الهيئة السعودية للتخصصات الصحية
Saudi Commission for Health Specialties

ADULT CARDIAC CRITICAL CARE MEDICINE FELLOWSHIP TRAINING PROGRAM


بسم الله الرحمن الرحيم

PREFACE:

- The primary goal of this document is to enrich the experience of postgraduate trainees by outlining the learning objectives to become independent and competent practitioners.
- This curriculum may contain sections outlining some training regulations; however, such regulations need to be sought from "General Bylaws" and "Executive Policies" published by the Saudi Commission for Health Specialties (SCFHS), which can be accessed through the official SCFHS website. In case of discrepancies in regulation statements, the latest updates in the bylaws and executive policies will be considered as the reference.
- As this curriculum is subjected to periodic refinements, please refer to the most updated edition posted at www.scfhs.org.sa.

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INTRODUCTION

Alongside increases in demand, the clinical demographics of general and cardiac critical care have evolved toward a patient population with increasing comorbid medical conditions, thereby requiring more specialized and sophisticated invasive support and treatment. Saudi Arabia has an evolving healthcare system, with an increasing number of governmental cardiac centers. The Saudi Ministry of Health statistical yearbook reported 59,321 cardiac, chest, and vascular surgeries within the Kingdom in 2018 (1). In addition, there are more cardiac centers in the Kingdom managing critical medical and surgical cardiac cases. As a result, the delivery of cardiac critical care advances substantially in its complexity. The development and advances in critical care management and new technologies have heavily influenced the practice of cardiac intensive care in cardiovascular medicine. Physicians in the modern coronary care unit (CCU), which includes surgical and cardiac units, must be experienced in managing patients with cardiac critical illnesses and able to appropriately utilize optimal diagnostic, investigation, and treatment methods. These include noninvasive and invasive diagnostic and hemodynamic monitoring tools, complex modes of mechanical ventilation, renal replacement therapies, bedside imaging studies to guide cardiac and vascular procedures, therapeutic hypothermia induction methods, pacemakers, ultrasonography including cardiac echo, and mechanical circulatory support. The cardiac intensive care specialty is multidimensional, requiring the trainee to acquire a large body of knowledge and skills in a relatively short 1–2 year period. The new fellowship program will provide a comprehensive training program for fellows interested in leading the field of cardiac critical care.

Goals and Responsibilities of Curriculum Implementation

This curriculum ultimately seeks to form competent trainees in their respective specialties. This goal requires a significant amount of effort and coordination from all stakeholders involved in postgraduate training. As "adult learners," trainees must be proactive, fully engaged, and exhibit the following: a careful understanding of learning objectives, self-directed learning, problem-solving, abilities an eagerness to apply learning by means of reflective practice from feedback and formative assessment, and self-awareness and willingness to ask for support when needed. The program director plays a vital role in ensuring the successful implementation of this curriculum. Moreover, the training committee members, particularly the program administrator and chief resident, significantly impact program implementation. Trainees should be involved in sharing responsibilities in curriculum implementation. The SCFHS applies the best models of training governance to achieve the highest quality of training. Additionally, academic affairs in training centers and the regional supervisory training committee play a major role in training supervision and implementation. The Specialty Scientific Committee will guarantee that the content of this curriculum is constantly updated to match the highest standards in postgraduate education of each trainee's specialty.

ABBREVIATIONS

Abbreviation	Description
F1	First year fellow
F2	Second year fellow
SCFHS	Saudi Commission for Health Specialties
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
ACSICU	Adult Cardiac Surgical Critical Care Unit
CA	Cardiac Anesthesia
CCU	Coronary Care Unit
ACSICU	Adult Cardiac Surgery Intensive Care Unit
EP	Electrophysiology laboratories
IC	Interventional Cardiology
ACCCM	Adult Cardiac Critical Care Medicine
ICU	Intensive Care Unit

ACLS	Advanced Cardiovascular Life Support
TEE	Transesophageal Echocardiography
ECMO	Extracorporeal Membrane Oxygenation
ACCM	Adult Cardiac Critical Medicine
ECG	Echocardiography

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 must reflect the professional "competencies" and tasks that are aimed to be entrusted by trainees upon graduation. This will ensure that graduates meet the expected demands of the healthcare system and patient care in relation to their particular specialty. Competency-based education (CBE) is an adult-learning approach based on achieving pre-defined, fine-grained, and well-paced learning objectives that are driven by complex professional competencies.

Healthcare professional-related competencies are usually complex and contain a mixture of multiple learning domains (knowledge, skills, and attitude). CBE is expected to change the traditional postgraduate educational system. For instance, the training period, though a precious resource, should not be considered as a proxy for competence (e.g., time of rotation in certain hospital areas is not the primary marker of competence). Furthermore, CBE emphasizes the critical role of informed judgment of learners' competency progress based on a staged formative assessment that is driven by multiple workplace observations. Several CBE models have been developed for postgraduate healthcare education (e.g., CanMEDs by the Royal College of Physicians and Surgeon of Canada [RCPSC], the CBME-Competency model by the Accreditation Council for Graduate Medical Education [ACGME], and Tomorrow's Doctors by the UK General Medical Council). The following are concepts that enhance the implementation of CBE in this curriculum:

- Competency: Competency is a cognitive construct that assesses the potential to perform efficiently in a given situation based on the professional standard. Professional roles (e.g., experts, advocates, communicators, leaders, scholars, collaborators, and professionals) are used to define competencies to better correlate learning and assessment practices.

- **Milestones:** Milestones are developmental stages throughout the competency continuum. Trainees, from junior and throughout senior levels, are assisted throughout their learning journey as they progress from being novice/supervised to being master/unsupervised practitioners. This should not undermine the role of supervisory/regulatory bodies in the malpractice of independent practitioners. Milestones are expected to enhance the learning process by appropriately pacing the training process according to the individual developmental level (junior vs. senior).
- **Learning Domains:** Whenever possible, efforts should be directed to annotate the learning outcomes with the corresponding domain: K, knowledge; S, skills; and A, attitude. Multiple annotations for a given learning outcome are possible.
- **Content-area Categorization:** It is advisable to categorize learning outcomes in broad content areas related to the profession (e.g., diagnostic vs. therapeutic, simple vs. complex, and urgent vs. chronic).

Trainees are expected to progress from novice to master by meeting a certain set of professional competencies. SCFHS endorsed CanMEDs to articulate professional competencies. This curriculum applies the principles of CBE. CanMEDs/ACGME/OTHER represents a globally accepted framework that outlines competency roles. The 2015 CanMEDs/2018 ACGME framework was adopted in this section (2).

PROGRAM STRUCTURE

1. Program entry requirements

Application requirements

1. Candidate should have either:
    a Completed formal critical care residency training with certification from the Saudi Board or equivalent documents from a recognized institute
    b Completed formal critical care fellowship with certification from the Saudi Board or equivalent documents from a recognized institute
    c Completion of formal cardiac anesthesia training with certification from the Saudi Board or equivalent documents from a recognized institute
2. Passed an interview conducted by the Scientific Committee.
3. Obtained three letters of recommendation from consultants with whom the candidate has recently worked.
4. Provided written permission from a sponsoring organization giving approval for the candidate to undertake full-time training for the total program duration.
5. Registered at the SCFHS as a senior registrar.

General training requirements

1. The trainee should abide by the training regulations and obligations set by the SCFHS.
2. Training is a full-time commitment; the trainee should be enrolled full-time in a continuous training program throughout its whole duration.

3. The training should be conducted at accredited training institutions by the Saudi Board of Adult Critical Care Medicine.
4. The training should be comprehensive in the specialties of cardiac critical care.

2. Program duration

This 2-year training program is intended to prepare candidates to practice independently as experts in the field of adult cardiac critical care. Candidates with a background in critical care or cardiac anesthesia will be exempted from the first year of the program.

3. Program rotations

1. Candidates must finish 2 years in cardiac critical care medicine with the following:

- FIRST year with a 12-block training period as follows (each block represents a 4-week period):
  Seven blocks in the Adult Cardiac Surgical Critical Care Unit (ACSICU)
  One block in the CCU
  One block in the Echocardiography Laboratory
  Two blocks for cardiac anesthesia (CA)
  One block for vacation
  A total of 42 on-calls are required in the ACSICU annually
- SECOND year with a 12-block training period as follows:
  Six blocks in the ACSICU
  One block in the CCU
  One block for interventional cardiology
  One block in the Echocardiography Laboratory
  One block for CA
  One block in the Electrophysiological Laboratory
  One block for vacation
  A total of 42 on-calls are required in the ACSICU annually

** Research Rotation is considered an elective and is to be decided according to the center needs and the demands of the trainee project.

2. During the entire program, kindly refer to SCFHS policies and procedures on www.scfhs.org.sa
3. Fellows must conduct at least one research/quality improvement project during the training period.
4. Upon successful program completion, fellows must exhibit specific goals per the Royal College of Physicians and Surgeons of Canada and CanMEDs competencies, as described in the next section.

Rotation roadmap

Blocks*												
Year	1	2	3	4	5	6	7	8	9	10	11	12
1	ACSICU	ACSICU	ACSICU	ACSICU	ACSICU	ACSICU	Vacation	CCU	CA	ECHO	ACSICU	CA
2	ACSICU	ACSICU	ACSICU	ACSICU	ACSICU	ACSICU	Vacation	CCU	IC	ECHO	EP LAB	CA

CCU, coronary care unit; ACSICU, adult cardiac surgery intensive care unit; CA, cardiac anesthesia; ECHO, Echocardiography; EP, Electrophysiology; IC, interventional cardiology.

*Each block represents a 4-week training period.

CONTINUUM OF LEARNING

Specialty General Practice	F1 (Junior Level)	F2 (Senior Level)	Consultant (Sub-specialist)
Sub-specialty, non-practicing	Dependent/supervised practice	Dependent/supervised practice	Independent practice/provision of supervision
Obtain a basic health sciences level according to core discipline knowledge	Obtain fundamental knowledge related to the core clinical problems of the specialty	Apply knowledge to provide appropriate clinical care related to the core clinical problems of the specialty	Acquire advanced and up-to-date knowledge related to the core clinical problems of the specialty
Internship to the practice of discipline	Apply clinical skills, such as physical examination and procedures, related to the core presenting problems and procedures of the specialty	Analyze and interpret the clinical findings to develop the appropriate differential diagnoses and management plan for the patient	Compare and evaluate challenging and contradictory findings and develop expanded differential diagnoses and management plans

LEARNING AND COMPETENCIES

General learning outcomes:

This section aims to match the competencies and objectives related to each rotation according to the roles of canMEDs. Trainees and trainers should work together to achieve these objectives during teaching and formative assessments. Expectations should evolve with the progression in training level (stage, milestones).

Medical expert:

1. Demonstrate knowledge of applied clinical physiology and homeostasis.
2. Demonstrate an understanding of physiology, pathophysiology, and pharmacology in patients needing surgical and medical cardiac critical care.
3. Demonstrate knowledge of the following bodily systems and areas of Adult Cardiac Critical Care Medicine:
    a. Respiratory system
        - Anatomy
        - Physiology of the airway, lung, alveoli, and chest wall mechanics
        - Respiratory monitoring
        - Diagnostic imaging
        - Pathophysiology and treatment of different lung diseases
        - Principles of mechanical ventilation and other respiratory support methods
        - Weaning and extubation from mechanical ventilation
    b. Cardiovascular system
        - Anatomy

- Physiology of the heart and circulation, including cardiopulmonary interactions
- Invasive and noninvasive hemodynamic monitoring
- Diagnostic imaging
- Pathophysiology and treatment of different heart diseases, such as coronary artery disease, heart failure, and arrhythmia
- Principles of Basic and Advanced Cardiovascular Life Support (ACLS)

c. Central Nervous System (CNS)

- Normal anatomy.
- Physiology of the entire nervous systems.
- Invasive and noninvasive neurological monitoring
- Diagnostic imaging
- Pathophysiology and treatment of toxic, metabolic, structural, vascular, and infectious causes of altered consciousness, as well as stroke, traumatic brain injuries, seizure disorder, delirium, substance intoxication, and withdrawal
- Neuromuscular system diseases, including spinal cord syndrome, motor disease, myopathy, and polyneuropathy in critically ill patients
- Determination of brain death

d. Renal system

- Anatomy
- Physiology
- Monitoring of renal function
- Diagnostic imaging
- Pathophysiology, prevention, and management of acute kidney injury, including renal replacement therapy

e. Hematological system

- Coagulation and fibrinolytic pathways.
- Pathophysiology and treatment of red and white blood cells, and platelets
- Pathophysiology and treatment of coagulation disorders.
- Simple and massive blood transfusion

f. Metabolic and endocrine system

- Physiology

- Pathophysiology and treatment of fluid, electrolyte, and acid-base disturbances, and endocrine emergencies

g. Shock
   - Different types
   - Physiology of hormones and regulatory inflammatory mediators
   - Invasive and noninvasive monitoring
   - Diagnostic imaging
   - Pathophysiology and treatment of different types of shock

h. Septic illness
   - Pathogenesis and diagnostic criteria for sepsis, septic shock, SIRS, and multiple organ dysfunction syndrome
   - Diagnostic tests
   - Pathophysiology and treatment, including appropriate use of antibiotics, source control, and other therapies
   - Infection control and prevention techniques for patients and healthcare workers

i. Intoxication
   - Pharmacology of common intoxicants and poisons
   - Pathophysiology and treatment, including supportive care
   - Specific antidotes

j. Trauma and environmental hazards
   - Assessment and management of traumatic patients, including advanced trauma life support (ATLS)
   - Diagnostic imaging of the injured patient
   - Pathophysiology and treatment of blunt and penetrating trauma; thermal, chemical, electrical, and radiation injury; and near-drowning and drowning

k. Nutritional support
   - Identification of current deficiencies, ongoing losses, monitoring of nutritional status, and patient response to therapy
   - Caloric, protein, vitamin, and micronutrient requirements in critically ill patients
   - Indications and complications of enteral and parenteral nutrition therapy

l. Pharmacotherapy

- Pharmacokinetics and pharmacodynamics
- Indications, routes of delivery, risks, and drug interactions
- Indications for using vasoactive agents
- Management of sedation, analgesia, and neuromuscular blockers
- Mechanisms of antibiotic resistance

m. Transplantation

- Principles of immunosuppressive medication
- Identification of opportunistic and nosocomial infections
- Pathophysiology and treatment of solid organ and bone marrow transplant-related complications

n. Critical illness in pregnancy

- Physiology of pregnancy
- Pathophysiology and treatment of critical illnesses due to pregnancy and birth complications
- Pathophysiology and treatment of critical illnesses in pregnant patients

o. Preoperative and postoperative care

- Patient assessment, optimization, and minimization of perioperative risk.
- Pathophysiology and treatment of perioperative critical cardiac illnesses
- Pathophysiology and treatment of postoperative critical cardiac illnesses

p. Critical care illness

- Pathophysiology of chronic critical illnesses
- Management of chronically ventilated patients
- Critical care-acquired weaknesses
- Post-traumatic stress disorder

q. End-of-life issues

- Ethical principles
- Withholding and/or withdrawing life-sustaining therapies
- Organ and tissue donation, including medical and ethical issues associated with brain death
- Optimal management of organ donors

4. Demonstrate appropriate and timely performance of the following diagnostic and therapeutic procedures relevant to adult critical care:
    a. Airway
        - Airway assessment
        - Endotracheal intubation
        - Management of difficult airways
        - Tracheostomy and tracheostomy tube replacement
        - Bronchoscopy and obtaining bronchoalveolar lavage samples
    b. Breathing
        - Bag-mask ventilation
        - Thoracentesis.
        - Fiberoptic bronchoscopy in intubated patients
    c. Circulation
        - Insertion of central and arterial lines
        - Ultrasonography for vascular access
        - Focused critical care echocardiography
        - Ultrasonography of patients with shock
        - Intraosseous vascular access
        - Emergency pericardiocentesis
        - Defibrillation/cardioversion
        - Insertion and management of invasive and noninvasive cardiac output monitoring
        - Catheter insertion to the pulmonary artery
        - Intravenous pacemaker insertion.
        - Transcutaneous pacemaker application
    d. Renal
        - Temporary hemodialysis catheter insertion
    e. GI
        - Paracentesis
    f. CNS
        - Lumbar puncture
        - Follow-up and management of intracranial pressure monitoring
5. Perform a complete and appropriate assessment of patients needing cardiac critical care

a. Take a relevant history for appropriate diagnosis, management, and disease prevention
b. Perform a relevant and appropriate physical examination to ensure correct diagnosis, management, and disease prevention
c. Utilize appropriate investigation and diagnostic methods
d. Demonstrate effective clinical problem-solving and judgment regarding patient problems, including interpretation of available data and integration of information to generate appropriate differential diagnoses and management plans
e. Recognize, resuscitate, stabilize, and sustain patients at risk of cardiopulmonary arrest or other life-threatening conditions.
f. Provide consultation to other services that may help the patient

Communicator

1. Communicate effectively with patients, families, and admitting services to patients' daily progress.
2. Demonstrate empathy and respect in all patient encounters.
3. Communicate effectively with the cardiac ICU team (nurses, residents, and/or attending staff) about patient care issues.
4. Engage patients in a respectful and non-judgmental way regarding their religious and cultural values.
5. Recognize and respond appropriately to patients' non-verbal cues.
6. Obtain and document informed consent from patients and explain the risks, benefits, and rationale for all discussed options.
7. Demonstrate competency in documentation, including histories and physical examinations, progress, and discharge notes in compliance with legal and regulatory requirements.
8. Disclose adverse events and procedural complications to the patients and their families accurately and appropriately.
9. Share information with the patients and caregivers while respecting the patients' privacy and confidentiality.

10. Counsel the patients and their families to effectively communicate end-of-life care issues.
11. Participate in end-of-life discussions with the cardiac ICU team and family members.
12. Perform an appropriately timed consultation and present well-documented assessments and recommendations in written, electronic, and/or oral formats.

Collaborator

1. Participate in effective teamwork and demonstrate a respectful attitude toward other colleagues, inter- and intra-professional team members, and other healthcare providers.
2. Prevent conflicts and identify and negotiate overlapping and shared responsibilities.
3. Discuss how the healthcare system affects the management of inpatient cardiac ICU care.
4. Demonstrate awareness of the impact of diagnostic and therapeutic recommendations on the healthcare system.
5. Demonstrate effective and safe handover during sign-out or transition of care, either within the institution or to a different setting or stage of care.

Leader

1. Promote a culture of teamwork that recognizes, supports, and responds effectively to colleagues in need during patient care.
2. Efficiently perform allocated patient care tasks during ward rounds.
3. Recognize personal limitations and seek help whenever appropriate.
4. Recognize and professionally respond to unprofessional and unethical behaviors of other staff members.
5. Utilize resources effectively to balance patient care, continuing education, and personal activities.

6. Work efficiently and effectively within a healthcare system.
7. Utilize information technology for optimal patient care.
8. Demonstrate knowledge of the physical requirements of the cardiac ICU design.
9. Apply quality improvement and assurance.

Health advocate

1. Contribute effectively to improving the health of patients and communities.
2. Recognize and respond to issues where health advocacies are appropriate.
3. Educate patients and families about and promote the importance of long-term healthy behaviors and preventive healthcare (e.g., smoking cessation, screening tests, vaccinations, exercise, and nutrition)
4. Respect and empower patient autonomy.

Scholar

1. Develop, monitor, and revise a personal learning plan by utilizing meaningful feedback and evaluations to promote goal-directed learning.
2. Integrate evidence into decision-making.
3. Promote patient safety and a safe learning environment.
4. Use available technologies effectively to manage information, support patient care decisions, and enhance both patient and physician education.
5. Demonstrate an attitude that supports teamwork and promotes collaborative learning.
6. Apply knowledge obtained from multiple studies to critically ill cardiac care
7. Analyze their own knowledge and clinical experience and employ a systematic methodology for improvement.

8. Develop and maintain a willingness to learn from errors and consequently improve the system and/or processes of care
9. Critically appraise and cite pertinent literature.

Professional

1. Exhibit a professional commitment to rounds.
2. Commit to maintaining and enhancing competence, quality improvement, and patient safety.
3. Recognize the importance of patient primacy, privacy, and autonomy, informed consent, and equitable respect and care.
4. Respect patients and their families, as well as staff and colleagues.
5. Model ethical behavior by reporting any key clinical findings to the attending and referring providers, following clinical questions, laboratory testing, and other patient care issues, and recognizing potential conflicts of interest.
6. Demonstrate integrity, honesty, and openness in discussing therapeutic options with patients while respecting their preferences and cultural differences.
7. Respond promptly to phone calls, pages, and messages.
8. Recognize and professionally respond to unprofessional and unethical behaviors in other staff members.
9. Promote teamwork that recognizes, supports, and responds effectively to colleagues in need during patient care.
10. Commit to disclosure of errors and adverse events, and realize their impact.
11. Demonstrate self-responsibility, including personal care, to best serve others.

ACSICU rotation

Objectives:

1. Effectively obtain a relevant history and perform a pertinent physical examination of patients needing cardiac critical care.
2. Explain the pathophysiology of commonly observed diseases in critically ill patients.
3. Demonstrate working knowledge of adult cardiac intensive care surgeries by actively participating in the management of critically ill cardiac patients.
4. Demonstrate an understanding of the integrative nature and interdisciplinary management of critical cardiac diseases.
5. Identify at-risk patients, formulate a problem list, and institute a course of therapy in the direction of senior personnel.
6. Summarize approaches in evaluating common presentations in critical care patients.
7. Consider triage interventions, including clinical urgency, potential for unexpected outcomes, and available alternatives.
8. Effectively manage cardiac arrest and acute resuscitation of postoperative or acutely ill patients
9. Effectively perform common procedures in the medical and surgical cardiac ICU, including central and arterial line insertions, orotracheal intubation, paracentesis, and thoracentesis.
10. Outline the basic principles, indications, contraindications, management, and troubleshooting protocols of intra-aortic balloon pump application and veno-venous (VV) or venoarterial (VA) extracorporeal membrane oxygenation (ECMO).
11. Appropriately select and interpret laboratory, imaging, and pathological studies, including arterial blood gases, chest X-rays, and computed tomography (CT), to evaluate cardiac critical cardiac illnesses.

12. Construct a comprehensive management plan and assess patients' response to therapy.
13. Execute interventions in a skillful and safe manner, adapt to new findings, and change clinical circumstances whenever appropriate.
14. Effectively use validated instruments effectively in assessing therapeutic responses to determine overall function and quality of life.
15. Recognize when care should be transferred to other physicians or healthcare providers.

Cardiac Anesthesia rotation

This rotation will be mandatory for fellows without a medical or surgical background in cardiac anesthesia. Fellows will be assigned to theater lists in the field of cardiac surgery.

Objectives:

1. Explain normal adult anatomy and physiology, as well as the pathophysiology of diseases of the following systems:
    - Cardiovascular
    - Respiratory
    - Nervous
    - Hepatic
    - Renal
    - Endocrine
    - Hematologic
2. Explain the functions of all anesthetic equipment, including the anesthetic machine, mechanical ventilator, and monitoring equipment.
3. Perform basic and advanced airway management including:
    - Bag-mask ventilation
    - Direct laryngoscopy
    - Use of different intubation techniques in cases of difficult intubation (e.g., laryngeal mask airway or glide scope)

4. Perform all technical skills (initially under supervision and then independently) necessary to manage adult patients perioperatively, including routine and difficult airway management as follows:
    - General anesthesia techniques, including those related to induction, maintenance, and emergence
    - Peripheral and central venous access invasive monitoring
    - Pulmonary artery catheter insertion and hemodynamic studies
    - Resuscitation of critically ill adult patients (with reference to ACLS and ATLS protocols)
5. Perform awake fiberoptic intubation.
6. Appropriately select and administer a complete spectrum of anesthetic and analgesic agents for the induction and maintenance of general, local, or regional anesthesia, while considering the relative advantages, disadvantages, and specific goals of each approach.
7. Perform resuscitation during anesthesia and perioperatively, considering the relative advantages, disadvantages, and specific goals of each approach.
8. Inserting the pulmonary catheter, and central and arterial lines, reading the waveform, and troubleshooting when appropriate.
9. Outline the concept of bypass machines, cannulation techniques (central and peripheral), troubleshoot and weaning from bypass, cardioplegia, and circulatory arrest.
10. Assess suitability for patient transfer to the cardiac ICU, intermediate care, ward, and home settings
11. Perioperatively alleviate impediments to recovery, such as nausea/vomiting, pain, and functional impairment.
12. Interpret information from monitors, including invasive and noninvasive blood pressure amplifiers, 5-lead electrocardiograms (ECGs), neuromuscular monitors, oximeters, end-tidal gas monitors, temperature monitors, and cardiac and urine output monitors.
13. Identify and correct sources of errors in the monitoring equipment.

14. Select and administer appropriate anticoagulation and reversal therapies.
15. Select and administer appropriate fluids and blood products perioperatively, while considering its indications, contraindications, and complications.
16. Appropriately assess patients and their risks, then formulate and implement an appropriate individualized perioperative management plan that considers the implications of patients' underlying problems, surgical procedures, and coexisting patient factors, such as other medical problems, anxiety, discomfort, culture, language, ethnicity, age, and sex.
17. Manage adult cardiac patients in a variety of settings, including:
    a. Elective, urgent, and emergency procedures
    b. Sites distant from the operating room
    c. Unforeseen emergencies (e.g., malignant hyperthermia and anaphylaxis)

CCU rotation

Objectives:

1. Outline the assessment and management of acute cardiac problems encountered in the CCU, including acute coronary syndrome, arrhythmias, syncope, cardiogenic shock, and congestive heart failure.
2. Address the hemodynamic complications of acute valvular (native and prosthetic) disease.
3. Outline basic principles, indications, and contraindications of intra-aortic balloon pump application.
4. Describe the pathophysiology and management of the following commonly encountered diseases in the CCU:

a. Coronary artery disease, acute myocardial ischemia and infarction, and complications of thrombolytic therapy and pacemaker application, and the indications for temporary pacing
b. Valvular heart disease, including the pathophysiological alterations induced by chronic valvular disease in critically ill patients
c. Shock, with management including volume resuscitation and administration of vasodilators/constrictors, inotropes, and lusitropes
d. Cardiac tamponade or constrictive pericarditis
e. Dilated, restrictive, and obstructive cardiomyopathy, congestive heart failure, and diastolic dysfunction
f. Aberrant conduction, dysrhythmia, and sudden acute and subacute ventricular and supraventricular arrhythmia
g. Aortic dissection, thoracic and thoracoabdominal aortic aneurysm, and pulmonary edema

5. Describe the dosages, mechanism of action, and complications of the following commonly used cardiac drugs:
   a. Heparin, thrombolytic, and antiplatelet agents
   b. Antifibrinolytic agents
   c. Vasodilators, vasoconstrictors, and inotropic and lusitropic agents
   d. Anti-arrhythmic agents
6. Interpret ECGs for ischemia, infarction, arrhythmias, and paced rhythms. Fellows should know the relevance of special lead placement and recognize the limitations, sensitivity, and specificity of ECGs for monitoring ischemia.
7. Gain procedural skills for complicated procedures such as pacemaker insertion, invasive and noninvasive hemodynamic and cardiac output monitoring, cardioversion, arterial line insertion, and pericardiocentesis under cardiologist supervision.
8. Describe current indications and recommendations for subacute bacterial endocarditis prophylaxis.

Research rotation (Elective)

Objectives:

1. Explain the principles and processes for development and implementation of clinical trials.
2. Explain the principles and purposes of common statistical tests.
3. Summarize the ethical considerations of research involving human and animal subjects.
4. Prepare research proposals and protocols involved in hypothesis and observational research.
5. Describe the process of organizing a laboratory research project.
6. Outline the principles of evidence-based medicine techniques.
7. Prepare, organize, and analyze research-generated data.
8. Prepare a draft manuscript and abstract.

Echocardiography rotation

The echocardiography rotation is required to help fellows in becoming competent in assessing critically ill cardiac patients by promptly identifying and treating the underlying causes of hemodynamic instability, thereby preventing or decreasing mortality and morbidity. Fellows should use focused and goal-directed cardiac examinations via appropriate transthoracic echocardiography (TTE). This is not intended to replace the detailed TTE by a cardiologist.

Objectives:

1. Describe the basic thoracic anatomy.
2. Outline the basic principles of cardiac transducer orientation and positioning.
3. Explain the anatomy and orientation of basic echocardiographic views.
4. Perform and interpret a focused and goal-directed echocardiography.

5. Perform an optimal echocardiographic examination via the transthoracic approach in acutely ill patients.
6. Answer questions through a focused or goal-directed examination, which are usually related to the following:
    a. Left and right ventricular size and function
    b. Pericardial space for effusion or tamponade.
    c. Fluid status and responsiveness
7. Identify cardiogenic, distribute, and hypovolemic causes of hemodynamic instability.

Electrophysiology rotation

Electrophysiology rotation is required to help fellows in the assessment of critically ill cardiac patients by promptly identifying and treating the underlying causes of arrhythmia, thereby preventing or decreasing mortality and morbidity. Fellows are expected to become competent in assessing critically ill cardiac patients using focused and goal-directed cardiac examinations via an appropriate 12-lead ECG and Holter. This is not intended to replace a detailed assessment by a cardiac electrophysiologist.

Objectives:

1. Outline the basic heart conduction system.
2. Explain the importance of proper rhythm analysis of the patient for optimal cardiac care.
3. Describe the basic principles of cardiac rhythm and tachy-brady arrhythmia.
4. Perform and interpret a focused ECG, and answer related questions.
5. Select the most effective treatment plan for tachy-brady arrhythmia “pharmacology and pacemaker”.

TEACHING METHODS:

To achieve the required competencies, fellows should be exposed to a wide range of topics that form the major subjects in the curriculum. Different educational activities will be used to help deliver the required components of these topics. Complementary and additional recommended workshops/courses and simulation sessions are required to provide a holistic approach to the topics. These include the following areas:

1. Formal teaching and learning activities.
    - Universal topics (10%)
    - Core specialty topics (70%)
    - Fellows' selected topics (20%)
2. Practice-based learning
    - Morning report case presentations
    - Morbidity and mortality reviews
    - Journal club
    - Case presentations
    - Grand round/guest speakers on core specialty topics
    - Joint specialty meetings
3. Work-based learning
    - Daily round-based learning
    - On-call-based learning
    - Workshops and courses
4. Self-directed learning

1. Formal learning and teaching

1.1 Universal topics

The SCFHS developed an e-learning platform to deliver high-value, interdisciplinary topics of the utmost importance to fellows to ensure that

all fellows receive high-quality teaching and develop essential core knowledge. These topics are common to all specialties and are delivered in a modular fashion. At the end of each learning unit, an online formative assessment was conducted. Upon completing all topics, fellows will undertake a combined summative assessment in the form of context-rich multiple-choice questions (MCQs) in which they must attain minimum competency. Completion of the following seven modules is mandatory:

Module 1: Introduction

1. Safe drug prescription
2. Hospital-acquired infections (HAIs)
3. Sepsis, systemic inflammatory response syndrome (SIRS), and disseminated intravascular coagulation (DIC)
4. Antibiotic stewardship
5. Blood transfusion

Module 2: Managing medical and surgical emergencies

1. Acute chest pain
2. Acute breathlessness
3. Altered sensorium
4. Hypotension and hypertension
5. Upper and lower gastrointestinal (GI) bleeding

Module 3: Acute care

1. Preoperative assessment
2. Postoperative care
3. Acute and chronic pain management
4. Management of fluid in the hospitalized patient
5. Management of acid-base/electrolyte imbalances

Module 4: Ethics and healthcare

1. Occupational hazards of healthcare workers
2. Evidence-based approach to smoking cessation
3. Patient advocacy
4. Ethical issues: transplantation/organ harvesting and withdrawal of care
5. Ethical issues: treatment refusal and patient autonomy
6. The role of doctors in death and dying

For the objectives of each module, refer to the SCFHS website.

Training Year	Modules		Topics name	
	Number	Name	Topic Number	Name
F1	Module-1	Introduction	1	Safe drug prescribing
			2	Hospital-acquired infections
			3	Sepsis; SIRS; DIVC
			4	Antibiotic stewardship
			5	Blood transfusion
	Module 4	Medical and Surgical Emergencies	15	Management of acute chest pain
			16	Management of acute breathlessness
			17	Management of altered sensorium
			18	Management of hypotension and hypertension
			19	Management of upper GI bleeding
			20	Management of lower GI bleeding
F2	Module 5	Acute Care	21	Preoperative assessment
			22	Postoperative care
			23	Acute pain management
			24	Chronic pain management
			25	Management of fluid in the hospitalized patient
			26	Management of electrolyte imbalances
			31	Occupational hazards of HCW

	Module 7	Ethics and Healthcare	32	Evidence-based approach to smoking cessation
			33	Patient advocacy
			34	Ethical issues: transplantation/organ harvesting; withdrawal of care
			35	Ethical issues: treatment refusal; patient autonomy
			36	Role of doctors in death and dying

1.2. Core specialty topics

Different educational activities will help deliver the required components of these topics.

Formal teaching will be utilized during the program for 2–3 hours per week. Topics may include interactive lectures, case discussions, simulation sessions, quizzes, and videos. This ensures that fellows become well-versed in vital critical care topics/clinical problems.

Cardiovascular section

Topics	Learning objectives
Cardiovascular pharmacology	• Gain advanced knowledge of the basic principles and use of various vasopressors and inotropes • Develop knowledge and experience regarding other cardiovascular medications
General preoperative considerations, patient preparation for surgery, and different scoring systems	• Know the criteria of patient selection • Know the concept of enhanced patient recovery • Know different mortality scoring systems • Cardiac ICU key performance indicators
Synopsis of cardiac anesthesia	• Cardiac anesthetics during induction, maintenance of anesthesia, bypass initiation, and weaning off • Ventilatory management during cardiac anesthesia • Basic TEE views • Immediate postoperative care, transportation, and handover

Synopsis of adult cardiac surgical interventions	• Know the basics, indications, complications, and management of different cardiac surgical interventions and procedures
Cardiopulmonary bypass and myocardial protection	• Know the basics and the concept of the cardiopulmonary bypass machine and expected complication • To understand the basics and the concept of myocardial protection during cardiac surgery
Admission to the CICU, handover, examination and approach, monitoring techniques	• Know how to receive a post-cardiac surgery patient • To know how to examine and assess post-cardiac surgery patients • Know the available monitoring techniques for post-cardiac surgery patients • Know the concept of fast tracking
Hemodynamic monitoring	• Recognize variable tools of hemodynamic monitoring, understand their basic science of and build the experience to start, calibrate, and interpret the result in the context of patients' clinical condition • Recognize indications, limitations, and pitfalls • Master principles of invasive pressure measurement and waveform recognition, interpretation, and troubleshooting
Approach and management of hemodynamic instability after cardiac surgery	• Perform proper assessment and evaluation of patients with postoperative hemodynamic instability • Initiate proper management and identify possible causes with differential diagnoses
Types of shock and assessment of the cardiac function	• Recognize circulatory shock and its different types and possible causes, utilizing clinical data and available laboratory and monitoring variables • Build experience to promptly manage all shock types and supporting organ functions • Gain the skills of assessing cardiac function utilizing different assessment methods
Mediastinal bleeding	• Approach and management of mediastinal bleeding

Management of advanced heart failure, valvular heart disease, and pericardial disease	• Manage advanced heart failure pharmacologically and recognize different modalities of mechanical support • Recognize severe valvular heart disorder, manage acute presentation, and plan further interventions • Recognize pericardial disease and identify emergency situations requiring immediate intervention
Acute coronary syndromes and evaluation	• Recognize an acute coronary syndrome (ACS) and initiate its management • Master thrombolytic therapy, indications, contraindications, and the need for immediate cardiac intervention • Recognize complications of ACS, including arrhythmias, cardiac dysfunction, and mechanical complications, and manage them accordingly
Arrhythmia recognition and management	• Diagnose and manage different arrhythmias and recognize different precipitating factors and basic physiology of cardiac rhythms and dysrhythmias • Understand the basics of cardiac pacemakers and the method and use of transvenous, percutaneous and epicardial pacing and defibrillators
Management of hypertension in the ICU	• Monitor and manage hypertensive emergencies and urgencies and build the knowledge of and experience in using different classes of antihypertensive medications and their side effects
Mechanical circulatory devices	• Gain knowledge of different skills regarding cardiac extracorporeal support strategies, including intra-aortic balloon pump, and troubleshooting protocols • Gain knowledge and skills, indications, contraindications, complications, and weaning of VV or VA ECMO and intra-aortic balloon pump utilization in cardiac intensive care settings
Patients with left ventricular assistive devices	• Approach and management of advanced heart failure and postoperative care of patients with left ventricular assistive devices
Cardiorespiratory resuscitation	• Master basic and advanced cardiac life support and maintain required training and certifications, following international guidelines • Know how to manage postoperative cardiac arrest

Diastolic heart failure	• Recognize the pathophysiology, evaluation, and management of diastolic heart failure • Manage the patient with chronic and acute right-sided heart failure
Post-cardiac transplant patients	• Understand the principles of patient care after cardiac, kidney, liver, and lung transplantation

Pulmonary section

Topic	Learning objectives
Assessment of respiratory failure	• Understand the basic principles of pulmonary function, gas exchange, and pathophysiology of respiratory failure • Recognize various types of respiratory failure and their causes and management
Blood gas and acid-base analysis	• Understand the principles of blood gas analysis • Master reading and interpretation of blood gas values and various single or combined acid-base abnormalities, using the conventional and strong ion difference methods
Oxygen therapy	• Understand physiology and the application of various oxygen therapy tools
Acute respiratory distress syndrome (ARDS)	• Understand the basic science, pathophysiology, clinical presentation, recognition, and management options and principles of ARDS
Bronchial asthma and chronic obstructive airway disease	• Understand the basic science, pathology, evaluation of severity, and management in critical care for acute exacerbation • Master ventilatory support of obstructive airway diseases
Extrapulmonary causes of respiratory failure	• Recognize, evaluate, and manage patients with respiratory failure secondary to extrapulmonary causes and evaluate severity and the need for mechanical support
Pulmonary hypertension in the ICU and right ventricular failure	• Understand basic principles, physiology, and pathophysiological causes, evaluation, and management of acute or acute on top of chronic pulmonary hypertension and right-sided heart failure • Understand the management of pulmonary hypertension in patients after cardiac surgery

Mechanical ventilation	• Master the basic principles of mechanical ventilation, including basic sciences related to physics, dynamics, machines, operation, maintenance, and troubleshooting • Understand mechanical ventilation modes, settings, delivery, phases, waveform analysis, pitfalls, and troubleshooting • Master the best methods to ventilate patients with normal lungs, restrictive or obstructive lung diseases, or ARDS • Gain knowledge of rescue therapy and nonconventional mechanical ventilation • Facilitate patient care with weaning from mechanical ventilation • Understand complications of mechanical ventilation and corresponding management
Noninvasive mechanical ventilation	• Understand and master the principles, types, interface, indications, contraindications, monitoring, and titration of noninvasive ventilation • Initiate and adjust noninvasive ventilation
Postsurgical atelectasis and diaphragm weakness	• Understand the disease, assessment and risk factor management of postoperative respiratory complications.

Renal section

Topic	Learning objectives
Acute kidney injury	• Recognize the basic principles of kidney function and understand the pathophysiology, causes, presentation, complications, diagnosis, prevention, and management of acute kidney injury.
Renal replacement therapy (RRT)	• Understand basic principles, types, indications, advantages, disadvantages, and management of RRT.
Severe electrolytes disorders	• Master recognition and management of severe electrolyte disorders, including sodium, potassium, calcium, phosphate, and magnesium abnormalities.
Chronic and acute on top of chronic kidney disorder	• Recognize clinical manifestations, complications, evaluation, and management of severe chronic kidney disease.
Kidney Transplant	• Understand the management of immune suppressive medication for postcardiac surgery patients.

Infectious diseases section

Topic	Learning objectives
Approaches to fever in the ICU	• Define fever in the ICU, recognize presentation of infectious disease, and initiate appropriate work-up and therapy for various life-threatening infections. • Determine the common causes of postoperative fever and corresponding management plans.
Antibiotic therapy in critical care	• Understand the principles, classes, pharmacodynamics, pharmacokinetics, spectrum, dosing, and dosing adjustment of antimicrobial therapy
Infections in the immunocompetent ICU patient	• Recognize pathogenesis, clinical presentation, diagnostics, and treatment of common infections and related microbiological principles, including community and hospital-acquired CNS, respiratory, intra-abdominal, urinary tract, and skin and soft tissue infections, infective endocarditis, and prosthetic valve, intracardiac, and intravascular devices, sternal wound infections, mediastinitis, and other device-related infections.
Infection in the immune compromised patient	• Recognize pathogenesis, clinical presentation, diagnostics, and treatment of common infections and related microbiological principles, including community and hospital-acquired CNS, respiratory, intra-abdominal, urinary tract, skin and soft tissue, and transplant-related infections, and acquired and congenital immunodeficiencies.
Prevention and control of HAIs	• Understand the principles of infection control, types of isolation, use of protective tools, and management of exposure to infectious hazards. • Understand the principles of prevention of device-related infections.
Antimicrobial resistance	• Understand the risks, mechanisms, treatment, and prevention of antimicrobial resistance.

GI section

Topic	Learning objectives
Upper and lower GI bleeding	• Understand pathogenesis and causes of GI bleeding and initiate resuscitation and pharmacological, mechanical, and interventional therapy
Acute liver or acute on top of chronic liver failure	• Master diagnosis, etiologies, and management of acute fulminant liver failure • Use scoring systems and available guidelines in initiating a transplant process
Acute abdomen	• Understand surgical and nonsurgical acute abdominal emergencies, including bowel ischemia, perforation, obstruction, pancreatitis, cholangitis, and abdominal infections.
Stress ulceration	• Master assessing the risk, prevention, and treatment of stress ulcerations.

Endocrine section

Topic	Learning objectives
Blood sugar related disorders	• Understand and master diagnosis and management of hyperglycemic disorder (diabetic ketoacidosis, and hyperosmolar nonketotic state) and hypoglycemia in the ICU • Understand postoperative glycemic control and its specific targets.
Endocrine emergencies	• Understand the concepts and perioperative management of thyroid storm, adrenal insufficiency, myxedema coma, acute pheochromocytoma acute, and perioperative management

Neurological section

Topic	Learning objectives
CNS infections	• Identify clinical presentations, pathophysiology, microbiology, diagnosis, management, and complications of meningitis, encephalitis, and bacterial, viral, and fungal cranial infections
Cerebrovascular accidents	• Recognize risk factors, clinical presentations, diagnostic modalities, and management of ischemic and hemorrhagic stroke, including subarachnoid, subdural, and epidural hemorrhages
Status epilepticus	• Understand the principles of seizure disorder and clinical presentation of refractory seizure and status epilepticus • Master therapeutic modalities, monitoring options, and possible complications
Decompensating neuromuscular disorder	• Understand the basics of neuromuscular disorders and assess exacerbation presentations • Assess severe cases requiring life support measures
Brain death	• Understand the principles, pathophysiology, and diagnosis of brain death and maintenance of potential donor organs
Altered mental status	• Approach and generate differential diagnoses and properly investigate and manage variable causes
Metabolic encephalopathy	• Understand common metabolic encephalopathies and manage them accordingly
CNS pharmacology	• Comprehend the principles of sedative agents, antiepileptics, thrombolytic, antithrombotic agents, neuromuscular blockades, and neuroleptic agents and their therapeutic use and complications

Hematological section

Topic	Learning objectives
Transfusion medicine	• Understand the basics of transfusion medicine, different types and properties of various blood product components, indications for use, and side effects. • Understand the triggers of transfusion after cardiac surgery. • Understand thromboelastrography and coagulation profile interpretation.
Benign hematology	• Recognize the presentation of complicated hematological disorders, including sickle cell disease, congenital hemoglobinopathies, coagulation disorders, and platelet disorders.
Venous thromboembolism	• Recognize risk factors, diagnostic methods, and management of severe and life-threatening forms of venous thromboembolism and methods of prophylaxis

Perioperative medicine section

Topic	Learning objectives
Perioperative physiology and monitoring	• Evaluate perioperative risks of patients for surgery • Understand perioperative physiological changes, complications, and corresponding monitoring strategies.
Non-cardiac surgery in cardiac patients	• Assess and manage surgical patients with cardiac disorders.
Surgical emergencies	• Recognize surgical emergencies, including bowel and esophageal perforation, intestinal obstruction, pancreatitis, bowel ischemia, abdominal sepsis, compartment syndrome, limb ischemia, and necrotizing soft tissue infections.

Administrative topics section:

- Recognizing and managing ICU staff stress
- Quality monitoring and indicators
- Interprofessional collaboration and communication among critical care team members
- ICU staff organization and management
- Defining and measuring patient safety in the ICU
- Medical ethics, end-of-life care, and communication with families, including breaking bad news
- Clinical research in the ICU
- Planning and organization for emergency mass critical care

1.3. Fellows' selected topics

1. Fellows will be given the opportunity to develop a list of topics on their own.
2. They can choose any topics relevant to their needs.
3. All these topics must be planned and cannot be random.
4. All the topics need to be approved by the local education committee.
5. The institution may work with the fellows in determining the topics.

2. Practice-based learning

Regular educational activities

A. Morning report

The morning report is a daily meeting activity designed to discuss on-call cases presented to the team. The format of the morning report is valuable and depends on the rotation. The morning report primarily aims to share the experiences of patient presentation, assessment, evaluation, and management. Fellows should build abilities in presenting and discussing clin ical cases to generate appropriate differential and working diagnoses and set the patient management plan.

The performance of fellows should be supervised by a senior member of the team to guide them through proper evaluation and management.

Different formats of clinical materials can be presented during the morning report, including case presentation, data interpretation, radiological imaging, hemodynamic figures, and other appropriate clinical data. This will be an excellent platform to raise queries and questions and stimulate fellows to conduct more reading and research around the presented cases. The designated time should be adequate to achieve the intended objectives and should be separated from sign-in and sign-out reports.

B. Case presentation

Case presentations are provided for fellows to prepare educational cases that they have seen and utilize them to present clinical situations with in-depth analyses and reviews. This may include a literature review of the highlighted clinical conditions, diagnostic dilemmas, management options, and other predetermined educational objectives. The frequency of the activity should match the number of fellows to provide a chance for each to present at least once a month during the training period.

C. Journal club

The journal club provides a platform for fellows to select, present, and critically appraise a pertinent published article. This activity will enhance the ability of fellows to evaluate published research, keep track of new updates in the field, and transform research findings into clinical applications, as well as apply knowledge gained from evidence-based principles. The frequency of the activity should match the number of fellows to provide a chance for each to present at least once a month during the training period.

D. Ground round

In this activity, a senior staff member reviews related literature on a specific topic. Fellows are given a chance to prepare a ground round, enhance presentation skills, and build necessary experience to develop expertise in the field. In addition to gaining clinical knowledge, this practice also develops the personality of fellows to become a scholar in their field.

E. Mortality and morbidity reviews and meeting

This activity aims to build skills in providing professional review of certain situations and conditions, recognize possible corrective actions, and improve quality and patient safety. Attending mortality and morbidity reviews presented by other team members and senior staff is essential for determining system-related issues and errors, recognizing complications and methods of prevention, and planning for monitoring parameters and performance improvement. The frequency of the activity should match the number of fellows to provide a chance for each to present at least twice per training year.

F. Academic half-day activity

It is a weekly half-day educational activity without any clinical duty. The academic half-day activity is a weekly protected time for fellows to attend a presentation on a core curriculum topic. The local training committee is responsible for arranging this activity to ensure exposure of fellows to required topics in the curriculum and stimulate them to read and expand their knowledge and skills regarding the topic. In each training region, the participating training center should organize the activity and decide on the venue and time.

G. Sign-in/sign-out meeting

Fellows should be given the chance to hand over patients under their care to the receiving team after they concisely highlight the important clinical data, plan of care, and therapeutic goals. Fellows are also required to receive handover from the team caring for the patient, which should be a routine daily activity. A consultant should provide assessment and evaluation for at least four times per month.

3. Work-based learning

A. Daily round-based learning

With this, fellows present a focused patient history and physical examination findings to the rounding team, document historical and

physical examination findings in an accepted format, including a complete written database and problem list, and develop a patient management plan in consultation with other fellows.

B. On-call duty-based learning

With on-call duty-based learning, fellows will elicit a comprehensive patient history and perform a complete physical examination on admission, clearly write assessment and differential diagnoses of medical problems, and initiate and thoroughly discuss the management plan, which includes investigations with the seniors, communication to the nurse-in-charge, performance of necessary basic procedures, and attending consultations within and outside the department, including emergency consultations and consultations with other specialties.

C. Workshops and courses

Fellows are expected to attend the following workshops once during their training period.

A. Required at entry level

- Basic life support
- ACLS

B. Mandatory

- Fundamental cardiac critical care
- Difficult airway management
- Critical care ultrasonography
    - Extended focused assessment with sonography in trauma (E-FAST)
    - Ultrasonography-guided central venous catheter insertion
    - Echocardiogram and TEE principles
- ECMO
- Crisis resource management/rapid response team

C. Recommended

- Emergency neurological life support

- Evidence-based medicine
- Research methodology and statistics
- Communication skills workshop
- Professionalism and ethics
- Examination preparation

4. Self-directed learning

- Maintenance of a personal portfolio that includes self-assessment, reflective learning, and a personal development plan
- Achievement of personal learning goals beyond the essential, core curriculum
- Reading medical journals and web-based materials
- Auditing and conducting research projects
- Attendance at national and international conferences
- Attendance of regional symposia, and conferences

ASSESSMENT

Assessment plays a vital role in the success of postgraduate training. Assessment will guide trainees and trainers to achieve defined standards, learning outcomes, and competencies. It will also provide feedback to learners and faculty regarding curriculum development, teaching methods, and quality of the learning environment. A reliable and valid assessment tool is excellent for evaluating curriculum alignments between objectives, learning methods, and evaluation methods. Finally, assessment ensures patients and the public that health professionals are safe and competent.

The assessment system aims to

- Enhance learning by providing formative assessment, enabling fellows to receive immediate feedback, and identifying areas for development.
- Provide robust and summative evidence that fellows are meeting curriculum standards during the training program
- Assess fellows' actual workplace performance
- Ensure that fellows possess the essential underlying knowledge, skills, and attitudes required for CCM

Fellows' evaluation and assessment throughout the program was undertaken by the Saudi Commission training and examination rules and regulations. The assessment includes the following areas that were later described in greater detail:

I. Continuous formative assessment:

- This assessment will be conducted toward the end of each training rotation throughout the academic year using different assessment tools.

- The fellows' performance will be evaluated jointly by relevant staff for the following competencies:
    - Performance of fellows during daily work
    - Performance and participation in academic activities
    - Performance of diagnostic and therapeutic procedural skills by fellows
- The CanMEDs-based end-of-rotation evaluation form (preferably the electronic format) must be completed within 2 weeks following the end of each rotation. The program director will discuss the necessary evaluation with the fellows. The evaluation form will be submitted to the local training supervisory committee of the SCFHS within 4 weeks following the end of the rotation.
- The annual promotion exam depends on a satisfactory annual overall evaluation, with a passing average score for all rotations of 60%.
- Written exam every 4 months include MCQ and/or short essay
- An objective structured clinical exam (OSCE) every 4 months

Structured academic activities (knowledge assessment)

- Fellows are expected to attend at least four grand rounds within the academic year in their department.
- Fellows are expected to attend at least three journal club meetings in their regions within the academic year.
- Fellows are expected to teach residents and medical students.
- Fellows are highly encouraged to participate in national/international meetings to present research projects or other topics of individual interest.

Direct Observation for Procedural Skills (DOPS) (skills assessment)

- This assessment is conducted at the beginning of fellowship training.
- The procedures form should be completed during each rotation (Appendix 2).
- Fellows will perform procedures under the supervision of the attending consultant and receive immediate feedback.

- Successful completion of the DOPS form is mandatory for all fellows and can be part of the logbook.
- Each fellow will complete the required procedures that can be assessed by DOPS, as defined by the critical care curriculum assessment blueprint (Table 1).
- Failure to submit the form to the local training committee within 6 months of training will be discussed with the local training program director.

Logbook (skills assessment)

- All fellows are required to keep a logbook during training (electronic records are highly recommended).
- The logbook aims to continually monitor fellows' performance, maintain a record of procedures and technical interventions performed, enable fellows and supervisors to determine learning gaps, and provide feedback to fellows.
- For the 2-year fellowship, fellows are required to complete a minimum of 50% of required procedures in the first year and all required procedures in their second year (Appendix 3).
- The completed logbook will be countersigned by the Program Director
- The logbook should be submitted at a maximum of 4 weeks before the end of the academic year.
- Failure to submit the logbook will be discussed with the Program Director and Scientific Committee.
- The completion of the logbook is included in the end-of-year total score for first- and second-year fellows.

Mini-clinical evaluation exercise (CEX) and case-based discussion (CBD) (Knowledge/skills assessment)

- This is a 10- to 20-minute direct assessment of fellow-patient interactions.
- Trainers are encouraged to perform at least two assessments per clinical rotation, preferably near the end of the rotation period.

Trainers should provide timely and specific feedback to fellows after each assessment of a fellow patient encounter (Appendices 4 and 5).

Research/quality project (Knowledge/skills assessment)

- Fellows must complete at least one of the following projects by the end of training:
    - A critical care-related evidence-based policy and procedures
    - Local guidelines for critical care
    - A case report
    - A qualitative or quantitative research project
- In each academic year, one research day is held where the research project for each fellow is evaluated.
- The components and scores are determined using the SCFHS Critical Care Fellowship Research Manual (Appendix 6).

In-Training Evaluation Report (ITER) (Attitude/knowledge/skills assessment)

- The fellowship program committee will evaluate the fellow's performance by ITER to fulfill the CanMEDs competencies on the end-of-rotation evaluation.
- ITER must be completed within 2 weeks following the end of each rotation (preferably in electronic format) and signed by at least one consultant assigned by the program director
- The program director will discuss the evaluation with the fellow as necessary.
- The evaluation form will be submitted within 4 weeks following the end of the rotations.

End-of-year promotion examination

The end-of-year examination will be limited to fellows who have started the fellowship program from the first year. The number of exam items, eligibility, and passing score will be per the commission's training and examination rules and regulations. Examination details and blueprints were published on the Commission website: www.scfhs.org.sa.

End-of-year promotion exam blueprint*

No.	Section	Percentage
1	Cardiac physiology	5%
2	Cardiovascular disorders and hemodynamics Cardiovascular monitoring	10%
3	Circulatory support, including ECMO, IABP, and LVAD	10%
4	Pulmonary disease and mechanical ventilation	5%
5	Postoperative infectious diseases	10%
6	Neurologic disorders and postoperative CNS monitoring and care	5%
7	Cardiovascular pharmacology	5%
8	Postoperative bleeding disorders	10%
9	Postoperative cardiovascular complications and management	10%
10	Noncardiac postoperative complications	10%
11	Postoperative adult rhythm disorders	5%
12	Research, ethics and professionalism, and patient safety	5%
13	Risk and outcome assessments	5%
14	Fluid management and electrolyte balance	5%
Total		100%

*Percentage distributions may differ by up to 3% in each category.

II. Summative assessment

1. FITER/comprehensive competency report

In addition to the approval of completion of the clinical requirements (Fellows' logbook) by the local supervising committee, the FITER was also prepared by the Program's Directors for each fellow at the end of their final year (Appendix 1). This may also involve clinical and oral examinations and other academic assignments.

2. Final fellowship examination

The final examination comprises two parts:

1. **Written examination:** This examination assesses the theoretical knowledge base (including recent advances) and problem-solving capabilities of candidates in the specialty of critical care, is delivered in an MCQ and modified essay questions format, and is held at the end of the clinical year. The number of exam items, eligibility, and passing score will be per the commission's training and examination rules and regulations. Examination details and blueprints were published on the Commission website: www.scfhs.org.sa.

Final written exam blueprint*

No.	Section	Percentage
1	Cardiac physiology	12%
2	Cardiovascular disorders and hemodynamics Cardiovascular monitoring	15%
3	Circulatory support, including ECMO, IABP, and LVAD	10%
4	Pulmonary disease and mechanical ventilation	15%
5	Postoperative infectious diseases	10%
6	Neurologic disorders and postoperative CNS monitoring and care	7%
7	Cardiovascular pharmacology .	10%
8	Postoperative bleeding disorders	5%
9	Postoperative cardiovascular complications and management	10%
10	Noncardiac postoperative complications	2%
11	Postoperative adult rhythm disorders	10%
Total		100%

*Percentage distributions may differ by up to 3% in each category.

2. **Clinical examination:** This examination assesses a broad range of high-level clinical skills, including data gathering, patient management, communication, and counseling skills. The examination

is held at the end of the year, preferably in an OSCE format, including patient management problems, a structured oral examination (SOE), and/or a simulation-based exam. The clinical exam will be conducted at the end of the second academic year. The final clinical exam is restricted to second-year fellows who have passed the final written exam. The exam passing score will be per the commission's training and examination rules and regulations. Examination details and blueprints were published on the Commission website (www.scfhs.org.sa).

Final clinical exam format

The adult cardiac critical care final clinical examination shall comprise 10 graded stations with 10-minute encounters.

a. There will be one examiner each for five OSCE stations and two examiners each for five SOE stations (the examiner can move between stations if the number of examiners is limited).
b. All stations shall be designed to assess integrated clinical encounters
c. SOE stations are designed with preset questions and ideal answers
d. Each OSCE station is assessed with a predetermined performance checklist; a scoring rubric for post-encounter questions is also set in advance.

Certification

Candidates who passed both examinations will be awarded the "Saudi Fellowship of Adult Cardiac Critical Care Medicine" certificate.

*Policies and Procedures

Holidays, vacations, and interruption of training

Holidays, vacations, and interruption of training were designated according to the SCFHS postgraduate rules and regulations (www.scfhs.org.sa).

Mentorship during fellowship training

Fellows entering the program will be asked to select a faculty mentor who will be available to them while they are in the program. Fellows without a mentor 6 months after starting the program will be assigned a mentor by a program director.

The following is a summary of the mentors' roles and the principles outlining the way the mentorship system should operate.

Mentors' role

1. The mentors' main responsibility will be to assist fellows in making decisions regarding training issues and career choices. The mentor should be supportive of fellows and advocate for the fellow.
2. While the frequency of meetings between fellows and mentors may vary, mentors should meet with mentees at least 4 times per academic year, with each meeting lasting 30–60 minutes.
3. Mentors should review rotation evaluations regularly and discuss pertinent weaknesses/strengths with mentees to improve academic standing, which also applies to in-training exam performance.
4. Mentors are encouraged to review mentees' rotations/electives annually to ensure that mentees meet their educational/research objectives and that exposure to a broad range of CCM is achieved by program completion.

Selection process

Fellows may choose their own mentors. It is recognized that many fellows entering the fellowship training program will have little knowledge of faculty members initially; however, after 6 months, fellows should be able to approach and choose a mentor. If they have not selected a mentor at this time, a mentor will be selected for them by the program director. If fellows require help to approach a mentor or feel that they need to change mentors, they should contact the Program Director.

Stress during fellowship training

As fellowship training can create physical, mental, and emotional stress, the Program Director provides continuous support for fellows. In some instances, the fellows' personal concerns will be reviewed at the Scientific Committee Meeting.

Stress counseling

Some fellows may experience stress during their training owing to multiple factors.

- Any fellow experiencing such issues can meet with the Program Director to seek advice
- The Scientific Committee will be asked to help with such issues if the program director cannot do so.
- The Scientific Committee will generate a report with recommendations
- The committee may request additional members to join the committee and help with the resolution of the matter as needed.

Suggested learning resources

Textbooks Recommended

Bojar, R. M., & Bojar, R. M. (2005). Manual of perioperative care in adult cardiac surgery (6th ed.). Malden, Mass: Blackwell Pub.

Brown, D. (2019). Cardiac intensive care (3rd ed.). Elsevier

Dabbagh, A., Esmailian, F., & Aranki, S. (2018). Postoperative critical care for adult cardiac surgical patients (2nd ed.). Springer.

Vincent, J. L., Abraham, E., Kochanek, P., Moore, F. A., & Fink, M. P. (2011). Textbook of critical care [E-Book]. Elsevier Health Sciences

Irwin, R. S., Lilly, C. M., Mayo, P. H., & Rippe, J. R. (2017). Irwin and Rippe's intensive care medicine (8th ed.) Wolters Kluwer.

Gabrielli, A., Layon, A. J., & Yu, M. (2011). Civetta, Taylor, and Kirby's manual of critical care. Lippincott Williams, Wilkins.

Irwin, R. S., & Rippe, J. M. (2008). Procedures, techniques, and minimally invasive monitoring in intensive care medicine. Lippincott Williams, Wilkins.

Others

Kluwer, W. W. (2014). Marino's ICU book (1st ed.). Bukupedia.

Society of Critical Care Medicine. (2001). Fundamental critical care support (2nd ed.).

Zimmerman J.L. Des Plaines, IL, Society of Critical Care Medicine, 1-5.

Zanotti-Cavazzoni, S. L., & Pino, R. M. (2016). Self-assessment of adult multiprofessional critical care (8th ed.). Society of Critical Care Medicine

Hess, D. R., & Kacmarek, R. M. (2018). Essentials on mechanical ventilation. McGraw Hill Professional.

Webb, A., & Gattinoni, L. (2016). Oxford textbook of critical care. Oxford: Oxford University Press.

Recommended journals

Critical Care Medicine

American Journal of Respiratory and Critical Care Medicine.

Chest

Critical Care

Annals of Intensive Care

Critical Care Clinics

Intensive Care Medicine

Anesthesia and Analgesia

New England Journal of Medicine

The Annals of Thoracic Surgery

European Journal of Cardio-thoracic Surgery

Journal of Thoracic and Cardiovascular Surgery

Annals of Cardiothoracic Surgery

Resuscitation

Journal of Trauma

References:

1- Adult critical care medicine fellowship training program [Internet]. Scfhs.org.sa. 2020 [cited 18 April 2021]. Available from: https://www.scfhs.org.sa/en/MESPS/Documents/Adult_Critical_care_-updated.pdf

2- Bojar R. Manual of perioperative care in adult cardiac surgery. 6th ed. Wiley: Blackwell; 2021.

3- Brown D. Cardiac intensive care. 3rd ed. Elsevier; 2019.

4- Curriculum for a CCT in Intensive Care Medicine [Internet]. Gmc-uk.org. 2019 [cited 18 April 2021]. Available from: https://www.gmc-uk.org/-/media/documents/cct-in-icm-part-i---handbook--2019-v2_4--final_pdf-77718175.pdf

5- Dabbagh A, Esmailian F, Aranki S. Postoperative critical care for adult cardiac surgical patients. 2nd ed.SPRINGER; 2019.

6- Frank JR, Snell L, Sherbino J, editors. CanMEDs 2015 Physician Competency Framework. Ottawa: Royal College of Physicians and Surgeons of Canada; 2015)

7- Ministry of health. Statistics. Available from: https://www.moh.gov.sa/en/Ministry/Statistics/book/

8- Saudi Board for Family Medicine Curriculum [Internet]. Scfhs.org.sa. 2020 [cited 18 April 2021]. Available from: https://www.scfhs.org.sa/MESPS/TrainingProgs/TrainingProgsStatement/Documents/Family%20Medicine%202020.pdf

9- Syllabus [Internet]. Gmc-uk.org. 2019 [cited 18 April 2021]. Available from: https://www.gmc-uk.org/-/media/documents/cct-in-icm-part-iii---syllabus--2019-v2_4-_pdf-77719464.pdf

Definitions

Care dimensions	Focus of care for the patient, family, community, and/or population
Approach and assessment	How to approach patients from history tracking to examination and investigations to reach diagnosis
Diagnosis	How to set the most appropriate diagnosis and excluding the other possible different diagnosis
Investigations and data interpretations	How to interpret the available investigations and radiological investigations to reach the diagnosis and set the management plan
Prevention and management	How to treat patients based on the diagnosis and change to prevent further deterioration or transmission to other patients

Domain	Reflects the scope of practice and behaviors of a practicing clinician
Patient care	Exploration of illness and disease through gathering, interpreting, and synthesizing relevant information that includes, but is not limited to, history taking, physical examination, and investigation. Management is a process that includes, but is not limited to, generating, planning, and organizing care in collaboration with patients, families, communities, populations, and healthcare professionals (e.g., finding common ground, agreeing on problems and goals of care, time and resource management, and arriving at mutual decisions for treatment)
Patient safety and procedural skills	Patient safety emphasizes the reporting, analysis, and prevention of medical errors that often lead to adverse healthcare events. Procedural skills encompass the areas of clinical care that require physical and practical skills of the clinician integrated with other clinical competencies to accomplish a specific and well-characterized technical task or procedure

Communication and interpersonal skills	Interactions with patients, families, caregivers, other professionals, communities, and populations. Elements include, but are not limited to, active listening, relationship development, education, verbal, non-verbal and written communication (e.g., patient-centered interview, disclosure of error, and informed consent)
Professional behaviors	Attitudes, knowledge, and skills based on clinical and/or medical administrative competence, ethics, societal, and legal duties resulting in the wise application of behaviors that demonstrate a commitment to excellence, respect, integrity, accountability, and altruism (e.g., self-awareness, reflection, life-long learning, scholarly habits, and physician health for sustainable practice)

APPENDICES

Appendix 1: Final in-training evaluation report (FITER)

1. The FITER is a summative evaluation prepared at the end of the Fellowship Program, which grants fellows with the full range of competencies (knowledge, skills, and attitudes) required of an intensivist and provides readiness to sit for the Saudi fellowship examinations.
2. The FITER provides information that will be considered by the Saudi Examination Board during the deliberation of a candidate whose performance at the Saudi certification examination falls into the borderline category.
3. The FITER is requested by the Saudi Board at the end of fellowship training
4. The FITER is completed by the fellowship training Program Director
5. The FITER is not a composite of regular in-training evaluations; rather, it is a testimony of the evaluation of competencies at the end of a fellowship education program.
6. The FITER will be completed as late as possible in fellows' training, but no later than 2 months before the final exam.
7. The FITER of individual candidates is available only to the Chair of the Examination Committee, who must maintain confidentiality regarding the name of the candidate, training center, and program director at all times.

Saudi Adult Critical Care Medicine Fellowship Program

Final in-training evaluation report (FITER)/Comprehensive competency report (CCR)

Fellow name:

Fellow SCFHS number:

Evaluation covering the last year as a fellow:

In the view of the Fellowship Program Committee, the fellow mentioned above has acquired the competencies of the critical care as prescribed in the objectives of training and is competent to practice as a specialist:

Yes ☐ No ☐

The following sources of information were used for this evaluation:

Evaluation source	Yes	No
• Written exams		
• Oral exams		
• Clinical observations (e.g., CBD, Mini-CEX) by faculty		
• OSCEs		
• Simulation-based assessment		
• Feedback from healthcare professionals		
• Completion of a scholarly project		
• Other evaluations		

Comments:

Name of Program Director:

Date: Signature:

Name of Postgraduate Dean

Date: Signature:

This is to attest that I have read this document

Name of Fellow SCFHS number:

Date: Signature:

Fellow's comments:

Note: If, during the period from the date of signature of this document to the completion of training, the Program Committee judges that the

candidate's demonstration of competence is inconsistent with the present evaluation, it may declare the document null and void and replace it with an updated FITER. Eligibility for the examination depends on the updated FITER

FITER: (medical expert competency)

Fellow name:

Fellow SCFHS number:

	Expectations					
	*Rarely meets	*Inconsistently meets	*Generally meets	*Sometimes exceeds	*Consistently exceeds	Not applicable
Medical expert						
a. Functions effectively as a consultant, integrating all the CanMEDS roles to provide optimal, ethical, and patient-centered medical care						
b. Demonstrates an understanding of the basic scientific and clinical knowledge relevant to critical care medicine						
c. Elicits histories and physical examinations that are complete, accurate, and well organized						
d. Uses all pertinent information to arrive at complete and accurate clinical decisions						
e. Recognizes and manages emergency conditions resulting in prompt and appropriate treatment						
f. Demonstrates safe application of equipment, careful monitoring, judicious use of drugs, and the coordinated provision of multidisciplinary care for effective organ system support						
g. Demonstrates safe preparation and execution of patient transportation						

Please comment on the strengths and weaknesses of the candidate and provide a rationale for your ratings. Make direct reference to the objectives and give specific examples wherever possible.

Rarely meets expectations: < 30%

Inconsistently meets expectations: 30%–59%

Generally meets expectations: 60%–79%

Sometimes exceeds expectations: 80%–89%

Consistently exceeds expectations: ≥ 90%

FITER: (procedures and clinical skills competencies)

Fellow name:

Fellow SCFHS number:

	Expectations					
	*Rarely meets	*Inconsistently meets	*Generally meets	*Sometimes exceeds	*Consistently exceeds	Not applicable
Procedures and clinical skills						
Demonstrates the ability to perform diagnostic and therapeutic procedures/skills described in the Critical Care Medicine Fellowship Training Curriculum and presented below						
a. Assessment and maintenance of the airway						
b. Management of the patient requiring endotracheal intubation						
c. Care of the patient requiring prolonged ventilation, including tracheostomy and weaning techniques						
d. Central venous cannulation for resuscitation and hemodialysis with ultrasound guidance						

e. Resuscitation of the patient with dysrhythmia including medication, cardioversion, defibrillation, and pacing						
f. Insertion of arterial lines						
g. Thoracentesis and thoracostomy tube insertion						
h. Lumbar puncture						
i. Paracentesis						
Obtains appropriate informed consent for procedures and therapies						
Minimizes patients' risks and discomforts						
Identifies and manages complications						
Overall, is proficient in clinical and procedural skills relevant to adult CCM						
Please comment on the strengths and weaknesses of the candidate and provide a rationale for your ratings. Make direct reference to the specific objectives and give specific examples wherever possible.						

Rarely meets expectations: < 30%

Inconsistently meets expectations: 30%–59%

Generally meets expectations: 60%–79%

Sometimes exceeds expectations: 80%–89%

Consistently exceeds expectations: ≥ 90%

FITER: (communicator competency)

Fellow name:

Fellow SCFHS number:

	Expectations					
	*Rarely meets	*Inconsistently meets	*Generally meets	*Sometimes exceeds	*Consistently exceeds	Not applicable
Communicator						
a. Establishes a therapeutic relationship with patients and communicates well with their families. Provides clear and thorough explanations of diagnosis, investigation, and management in a professional manner. Demonstrates empathy and sensitivity to racial, sex, and cultural issues						
b. Prepares documentation that is accurate and timely						
c. Develops diagnostic and therapeutic plans that are understandable to patients and clear and concise for other healthcare personnel, including other consultants						
d. Demonstrates an awareness of the unique and stressful environment of the critical care facility for patients and their families						
e. Communicates effectively with patients and their families including but not limited to those who may present as dysfunctional, angry, confused, or litigious						
f. Develops a common understanding on issues, problems, and plans of care including but not limited to end-of-life issues						
g. Presents clinical summaries and scientific information in a clear and concise manner to a healthcare audience						
Please comment on the strengths and weaknesses of the candidate and provide a rationale for your ratings. Make direct reference to the objectives and give specific examples wherever possible.						

Rarely meets expectations: < 30%

Inconsistently meets expectations: 30%–59%

Generally meets expectations: 60%–79%

Sometimes exceeds expectations: 80%–89%

Consistently exceeds expectations: ≥ 90%

FITER: (collaborator competency)

Fellow name:

Fellow SCFHS number:

	Expectations					
	*Rarely meets	*Inconsistently meets	*Generally meets	*Sometimes exceeds	*Consistently exceeds	Not applicable
Collaborator						
a. Interacts effectively with health professionals by recognizing and acknowledging their roles and expertise						
b. Consults and delegates effectively						
c. Establishes good relationships with peers and other health professionals						
d. Effectively provides and receives information from other health professionals						
e. Manages conflict situations well						
Please comment on the strengths and weaknesses of the candidate and provide a rationale for your ratings. Make direct reference to the objectives and give specific examples wherever possible.						

Rarely meets expectations: < 30%

Inconsistently meets expectations: 30%–59%

Generally meets expectations: 60%–79%

Sometimes exceeds expectations: 80%–89%

Consistently exceeds expectations: ≥ 90%

FITER: (manager competency)

Fellow name:

Fellow SCFHS number:

	Expectations					
	*Rarely meets	*Inconsistently meets	*Generally meets	*Sometimes exceeds	*Consistently exceeds	Not applicable
Manager						
a. Understands and makes effective use of information technology, such as methods for searching medical databases						
b. Makes cost-effective use of healthcare resources based on sound judgment						
c. Prioritizes and uses personal and professional time effectively to achieve a balanced personal and professional life						
d. Demonstrates an understanding of the principles of practice management						
e. Demonstrates the ability to effectively utilize healthcare resources to maximize benefits to all patients, including managing a waiting list for patients outside the critical care unit						
Please comment on the strengths and weaknesses of the candidate and provide a rationale for your ratings. Make direct reference to the objectives and give specific examples wherever possible						

Rarely meets expectations: < 30%

Inconsistently meets expectations: 30%–59%

Generally meets expectations: 60%–79%

Sometimes exceeds expectations: 80%–89%

Consistently exceeds expectations: ≥ 90%

FITER: (health advocate competency)

Fellow name:

Fellow SCFHS number:

	Expectations					
	*Rarely meets	*Inconsistently meets	*Generally meets	*Sometimes exceeds	*Consistently exceeds	Not applicable
Health advocate						
a. Understands the specialist's role to intervene on behalf of patients regarding the social, economic, and biological factors that may impact their health						
b. Understands the specialist's role to intervene on behalf of the community regarding the social, economic, and biological factors that may impact community health						
c. Recognizes and responds appropriately in advocacy situations						
Please comment on the strengths and weaknesses of the candidate and provide a rationale for your ratings. Make direct reference to the objectives and give specific examples wherever possible.						

Rarely meets expectations: < 30%

Inconsistently meets expectations: 30%–59%

Generally meets expectations: 60%–79%

Sometimes exceeds expectations: 80%–89%

Consistently exceeds expectations: ≥ 90%

FITER: (scholar competency)

Fellow name:

Fellow SCFHS number:

	Expectations					
	*Rarely meets	*Inconsistently meets	*Generally meets	*Sometimes exceeds	*Consistently exceeds	Not applicable
Scholar						
a. Demonstrates an understanding of, and a commitment to, the need for continuous learning. Develops and implements an ongoing and effective personal learning strategy						
b. Critically appraises medical information by asking relevant questions and determining what information is reliable. Successfully integrates information from a variety of sources						
c. Understands the principles of adult learning and helps others to learn by providing guidance, teaching, and giving constructive feedback						
d. Facilitates the learning of patients, other house staff/students, and other health professionals						
e. Completes the electronic logbook in a timely fashion						
Please comment on the strengths and weaknesses of the candidate and provide a rationale for your ratings. Make direct reference to the specific objectives and give specific examples wherever possible.						

Rarely meets expectations: < 30%

Inconsistently meets expectations: 30%–59%

Generally meets expectations: 60%–79%

Sometimes exceeds expectations: 80%–89%

Consistently exceeds expectations: ≥ 90%

FITER: (professional competency)

Fellow name:

Fellow SCFHS number:

	Expectations					
	*Rarely meets	*Inconsistently meets	*Generally meets	*Sometimes exceeds	*Consistently exceeds	Not applicable
Professional						
a. Demonstrates integrity, honesty, compassion, and respect for diversity						
b. Fulfills medical, legal, and professional obligations of the specialty						
c. Meets deadlines and demonstrates punctuality						
d. Monitors patients and provides follow-up						
e. Understands the principles of ethics and applies these in clinical situations						
f. Demonstrates an awareness of limitations and seeks advice when necessary and accepts advice graciously						
g. Demonstrates respect toward other physicians and healthcare workers						
h. Participates in local, provincial, and national professional organizations						
Please comment on the strengths and weaknesses of the candidate and provide a rationale for your ratings. Make direct reference to the objectives and give specific examples wherever possible.						

Rarely meets expectations: < 30%

Inconsistently meets expectations: 30%–59%

Generally meets expectations: 60%–79%

Sometimes exceeds expectations: 80%–89%

Consistently exceeds expectations: ≥ 90%

Appendix 2: Direct Observation of Procedural Skills

Saudi Commission for Health Specialties
*SCFHS - Adult Critical Care - Fellowship

Evaluated By :evaluator's name
Evaluating :person (role) or moment's name (if applicable)
Dates :start date to end date

* indicates a mandatory response

Direct Observation Of Procedural Skills - DOPS Assessment

*Procedure:

	n/a	Below expectations 1	Borderline 2	Meets expectations 3	Above expectation 4
***Domain & Comments: Professional Approach (to include communication, consent and consideration of the patient.)**	○	○	○	○	○
***Knowledge (indication, anatomy, technique)**	○	○	○	○	○
***Demonstrate appropriate pre-procedure preparation**	○	○	○	○	○
***Appropriate analgesia or/and sedation**	○	○	○	○	○
***Technical Ability**	○	○	○	○	○
***Aseptic Technique**	○	○	○	○	○
***Post Procedure Management**	○	○	○	○	○

	Needs more practice	May need supervision if complications arise	Competent to perform unsupervised
***Overall Ability to perform Procedure:**	○	○	○

*Comments:

*Assessor's position:
- ○ Consultant
- ○ Associate Consultant
- ○ Senior Registrar
- ○ Registrar
- ○ Fellow
- ○ Senior Resident
- ○ Nurse
- ○ Others

Others (specify):

*Complexity of procedure:
- ○ Low
- ○ Average
- ○ High

Page 1

*Time taken for Feedback & Observation (in minutes):

The following will be displayed on forms where feedback is enabled...
(for the evaluator to answer...)

*Did you have an opportunity to meet with this trainee to discuss their performance?
- Yes
- No

(for the evaluee to answer...)

*Did you have an opportunity to discuss your performance with your preceptor/supervisor?
- Yes
- No

Page 2

Appendix 3: Procedures Logbook

Procedures Logbook					
Date	Medical record number	Age/sex	Procedure name	Supervisor	Comments

Required procedures in logbook and DOPS

The following illustrates the procedures, categories, number of required procedures, sites, and number of DOPS over 2 years of training (Fellows are supposed to complete at least 50% of procedures during the first fellowship year [F1] and complete all procedures by the second fellowship year [F2]).

Procedure	Required number	Site and type	Required DOPS
Performs US-guided central venous catheterization	20	IJV, SCV, femoral	1 for each site
Performs arterial catheterization	10	Radial, femoral	1 for each
Performs pulmonary artery catherization	10	IJV or SCV	10
Performs emergency airway management	1 (if possible)	Cricothyroidectomy	1 (if possible)
Performs difficult and failed airway management per local protocols	4	Not applicable	2
Directs laryngoscopy and intubation	10	Not applicable	2
Pleural tap	6	Not applicable	2
Bronchoscopy (intubated patient)	5	Not applicable	3
Chest tube insertion	5	Not applicable	2
Percutaneous tracheostomy	5	Not applicable	2
US of the chest	30	Lungs and pleural cavity	10
US of the abdomen	10	Ascites and E-FAST	4
US of the heart	50	Assess contractility, effusion, and chambers and valves	20

US for inferior vena cava assessment	30	For fluid status assessment	10
Transthoracic transvenous, and percutaneous cardiac pacing	10	Not applicable	5
Cardiac output monitoring (e.g., PiCCO, LiDCO, NICO)	10 (if possible)		5

IJV, internal jugular vein; SCV, subclavian vein; DOPS, Direct Observation of Procedural Skills; US, ultrasonography; E-FAST, Extended Focused Assessment with Sonography in Trauma.

Appendix 4: Mini-CEX

Saudi Commission for Health Specialties
*SCFHS - Adult Critical Care - Fellowship

Evaluated By : evaluator's name
Evaluating : person (role) or moment's name (if applicable)
Dates : start date to end date

* indicates a mandatory response

Mini-Clinical Evaluation Exercise (Mini-CEX)

*Brief Summary of Case:

	n/a	Below expectations (1)	Borderline (2)	Meets expectations (3)	Above expectation (4)
***1) Medical Interview Skills**	○	○	○	○	○
***2) Physical Examination Skills**	○	○	○	○	○
***3) Counselling and Communications Skills**	○	○	○	○	○
***4) Clinical Judgement**	○	○	○	○	○
***5) Consideration for Patient/Professionalism**	○	○	○	○	○
***6) Organisation/Efficiency**	○	○	○	○	○
***7) Overall Clinical Competence**	○	○	○	○	○

*Comments :

*Which aspects of the encounter were done well?

*Suggested areas for improvement / development?

*Agreed Actions / learning plan:

*Student's reflections on patient and areas of learning:

Page 1

*Assessor's position:

- Consultant
- Associate Consultant
- Senior Registrar
- Registrar
- Fellow
- Others

Others (specify):

*Time taken for Observation & Feedback (in minutes):

The following will be displayed on forms where feedback is enabled...
(for the evaluator to answer...)

*Did you have an opportunity to meet with this trainee to discuss their performance?

- Yes
- No

(for the evaluee to answer...)

*Did you have an opportunity to discuss your performance with your preceptor/supervisor?

- Yes
- No

Appendix 5: CBD Rating Form

Saudi Commission for Health Specialties
*SCFHS - Adult Critical Care - Fellowship

Evaluated By :evaluator's name
Evaluating :person (role) or moment's name (if applicable)
Dates :start date to end date

* indicates a mandatory response

Case based Discussion (CbD)

***Brief description of case including curricula areas covered:**

	n/a	Below expectations 1	Borderline 2	Meets expectations 3	Above expectation 4
***Domain & Comments Clinical Assessment :**	○	○	○	○	○
***Investigations and referrals**	○	○	○	○	○
***Management plan**	○	○	○	○	○
***Follow-up and future planning**	○	○	○	○	○
***Overall clinical judgement**	○	○	○	○	○
***Organisation**	○	○	○	○	○

***comments:**

***Which aspects of the encounter were done well?**

***Suggested areas for improvement / development?**

***Agreed Actions / learning plan:**

***Assessor's position:**

Page 1

- Consultant
- Associate Consultant
- Senior Registrar
- Registrar
- Fellow
- Other

Others (specify):

***Complexity of Case:**

- Low
- Average
- High

***Time taken for Observation & Feedback (in minutes)**

***Basis for discussion:**

- Outpatient case/record/letter
- Discharge Summary
- Inpatient case/consult/record

The following will be displayed on forms where feedback is enabled...
(for the evaluator to answer...)

*Did you have an opportunity to meet with this trainee to discuss their performance?

- Yes
- No

(for the evaluee to answer...)

*Did you have an opportunity to discuss your performance with your preceptor/supervisor?

- Yes
- No

Appendix 6: Research Manual

Definition of research

Research is a systematic and rigorous investigation of a situation or problem to generate new knowledge or validate existing knowledge. Research in healthcare involves a variety of aspects, including professional practice, environmental issues affecting health, vitality, treatments, theory development, and healthcare economics, and has many potential benefits. Most healthcare-related research is called clinical research. Clinical research is a branch of healthcare science that determines the safety and efficacy of medications, devices, diagnostic products, and treatment regimens intended for human use. These may be used for the prevention, treatment, diagnosis, or relief of symptoms of a medical condition.

Types of research

- Basic medical research: These involve areas tackled in the most fundamental parts of medical research, including cellular and molecular biology, medical genetics, immunology, neuroscience, and psychology.
- Preclinical research: Preclinical research prepares the groundwork for clinical research with patients. Typically, the work requires no ethical approval (except for some work involving animals), is supervised by PhDs rather than medical doctors, and is conducted in a university or company rather than a hospital or surgery.
- Clinical research: Clinical research is conducted with patients as participants. It is generally supervised by doctors in a medical setting, such as a hospital, and requires ethical approval. The clinical phase of drug testing is called a clinical trial.

Types of clinical study designs

- Meta-analysis: This method combines data from many different research studies. Meta-analysis is a statistical process that combines findings from individual studies.

- Systematic review: This type provides a summary, critical assessment, and evaluation of all research studies that address a particular clinical issue. Researchers use an organized method of locating, assembling, and evaluating a body of literature on a particular topic using a set of specific criteria. A systematic review typically includes a description of the findings from collected studies.
- Randomized controlled trial: This is a controlled clinical trial that randomly assigns participants to two or more groups. There are various methods to randomize study participants to their groups.
- Cohort study (prospective observational study): This is a clinical study in which people who presently have a certain condition or receive a particular treatment are followed up over time and compared with healthy unaffected controls.
- Case-control study: Case-control studies begin with outcomes and do not follow people over time. Researchers select, interview, or check medical records of people with a particular result to ascertain the different experiences they had. They compare the odds of having an experience with a specific outcome to the odds of having an experience without that outcome.
- Cross-sectional study: This involves observing a defined population at a single point in time or time intervals. Exposure and other outcomes are simultaneously determined.
- Case report and series: This is a report on a series of patients with an outcome of interest. No control group is included.
- Ideas, editorials, and opinions: These are put forth by experts in the field of bioethical training and certification.

Each fellow should take an online ethics course that usually requires the testing of acquired knowledge and certification. Most universities provide these courses either for free or for subscription.

Research requirements

Research requirements include each of the following steps: 1) selection of research; 2) creation of a research team; 3) approval of the project by

the local training committee; 4) preparation of a proposal with references; 5) fulfillment of the internal review board (IRB) requirements; 6) IRB approval; 7) data collection; 8) data analysis; 9) manuscript writing; and 10) publication.

Research duration components and presentation: During the 2 years of training, a 1-month elective period is allocated for the completion of the individual fellow research project. This elective period can be placed in the second year, if possible.

During the year and the rotation, the candidate should select the research project, write the proposal, and apply for IRB approval. Fellows should be able to present their work on the research day. The candidate should complete the analysis and writing of the final manuscript. Fellows are encouraged to write the research manuscript, publish it, or at least have evidence of the research manuscript being accepted for publication. They should present detailed data with the abstract, method of study, results, discussion, and references on the research day.

Evaluation of research and scoring

The final research is assessed and scored by critical care fellowship scientific council members. The entire 2-year research will be scored from 0%–100% per mark distribution. The final score for the second year will be calculated as 10% of the total promotion mark for the year. The completion of the end of training research was evaluated with the following score distribution: 20% for the proposal, 15% for IRB approval, 20% for data collection, 10% for data analysis, 15% for writing the manuscript, and 20% for publication in or at least acceptance from a well-known journal. The passing mark for the research was ≥ 60%. A certificate of completion of training will be issued and signed by the local program director and submitted to the SCFHS before the written exit exam.

Research days

During each training year, there were one or two research days. Each fellow should be ready to present the required component of their research work on these research days.

Journal selection: either a local or an international indexed journal is acceptable. Fellows should be encouraged to publish in international journals.

Appendix 6: Research Evaluation Sheet

Saudi Adult Critical Care Medicine

Research Evaluation Sheet

Name of the candidate:

Research title:

Part	Component	Mark	Candidate's score	Comments
Part-1- Written text evaluation	1. Originality	3		
	2. Abstract	5		
	3. Aims and objectives	5		
	4. Literature review	6		
	5. Methodology	12		
	6. Results (data analysis and presentation)	12		
	7. Discussion, conclusions, and recommendations	5		
	8. Ethical considerations	2		
	9. Style and structure of the text, tables, and diagrams	5		
	10. References	5		

Total		60		
Part-2 Presentation PART 11- DEFENSE	1. Presentation	10		
	2. Discussion	30		
Total		40		
Grand total		100		

Revision Pass Results:

Evaluator name: Signature:

≥ 60% = Pass

< 60% revision ☐ recommendation

Correction within _____

Appendix 7: Presentation Evaluation form

Saudi Adult Critical Care Medicine

Presentation Evaluation form

Fellow name: Level:

Supervisor: Presentation date:

Topic:

_____

Please use the following scale to evaluate the presentation:

Very weak	Weak	Acceptable	Good	Very good
1	2	3	4	5

Medical expert	1	2	3	4	5
- Demonstrated thorough knowledge of the topic					
- Presented at an appropriate level and with adequate details					
- Comments (optional)					
Communicator					
- Provided objectives and an outline					
- Presentation was clear and organized					
- Used clear, concise, and legible materials					
- Used an effective method/style of presentation					
- Established good rapport with the audience					
Collaborator					
- Invited comments from learners and led discussion					
- Worked effectively with staff supervisor in preparing the session					
- Comments (optional)					
Health advocate					
- Managed time effectively					
- Addressed preventive aspects of care if relevant					
- Comments (optional)					
Scholar					
- Posed an appropriate learning question					
- Accessed and interpreted the relevant literature					
- Comments (optional)					
Professional					
- Maintained patients' confidentiality if clinical material is used					
- Identified and managed relevant conflict of interest					
- Comments (optional)					
Total					
Overall performance: Good ☐ Fair ☐ Needs improvement ☐ Additional comments:					

Evaluation completed by: Date:

** This feedback was discussed with the resident: Yes ☐ No ☐

Appendix 8: Portfolio Assessment

Saudi Adult Critical Care Medicine

Portfolio assessment

This form is completed at every rotation during the mentoring/supervision meeting with the fellow

Fellow name: Level:

Mentor name: Date: Time:

Domain		Achievement required	Scoring marks 0 = Poor to 4 = outstanding					Remarks
Mini-CEX/CBD (2/month)	Minimum number achieved	Did fellows complete a minimum of two Mini-CEX/CBD last month?	0	1		2		
	Competency assessment score	What was the average result of the assessment?	0	1	2	3	4	
DOPS (2/month)	Minimum number achieved	Did fellows complete a minimum of two DOPS last month?	0	1		2		
	Competency assessment score	What was the average result of the assessment?	0	1	2	3	4	
Learning contract/objectives (2–3 objectives/week)		Did fellows complete at least one sheet for the learning objectives, for an average of two to three objectives every week with feedback and signed by the trainer?	0	1	2	3	4	
Evidence of self-directed learning		Did fellows show any documentation of self-directed learning (CME/topic review/journal club/presentation/course/workshop /conf erence/etc.) ?	0	1	2	3	4	
Overall assessment of portfolio			/20					

Clinical rotation:

Site of rotation:

Duration:

Stressed/burned-out: Yes No

Recommendation:

Exam preparation: Promotion/final: Yes No

Recommendation:

Comments:

- Original for program secretary/fellow file
- Copy for the fellow

Appendix 9: In-training Evaluation Report (ITER)

In-training evaluation report—Critical Care Fellowship Training Program

Center: _____ **Level of training:** _____
Name: _____ **Registration number:** _____
Rotation: _____ **Period:** _____

It is **mandatory** that this evaluation be discussed with the fellow prior to the end of the rotation.

Roles/competencies	Clear fail (1)	Borderline (2)	Clear pass (3)	Exceeds expectation (4)	N/A
A. Medical expert					
History and physical examination 1. Comprehensive, accurate, and concise with all relevant details					
Diagnostic tests 2. Used in a cost-effective manner and understands limitations and predictive value					
Clinical decision 3. Can formulate an appropriate differential diagnosis					
4. Can analyze, integrate, and formulate effective management strategies					
Medical knowledge 5. Demonstrates broad clinical and basic knowledge of a wide variety of medical problems and develops a plan of secondary prevention					
Emergency management 6. Can identify and respond appropriately to urgent cases					
Evidence-based practice/critical appraisal skills 7. Aware of the role of evidence in clinical decision-making					

8. Can apply relevant information in problem-solving					
9. Demonstrates knowledge of medications used, mechanisms of action, clinically relevant pharmacokinetics, indications, contraindications, and adverse effects.					
Procedural skills 10. Performs diagnostic and therapeutic procedures, understands indications, limitations and complications					
B. Communicator					
11. Communicates effectively with patients, their families, and healthcare providers					
12. Can maintain clear, accurate, and appropriate records					
13. Written orders and progress notes are well organized and legible					
14. Creates discharge summaries that are concise and completed promptly					
C. Collaborator					
15. Works effectively in a team environment with attending, juniors and nursing staff					
D. Leader					
16. Serves in administration and leadership roles as appropriate					
17. Demonstrates appropriate and efficient use of healthcare resources					
E. Scholar					
18. Attends and contributes to rounds, seminars, and other learning events					
19. Accepts and acts on constructive feedback					
20. Contributes to the education of patients, junior residents, house staff, and students					
21. Contributes to scientific research					

F. Health advocate

22. Can identify the psychosocial, economic, environmental, and biological factors that influence the health of patients and society

- Offers advocacy on behalf of patients at practice and general population levels

G. Professional

- Delivers the highest quality care with integrity, honesty, and compassion, and recognizes limitations and seeks advice and consultation when necessary
- Reflects the highest standards of excellence in clinical care and ethical conduct

Total score

Total score: _____ X 25 = $\frac{\text{Number of evaluated items}}{(100\%)}$

Comments:

_____

_____

_____

_____

Fellow name: Signature: Date:

Program Director: Signature: Date:

Director—Academic Affairs: Signature: Date: