives
 - Clinical objectives: Upon the completion of vascular rotations, a VIR fellow should obtain:
 - Comprehensive understanding of vascular pathologies and indications/contraindications/complications for vascular interventions
 - Ability to perform detailed clinical examination and evaluation of patients referred for vascular interventions
 - Ability to deliver periprocedural care and follow-up in patients who undergo vascular interventions
 - Comprehensive understanding of medications commonly utilized during vascular interventions
 - Ability to recognize potential complications and appropriately deliver timely management
 - Technical objective: Upon the completion of vascular rotations, a VIR fellow should:
 - Obtain comprehensive knowledge about anatomy relevant to vascular access and performed interventions
 - Obtain comprehensive knowledge about the equipment and tools needed for vascular interventions
 - Master the vascular techniques including access, cannulation, angiography, angioplasty, stent placement, embolization, intra-arterial drug administration, vascular closure, and hemostasis
- Nonvascular rotation specific objective
 - Clinical objectives: Upon the completion of nonvascular rotations, a VIR fellow should obtain:
 - Comprehensive understanding of nonvascular pathologies that can be managed by VIR, including percutaneous drainage, biopsy, or ablation
 - Ability to perform detailed clinical examination and evaluation of patients referred for nonvascular interventions
 - Ability to deliver periprocedural care and follow-up in patients who undergo nonvascular interventions
 - Comprehensive understanding of medications commonly utilized during nonvascular interventions
 - Ability to recognize potential complications and appropriately deliver timely management
 - Technical objective: Upon the completion of vascular rotations, a VIR fellow should obtain:
 - Comprehensive knowledge about anatomy relevant to nonvascular interventions

- Comprehensive knowledge about the equipment and tools needed for nonvascular interventions
- Master the nonvascular approaches such as percutaneous drainage, biopsy, or ablation using different guidance methods, including ultrasound, Computed Tomography, or fluoroscopic guidance
- External rotation specific objectives
 - Intensive care rotation: A VIR fellow is expected to acquire the following knowledge and skills during ICU rotation:
 - Participate in ICU rounds and direct patient care
 - Perform basic management of critically ill patients
 - Perform the basics of fluid and electrolyte replacement and antibiotic administration
 - Perform basic and advanced life support protocols
 - Deliver and perform bedside procedures that are commonly referred to IR
 - General surgery or podiatry: A VIR fellow is expected to acquire the following knowledge and skills during the surgical rotation:
 - Participate in clinical rounds and direct patient care
 - Perform basic management of surgical patients
 - Perform the basics of fluid replacement and antibiotic administration
 - Participate in care delivery in patients with diabetic foot

7.2.2 Communicator (Knowledge and Attitude)

Definition: As communicators, vascular interventional radiologists should effectively communicate with consulting and referring medical and surgical teams and actively engage in the doctor-patient relationship, including the dynamic exchanges that occur before, during, and after medical encounters and procedures.

Key Competencies

VIR physicians are able to:

- Perform a clinical consultation, including the presentation of well-documented assessments and recommendations in written and/or verbal forms in response to a request from other healthcare professionals.
- Identify and appropriately respond to relevant ethical issues arising in patient care and medical decision-making.
- Demonstrate the ability to prioritize professional duties when faced with multiple patients and problems.
- Demonstrate compassionate and patient-centered care.
- Demonstrate ability to explain the procedure and answer all related questions and concerns raised by the patient and family.
- Ensure appropriate informed consent is obtained for procedures.
- Document appropriate pre-procedure assessment.
- Document and disseminate information related to procedures performed and their outcomes in the form of post-procedure notes and official procedural reports.
- Communicate with other teams any critical concerns or complications related to the procedure performed and formulate management plans.
- Ensure adequate follow-up is arranged for procedures performed.
- Demonstrate medical expertise in situations other than patient care, such as providing expert legal testimony or advising governments, as needed.

7.2.3 Collaborator (Knowledge and Attitude)

Definition: As collaborator, vascular interventional radiologists effectively work within a healthcare team to achieve optimal patient care.

Key Competencies

- Demonstrate effective, appropriate, and timely consultation of another health professional as needed for optimal patient care.
- Arrange appropriate follow-up care services for patients and their families.
- Collaborate with other clinical teams in multidisciplinary meetings.

7.2.4 Leader (Knowledge and Attitude)

Definition: As leaders, vascular interventional radiologists are integral participants in healthcare organizations as they organize sustainable practices, make decisions about resource allocation, and contribute to the effectiveness of the healthcare system.

Key Competencies

- Quality improvement projects: A fellow should complete at least one quality improvement project during training.
- Finances: A fellow should have basic understanding of resources and inventory management in addition to the cost-effectiveness orientation related to various types of interventions and tools.

7.2.5 Health Advocate (Knowledge and Attitude)

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

Key Competencies

- Participate in public and medical awareness campaigns related to VIR.
- Understand the role and function of the Saudi Interventional Radiology Society and other regional and international interventional societies.

7.2.6 Scholar (Knowledge, Skills, and Attitude)

Definition: Vascular interventional radiologists demonstrate a lifelong commitment to reflective learning, as well as the creation, dissemination, application, and translation of medical knowledge.

Key Competencies

- Practicing evidence-based medicine: A VIR fellow should be able to utilize existing evidence and guidelines to improve patient care.
- Participating in research activities: A fellow must complete at least one research project under the mentorship of an attending interventional radiologist or other faculty supervisor, which should be at least presented in either a national or international scientific event or be published in a peer-reviewed journal.
- Present in national and international meetings.
- Participate in continuing medical education activities.

7.2.7 Professional (Knowledge and Attitude)

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

Key Competencies

- Fulfill the regulatory and legal obligations required of current practice
- Participate in Saudi and international professional organizations
- Maintain patient privacy and confidentiality
- Manage conflicts of interest
- Demonstrate understanding of the professional, legal, and ethical codes of practice

7.3. Mapping of Training Milestones and Continuum of Learning

A VIR fellow is required to perform the following minimum number of procedures *as a primary operator*. The distribution of cases throughout the academic years is illustrated in percentages, depending on the type of vascular and nonvascular procedures. This can be monitored by the local fellowship program director on a quarterly basis to ensure proper compliance with requirements and matching the training goals as the fellow progresses:

Procedures and clinical skills		Requirements	Procedures	
Diagnostics		Minimum of 100 cases	CT angiography, Magnetic Resonance angiography, arterial and venous Doppler, ankle brachial index, segmental arterial pressures	
Adult interventions 95% Pediatric interventions 5%	Vascular interventions F1: 40% F2: 60%	Minimum of 500 procedures performed collectively	Diagnostic angiography (lower/upper limb, visceral, pulmonary, and cerebral angiography)	100 cases
			• Venous access: totally implantable venous access devices (or chest/arm ports, tunneled dialysis catheters, peripherally inserted central catheters, Hickman lines)	150 cases
			• Inferior vena cava (IVC) filter insertion and retrieval (retrievable and permanent)	20 cases
			• Angioplasty and stenting (aortoiliac, peripheral, visceral, venous)	50 cases
			• AV fistula/graft surveillance and intervention: diagnostic fistulogram, thrombolysis, thrombectomy, and angioplasty	40 cases
			• Embolotherapy: aneurysms, traumatic hemorrhage (solid organ, pelvic, or muscular injury), spontaneous bleeding, nonvariceal and variceal gastrointestinal bleeding, preoperative embolization (renal cell carcinoma, bone metastases), gonadal veins (varicoceles, pelvic congestion), Arteriovenous malformation, epistaxis, bronchial artery embolization hemoptysis	50 cases
			• Portal hypertension interventions/transjugular intrahepatic portosystemic shunt	15 cases

		(TIPSS)/revision/gastroesophageal variceal embolization Transvenous biopsy/transjugular liver biopsy	
		• Prostate/uterine artery embolization (including uterine fibroid embolization and postpartum hemorrhage, prophylactic internal iliac artery occlusion balloons)	15 cases
		• Pharmacologic, mechanical, and pharmacomechanical thrombolysis: arterial and venous including pulmonary embolism (PE) and lower limb veins (deep venous thrombosis [DVT])	10 cases
		• Varicose vein interventions: sclerotherapy, glue, laser, radiofrequency ablation	10 cases
		• Foreign body retrieval	5 cases
		• Interventional oncology interventions: transarterial chemoembolization, transarterial embolization, transarterial radioembolization, hepatic artery mapping	25 cases
		• Venous sampling: adrenal venous sampling, renal vein sampling, parathyroid venous sampling, petrosal venous sampling, calcium stimulation test	2 cases
		• Aortic interventions: abdominal aortic aneurysm endovascular repair, thoracic endovascular aortic repair	8 cases

Nonvascular interventions F1: 60% F2: 40%	Minimum of 500 procedures performed collectively	Genitourinary interventions: percutaneous nephrostomy, percutaneous nephrolithotripsy, antegrade ureteric stenting (Double J or nephroureteral stenting), brush biopsies, ureteroplasty, renal cyst aspirations/ablation	50 cases
		• Hepatobiliary interventions: percutaneous transhepatic cholangiography (PTC), biliary drains and endoprosthesis insertion (external and internal stents + metallic stent), transductal biopsy (brush, forceps), gallbladder interventional procedures (cholecystostomy)	50 cases
		• Paracentesis/thoracentesis	60 cases
		• Gastrointestinal interventions: percutaneous feeding tubes (gastrostomy, gastrojejunostomy, primary jejunostomy, and cecostomy), GI tract stenting (esophageal, gastric, duodenal, colorectal)	50 cases
		• Percutaneous abscess drainage (transabdominal, transvaginal, transrectal and transgluteal)	100 cases
		• Percutaneous biopsies under fluoroscopic, ultrasound, and CT guidance	100 cases
		• Spine interventions: percutaneous vertebroplasty/kyphoplasty, disc/vertebral biopsy. Lumbar puncture, nerve root injection, epidural injection	30 cases
		• Tumor ablation of the liver, bone, renal, and lung	20 cases
		• MSK interventions (biopsies, joint and tendon injections, joint aspiration, drainage, pain management, ablations)	40

7.4. Academic Activities

7.4.1. General Principles

The fellowship training program aims to gradually introduce the basic and advanced clinical and technical skills of VIR through practice-based learning and systematic delivery of the core curriculum.

7.4.2. Time Management

- At least 4–6 h of formal training time should be reserved per week.
- Formal teaching time is an activity that is planned in advance with an assigned tutor with time slots and a venue.
- Formal teaching time can include any of the following:
 - Morning report (MR) or case presentations
 - Journal clubs
 - Systematic reviews of assigned topics.
 - Hospital grand rounds and other Continuous Medical Education activities
 - Core specialty topics, simulations, or workshops
- At least 1 h for every 1 month should be assigned to meet with mentors and review of portfolio.

7.4.3. Practice-Based Learning

Practice-Based Learning Contents

- Fellowship training educational curriculum, which includes the following:
 - MRs
 - Morbidity and mortality reports (MMRs)
 - Grand rounds/guest speaker lectures
 - Case presentations
 - Journal clubs, critical appraisal, and evidence-based medicine joint specialty meetings

- Weekly academic activity, which includes the following:
 - Topic review
 - IR procedures
 - Approach to common conditions and symptoms
 - Clinical skills
 - Communication skills
 - Medical ethics
 - Data interpretation
 - Research and evidence-based medicine

- Work-based learning, which includes the following:
 - Daily round-based learning
 - On-call duty-based learning
 - Clinical-based learning

7.4.4. Universal topics

Interventional vascular radiology is a continuum of the diagnostic radiology residency program, which will require the same universal topics to be done if not completed during the diagnostic radiology residency program.

7.4.5. Core Specialty Topics

The following general topics of VIR should be covered during academic years:

- Focused history and physical examination (knowledge, skills, and attitude)
- Informed consent for IR procedures (knowledge)
- Inpatient care (knowledge, skills, and attitude)
- IR clinic (knowledge, skills, and attitude)
- Medical conditions relevant to IR procedures (knowledge)
- Pharmacology relevant to IR (knowledge, skills)
- Procedural sedation for IR procedures (knowledge, skills)
- Recognition and initial management of intra- and periprocedural emergencies (knowledge, skills)
- Radiation safety (knowledge, skills)
- Healthcare team coordination (knowledge, skills, and attitude)

The fellow will be required to acquire the following topics:

Vascular pathology (knowledge)

Noninvasive vascular imaging (knowledge, skills)

Fundamentals of vascular access (knowledge, skills)

Fundamentals of angiography (knowledge, skills)

Arterial interventions (knowledge, skills)

Peripheral vascular interventions (knowledge, skills)

Aortic interventions (knowledge, skills)

Pulmonary arterial interventions (knowledge, skills)

Venous interventions (knowledge, skills):

- DVT management
- IVC filters
- PE interventions
- Venous insufficiency
- Management varicose veins

Vascular malformations (knowledge, skills)

Venous sampling (knowledge, skills)

Lymphatic interventions (knowledge, skills)

Portal hypertension (knowledge, skills):

- Management of variceal bleeding
- TIPSS
- Techniques for retrograde venous obliterations

Interventional oncology (knowledge, skills):

- Tumor ablation
- Transarterial therapies

Hepatobiliary interventions (knowledge, skills)

Transplant interventions (knowledge, skills)

Gastrointestinal interventions (knowledge, skills)

Genitourinary interventions (knowledge, skills)

Percutaneous biopsies (knowledge, skills)

Percutaneous drainage (knowledge, skills)

MSK interventions (knowledge, skills)

Neurointerventions (diagnostic 6 vessel angiogram) (knowledge, skills)

Pain interventions (knowledge, skills)

Technique- and tool-specific topics (knowledge, skills):

- Vascular access and closure devices
- Diagnostic and guiding catheters/wires
- Stents
- Embolic agents
- Ablation devices
- Thrombectomy devices/thrombolysis catheters
- Atherectomy devices
- Endovascular retrieval tools
- Biopsy tools
- Drainage catheters

Pharmacology topics (knowledge, skills):

- Anticoagulation/antiplatelets
- Antibiotics
- Sedation and analgesia
- Thrombolytics
- Fluid and electrolyte management
- Sclerosing agents
- Chemotherapy agents related to IR interventions
- Blood pressure management
- Glycemic control

Research related topics (knowledge, skills, and attitude):

- Critical appraisal
- Data collection
- Manuscript writing
- Research ethics
- Study designs
- Reference managers
- Presentation skills

8. Assessment

8.1. Purpose of Assessment

Assessment plays a vital role in the success of postgraduate training. The assessment will guide trainees and trainers in achieving the targeted learning objectives. Conversely, a reliable and valid assessment will provide excellent means for training improvement, as it will inform the following aspects: curriculum development, teaching methods, and quality of learning environment.

Assessment will be further classified into two main categories: formative and summative.

8.2. Formative Assessment

8.2.1 General Principles

Formative assessment (also referred to as continuous assessment) is the component of assessment that is distributed throughout the academic year aiming primarily to provide trainees with effective feedback. Input from the overall formative assessment tools will be utilized at the end of the year to decide the promotion of each individual trainee from the

current-to-subsequent training level. Formative assessment will be defined based on scientific (council/committee) recommendations (usually updated and announced for each individual program at the start of the academic year). According to the executive policy on continuous assessment (available online: www.scfhs.org), formative assessment will have the following features:

- Multisource: minimum of four tools
- Comprehensive: covering all learning domains (knowledge, skills, and attitude)
- Relevant: focusing on workplace-based observations
- Competency-milestone-oriented: reflecting the trainee's expected competencies that match the trainee's developmental level

Trainees should play an active role in seeking feedback during training. However, trainers are expected to provide timely and formative assessments. The SCFHS will provide an e-portfolio system to enhance communication and analysis of data arising from formative assessments.

Trainers and trainees are directed to follow the recommendations of the scientific council regarding the updated forms, frequency, distribution, and deadlines related to the implementation of evaluation forms.

8.2.2 Formative Assessment Tools

Learning domain	Formative assessment tools	Frequency
Knowledge	<ul style="list-style-type: none"> • Structured oral exam (SOE) • Annual written progress test (local or international) • Case-based discussion (CBD) 	Once at end of F1
Skills	<ul style="list-style-type: none"> • Objective structured clinical examination • Logbook (see Section 8.2.3 for details) • Research: one publication in 2 years • Direct observation of procedural skills (DOPS; see Section 8.2.3 for details) • Mini-clinical evaluation exercise (mini-CEX; see Section 8.2.3 for details) 	End of F1
Attitude	<ul style="list-style-type: none"> • In-training evaluation report 	After each rotation

- To achieve unconditioned promotion, the candidate must score a minimum of “borderline pass” in all five components.
- The program director can still recommend the promotion of candidates if the above is not met in some situations:
 - If the candidate scored “borderline failure” in one or two components at maximum, and these scores should not belong to the same area of assessment (for example, both borderline failures should not belong to skills).
 - The candidate must have passed all other components and scored a minimum of clear pass in at least two components.

8.2.3. Formative Assessment Methods

- **DOPS**

- The procedure's form should be completed at the beginning of the two months' training.
- The trainee will perform procedures under the supervision of the attending consultant and receive immediate feedback.
- Each trainee shall perform five procedures of each of the following:
 - Vascular access (venous/arterial)
 - Nonvascular interventions (such as gastrostomy, nephrostomy, PTC)
 - US-/CT-guided interventions
- The program director and fellow jointly should declare that the fellow has safely performed the required number of procedures under supervision and is ready to proceed to the next stage of training.
- Failure to submit this form to the local training committee within two months of training shall be discussed with the local training program director.

- **Logbook**

- All trainees are required to keep a logbook during training (electronic records are highly recommended).
- A successful completion of the DOPS form is required for fellows before starting the logbook.
- The purpose of the logbook is to:
 - Monitor trainees' performance on a continual basis
 - Maintain a record of procedures and technical intervention performed
 - Enable the trainee and supervisor to determine the learning gaps
 - Provide a basis of feedback to the trainee
- The fellow is required to perform the minimum number of procedures each year, as listed in Section 7.3.
- The program director or his/her designee should monitor the fellow every two months and keep track of procedures performed by the fellow.
- The completed logbook will be countersigned by the program director.
- The logbook should be submitted for a maximum of 4 weeks before the final written exam. Failure of submission shall be discussed with the program director and scientific committee.
- The completion of the logbook is included in the end-of-year total score for the first- and second-year trainees.

- **Continuous evaluation**

- This assessment is conducted at the end of each training rotation throughout the academic year.
- The fellow's performance will be evaluated jointly by relevant staff for the following competencies:
 - Daily work
 - Procedural skills
 - Professional and communication skills
 - Academic activities
 - Mini-CEX and CBD: Consists of 10- to 20-min direct observation assessment of trainee-patient interactions. 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 after each assessment of a trainee-patient encounter.
- Annual promotion depends on a satisfactory annual overall evaluation, and the average score for all rotations should not be less than 60%.

- **Research**
 - All fellows are required to conduct and publish a minimum of one research project during training.
 - The research project for each fellow is evaluated during a research day held annually.
- **First-year promotion examination (SOE)**
 - Held once at the end of the first academic year. Date will be announced on the SCFHS website.
 - Exam eligibility
 - Fellows must complete the required number of procedures performed before appearing in the promotion examination.
 - Fellows must pass all the required rotations for the first year.
 - **Exam format**
 - The oral interview consists of four stations. A fellow is assessed by two examiners at each station.
 - Each station is 30 min.
 - Each examiner should discuss a minimum of three cases with the fellow.
 - **Passing score:** The fellow must achieve at least 70%.

8.3. Summative Assessment

8.3.1. General Principles

Summative assessment is a component of assessment that aims primarily to make informed decisions on trainees' competency. In comparison to formative assessment, summative assessment does not aim to provide constructive feedback. For further details on this section, please refer to the general bylaws and executive policy of assessment (available online: www.scfhs.org). To be eligible to sit for the final exams, a trainee should be granted "Certification of Training Completion"

8.3.2. Certification of Training Completion

To be eligible to sit for the final specialty examinations, each trainee is required to obtain “Certification of Training Completion” based on the training bylaws and executive policy (please refer to www.scfhs.org). Trainees will be granted “Certification of Training Completion” once the following criteria are fulfilled:

- Successful completion of all training rotations.
- Completion of training requirements as outlined by the scientific council/committee of specialty (e.g., logbook, research, others).
- Clearance from SCFHS training affairs ensuring compliance with tuition payments and the completion of universal topics.
- “Certification of Training Completion” will be issued and approved by the supervisory committee or its equivalent according to SCFHS policies.

8.3.3. Final Saudi Board of Vascular Interventional Radiology Fellowship Exam

Objectives

- Determine the quantity and quality of specialty knowledge base ranked as competent, so that the individual can be used as a referral source for the specialty.
- Using theoretical data, determine the candidate’s ability to think logically, solve problems, apply basic medical science to clinical problems, and make judgments with valid comparisons.
- Screen candidates for the purposes of being allowed to take the final clinical examination.

Eligibility

- Successful completion of the required period of fellowship training.
- Obtaining a training completion certificate (or equivalent) issued by the local supervisory committee based on a satisfactory final in-training evaluation report (FITER) and any other related requirements assigned by any mentioned scientific board (e.g., research, publication, logbook, etc.). A FITER example is outlined in Appendix 6 in the exam rules and regulations document on the SCFHS website.
- Any candidate missing a maximum of three months of training of the whole fellowship program is allowed to sit for the exam (written and clinical), and their results will be suspended until that missing period is completed.
- Registering for the examination at least one month before the exam date.

Rules

- The Saudi Fellowship of Interventional Radiology written examination will be held once each year on a date published on the SCFHS website.
- Examination dates should be provided by the specialty examination committee (SEC) in accordance with the fixed annual schedule submitted by the examination department.
- There shall be no re-sit examination.
- A candidate would remain eligible for a Saudi fellowship written examination for a period not longer than three years provided they could prove they had been clinically active.
- If the candidate did not pass within three years, an exceptional attempt may be granted upon the approval of the scientific council, provided evidence of continuing clinical practice is presented.
- A candidate who failed to pass the Saudi fellowship written examination, including the exceptional attempt, must repeat the final year of training, after which he/she is allowed to sit the written examination twice after approval by the scientific council.
- After exhausting all the above attempts (maximum of six attempts), the candidate will not be permitted to sit on the Saudi fellowship written examination.

Examination format

- A Saudi fellowship subspecialty examination shall consist of three components:
 - **Written exam:** One paper with 100 single best answers (SBAs) (MCQs). Ten unscored items can be added for pretesting purposes.
 - The examination shall contain more than 70% K2-type questions (interpretation, analysis, reasoning, and decision making), and the remaining questions shall be K1-type questions (recall and comprehension).
 - Clinical presentation questions include history, clinical finding, diagnosis, and investigation questions and the possible diagnosis and diagnostic methodologies (radiological findings); management questions include interventional treatment, clinical management, patient safety, and complications; health maintenance questions include health promotion, disease prevention, risk factor assessment, and prognosis.
 - The examination shall include basic concepts and clinical questions relevant to the subspecialty (see blueprint below).
 - The exam period is 2 h for a 100-question paper. The exam will be delivered as a computer-based test when available, otherwise paper and pencil.

- Objective structured practical examinations (OSPE)

- 20 cases in 2-h duration.
- All cases should be presented as a clinical scenario supported by images and lab studies.
- All questions should be in SBA (MCQs).
- A total of 50 MCQs for the set of 20 cases.
- The weight of OSPE is 50% of the entire final exam.

- SOE

- Candidates who pass the written and OSPE exams are eligible for the SOE exam.
- There are four examination stations, with two examiners per station.
- Each station will have a minimum of three structured, predefined clinical scenarios with predetermined questions and suggested answers.
- The duration of each station is 30 min.
- Each station will be marked independently.
- The stations are as follows:
 - Arterial interventions
 - Venous intervention
 - Nonvascular interventions
 - Interventional oncology

Passing score

- The passing score is 70% for the F2. 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 to achieve a 70% passing rate or 65% passing score whichever comes first. Under no circumstances can the passing score be reduced below 65%.
- Alternatively, to set the passing score, a standard setting method that is supported by published scientific evidence can be used, for which the Angoff method is recommended. The process of arriving at the passing score requires prior review and approval. If standard setting is used, the above passing score regulation does not apply. See Appendix 7 for more details on the exam rules and regulations document on the SCFHS website.
- To set a passing score using a standard setting method (b), the SEC must obtain approval of the process and passing score from the SCFHS Assistant General Secretary for Postgraduate Studies one month prior to exam administration.

References for the Saudi board final fellowship examination:

The following are the suggested readings for the fellowship examination. This list is intended for use as a study aid only. SCFHS does not intend the list to imply endorsement of these specific references, nor are the exam questions necessarily taken solely from these sources.

- **Textbooks**

- Image-Guided Interventions by Mauro, Murphy, Thomson, Venbrux, and Zollikover
- Vascular and Interventional Radiology by Karim Valji
- Handbook of Interventional Radiology Procedures by Krishna Kandarpa
- Interventional Radiology Survival Guide by David Kessel and Lain Robertson
- Abrams' Angiography Interventional Radiology by Jean-Francois H. Geschwind and Michael D. Dake
- The Requisites Vascular and Interventional Radiology by John A. Kaufman and Michael J. Lee
- Atlas of Vascular Anatomy: An Angiographic Approach by Renan Uflacker

- **Journals**

- The Journal of Vascular Interventional Radiology (JVIR)
- Cardiovascular Interventional Radiology (CVIR)
- The Arab Journal of Interventional Radiology (AJIR)
- Radiology
- American Journal of Roentgenology
- Radiographics
- European Radiology

Blueprint for the Final written exam for the Saudi Board of Vascular Interventional Radiology Fellowship

SN	Topic	Questions
1	Arterial intervention (to include Uterine Fibroid Embolization, prostate, and other embolizations)	15
2	Venous intervention (to include varicose vein malformations, varicoceles, pelvic congestions, etc.)	15
3	Hepatobiliary intervention	6
4	Gastrointestinal intervention	5
5	Genitourinary intervention	5
6	Oncology intervention	12
7	Pediatric intervention	3
8	Neurointervention	3
9	MSK interventions	3
10	Intravenous lines	5
11	Breast intervention	3
12	Chest intervention	3
13	Techniques	4
14	Medication	4
15	Radiation safety and quality	4
16	Ethics, research, and patient safety	10
Total		100

Examples

K1 question

Which of the following catheters is most suitable for lumbar artery catheterization?

- a) Big tail
- b) Bernstein
- c) Mickelson
- d) Headhunter

K2 question

A 27-year-old pregnant woman whose pregnancy was complicated with DVT, PE, and retroplacental hemorrhage requiring placement of an IVC filter.

Which of the following filters is most appropriate for this patient?

- a) Celect
- b) TrapEase
- c) OptEase
- d) Bird's Nest



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