الهيئة السعودية للتخصصات الصحية
Saudi Commission for Health Specialties

Thoracic Surgery Fellowship

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بسم الله الرحمن الرحيم

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III. Forward

The Curriculum Scientific Task Force is indebted to the efforts of all the Thoracic Surgeons who participated in the training process and strove to provide the trainees with the highest level of training experience. We also appreciate the opportunities afforded by the trainees to improve ourselves, in turn enabling us to serve our patients to the best of our abilities.

The Task Force acknowledges the strong support of the Saudi Commission for Health Specialties and its incorporation of the Can MEDS competency roles in medical training.

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V.Introduction

Thoracic surgery is a highly specialized field of surgery that provides services for patients with diseases of the lung, airways, esophagus, mediastinum, and diaphragm, as well as chest wall problems.

In 2010, the Saudi Fellowship in Thoracic Surgery was initially started as a three-year local program at King Faisal Specialist Hospital and Research Center, Riyadh. In 2013 the fellowship was accredited by the Saudi Commission for Health Specialties. To keep pace with the rapid evolution in thoracic surgery and to accommodate the growing number of thoracic surgery cases, the Scientific Board of General Surgery in the Commission approved the conversion of the fellowship to a regional program in 2019.

The Thoracic Surgery Fellowship Program imparts to the training fellow the skills, knowledge, and experience needed to become a solid and safe thoracic surgeon. At the same time, the program provides the fellow with the necessary tools to participate in research publications and encourages the fellow to apply evidence-based medicine and to be always up to date in his field. The training is conducted at certified training centers, which must fulfill a rigorous process of certification managed by the Saudi Commission for Health Specialties (SCFHS). In 2020, three training centers were accredited for thoracic surgery fellowship training:

1. King Faisal Specialist Hospital and Research Center – Riyadh (KFSHRC)
2. King Fahad Medical City – Riyadh (KFMC)
3. King Abdulaziz Medical City – Riyadh (KAMC)

The Fellowship Committee emphasizes that the trainees must clearly understand the objectives of the training program as well as the competencies they will acquire throughout the training period. Therefore, it is the responsibility of the program director to provide a copy of this curriculum each trainee upon acceptance to the program, who in turn must review all the contents and address any questions to the program director.

VI. Goals and responsibilities of the curriculum

The ultimate goal of this curriculum is to guide trainees to become competent in thoracic surgery. This goal will require significant efforts and coordination from all stakeholders involved in postgraduate training. As “adult-learners,” trainees have to demonstrate full engagement with their proactive role through careful understanding of learning objectives, self-directed learning, problem solving, openness and readiness to apply what they have learned by reflective practice from feedback and formative assessment, and self-wellbeing and seeking support when needed. The program director has a vital role in ensuring the most successful implementation of this curriculum. Training committee members, and particularly the program administrator and chief fellows, have significant impact on program implementation. Trainees should be enabled to share responsibility in curriculum implementation. The Saudi Commission for Health Specialties

(SCFHS) will apply the best models of training governance to achieve the highest quality of training. Academic affairs in training centers and regional supervisory training committees will play a major role in training supervision and implementation. The Thoracic Surgery Scientific Committee will be responsible for making sure that the content of this curriculum is constantly updated to match the best-known standards in postgraduate education of their specialty.

VII. Abbreviations used in this document

Abbreviation	Description
SCFHS	Saudi Commission for Health Specialties
F(1)	(First) year of Fellowship
F(2)	(Second) year of Fellowship
F(3)	(Third) year of Fellowship
SOE	Structured Oral Exam
OSCE	Objective Structured Clinical Examinations
ITER	In-Training Evaluation Report
CBE	Competency-Based Education
KFSH&RC	King Faisal Specialist Hospital and Research Center – Riyadh
KFMC	King Fahad Medical City – Riyadh
KAMC	King Abdulaziz Medical City – Riyadh

VIII. Program entry requirements

To be eligible for the fellowship, candidates must fulfill the following requirements (as these criteria are subject to change, please refer to the Executive Policies on Admission for updates of these criteria):

- Saudi Board in General Surgery or equivalent certification.
- Completion of a personal interview by the members of the Fellowship Committee.
- Three recent letters of recommendation.
- A sponsorship letter.
- A letter of interest.
- Curriculum Vitae.

IX. Learning and competencies

1. Introduction to Learning Outcomes and Competency-Based Education

Training should be guided by well-defined "learning objectives" that are driven by targeted "learning outcomes" of a particular program to serve specific specialty needs. Learning outcomes are supposed to reflect the professional "competencies" and tasks that are expected to be "entrusted" to trainees upon graduation. This will ensure that graduates will 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.

Professional competencies related to healthcare are usually complex and involve multiple learning domains (knowledge, skills, and attitude). CBE is expected to change the traditional way of postgraduate education. For instance, time of training, though a precious resource, should not be looked to as a proxy for competence (e.g., time of rotation in certain hospital areas is not the primary marker of competence achievement). Furthermore, CBE emphasizes the critical role of the informed judgment of a learner's competency progress, which is based on a staged and formative assessment driven from multiple workplace-based observations. The following are concepts to enhance the implementation of CBE in this curriculum:

Competency: A cognitive construct assessing the potential to perform efficiently in a given situation based on the standards of the profession. Professional roles are used to define a competency role to make it amenable to learning and assessment.

Milestones: Milestones are stages along the developmental levels. Trainees throughout their learning journey, from junior through senior levels, will be assisted to transform from (novice/supervised) to (master/unsupervised) practitioners. Milestones are expected to enhance the learning process by pacing the training/assessment to match the developmental level of trainees (junior vs. senior).

Learning Domains: Efforts should be directed to improve the learning outcomes in the corresponding domain (Knowledge, Skills, and Attitude).

Categorization: It is advisable to categorize the learning levels in broad content areas related to the practice of the profession. For example, diagnostic versus therapeutic, simple versus complex, and urgent versus chronic.

This curriculum applies principles of competency-based medical education. CanMeds represents a globally accepted framework outlining competency roles. The "CanMeds 2015 framework" has been adopted in this section.

This reference is an example for the general outline of the CanMED competency (Frank JR, Snell L, Sherbino J, editors. CanMEDS 2015 Physician Competency Framework. Ottawa: Royal College of Physicians and Surgeons of Canada; 2015).

Medical expert

Provide optimal, ethical, and patient-centered holistic medical care according to their level of training.

Perform a complete and appropriate clinical assessment of the patient.

Demonstrate the ability to order and interpret the diagnostic tests relevant to the clinical setting.

Seek appropriate consultation from other health professionals.

Communicator

Develop trust and ethical relationships with patients and their families and caregivers.
Elicit and synthesize relevant information and data from patients, their families and caregivers, colleagues, and other professionals.
Convey accurately the relevant information and explanations to patients, their families and caregivers, colleagues, and other professionals.
Develop a consensus care plan with patients, their families and caregivers, and other professionals.
Convey oral and written information effectively on a medical encounter.

Collaborator

Participate effectively and appropriately in an inter-professional healthcare team.
Work effectively with other health professionals to prevent, negotiate, and resolve inter-professional conflicts.

Leader

Participate in activities related to the effectiveness of their healthcare organizations and healthcare systems.
Serve in administrative roles in the field of thoracic surgery.

Health advocate

Respond to the health needs and issues of the individual patient as part of patient care.
Promote the health of individual patients, communities, and populations.

Scholar

Maintain professional activities through ongoing learning.
Careful evaluation of medical information and its sources and apply this appropriately to in-practice decisions.
Facilitate the learning of patients, their families and caregivers, students, residents, other health professionals, and the public in general.
Contribute to the development and dissemination of new knowledge and practices.
Complete at least one research project under the mentorship of an attending thoracic surgeon.

Professional

Demonstrate commitment to patients, the profession, and society through ethical practices and professional regulation.

Program duration

The thoracic surgery fellowship program is a three-year training program.

Program rotations

- 32 blocks: Thoracic surgery.
- 2 blocks: Cardiac surgery.
- 2 blocks: Elective rotations (one block for each rotation)

1. Intervention pulmonary
2. Upper GI endoscopy and manometry
3. Thoracic radiology
4. Thoracic oncology and pathology

- 3 blocks: Vacation (one per year)

Training Year	Mandatory core rotations		Elective rotations	
	Rotation name	Duration	Rotation name	Duration
F1	Thoracic surgery Vacation	10 blocks 1 block	Intervention pulmonary Upper GI endoscopy and manometry Thoracic radiology Thoracic oncology and pathology	2 blocks (1 block for each)
F2	Thoracic surgery Cardiac surgery Vacation	10 blocks 2 blocks 1 block		
F3	Thoracic surgery Vacation	12 blocks 1 block		

4. Mapping of learning objectives and competency roles to program rotations:

Thoracic Surgery Rotation:

Mandatory rotation of 10 blocks during the first year, 10 blocks during the second year, and 12 blocks during the third year of fellowship.

LUNGS AND PLEURA

Learner Objectives: At the end of this rotation the learner will be able to:

- Discuss the anatomy of the lungs and pleura and their relationships.
- Recognize the indications for different thoracic incisions.
- Recognize the indications for radiological studies in the staging of lung cancer.
- Determine the operability of candidates for pulmonary resection.
- Discuss TNM staging and its application to the diagnosis and management of lung carcinoma.
- Discuss the methods of invasive staging (e.g., mediastinoscopy, Chamberlain procedure).
- Describe the complications of pulmonary resection and their management.
- Identify the indications for resection of pulmonary metastases.
- Identify the therapeutic options for patients with lung neoplasms.
- Recognize the role of adjuvant therapy for lung neoplasms.
- Describe the indications for resection of benign lung neoplasms.
- Identify the types of pleural effusions and, their evaluation and treatment.
- Identify the causes, physiology, evaluation and management of hemoptysis.

Clinical Skills: During the training program the resident shall:

- Interpret pulmonary function tests, ventilation/perfusion scans, and correlate the results with operability.
- Read and interpret plain radiography, CT scans, and PET scanning of the chest.
- Perform different operations for lung neoplasms (e.g., local excision, wedge resection, lobectomy).
- Demonstrate skill in bedside bronchoscopies and placement of tracheostomies.
- Participate in major operations for neoplasms of the lung (e.g., segmental resection, pneumonectomy, sleeve lobectomy and carinal resection).
- Recognize and manage complications of pulmonary resections (e.g., space problem, persistent air leak, bronchopleural fistula).
- Evaluate pleural effusions and recommend appropriate therapy.

TRACHEA AND BRONCHI

Learner Objectives:

- Describe the anatomy and blood supply of the trachea and bronchi and their endoscopic anatomy.
- Discuss the radiologic assessment of the trachea and bronchi.
- Describe the etiology, presentation, management, and prevention of acquired tracheal strictures.
- Identify the methods of airway management, anesthesia, and ventilation for tracheal operations.
- Evaluate patients for tracheal resection and plan the operation.
- Clinical Skills:

- Perform rigid and flexible bronchoscopy of the upper airway, trachea, and major bronchi.
- Participate in tracheal resection and anastomosis surgeries.

MEDIASTINUM

Learner Objectives:

- Describe the anatomic boundaries of the mediastinum and the structures within each compartment.
- Discuss the embryologic development of structures within the mediastinum.
- Recognize the differential diagnosis of mediastinal mass.
- Clinical Skills:
- Read and interpret mediastinal plain radiographs, CT scan, MRI, and contrast studies.
- Apply knowledge of mediastinal anatomy and physiology to diagnose mediastinal diseases.
- Select the proper management for mediastinal tumors.

CHEST WALL

Learner Objectives:

- Recognize the anatomy and physiology of the chest wall and its relationships to adjacent structures.
- Identify all operative approaches to the chest wall.
- Evaluate and diagnose chest wall tumors and understand the indications for biopsy.
- Clinical Skills:
- Perform surgical resections of primary and secondary chest wall tumors.
- Identify the need for major flaps of the chest wall.

DIAPHRAGM

Learner Objectives:

- Describe the neural and vascular supply of the diaphragm.
- Evaluate imaging studies for assessing the diaphragm.
- Describe the consequences of incisions in the diaphragm.
- Describe the etiology, diagnosis, and treatment of diaphragmatic paralysis.
- Discuss the presentation of diaphragmatic rupture and associated injuries.
- Distinguish management of infections immediately above and below the diaphragm.
- Evaluate the etiology, presentation, diagnosis, and management of diaphragmatic hernias.
- Clinical Skills:
- Evaluate and interpret radiographic studies of the diaphragm including fluoroscopy and CT scan.
- Perform operative repair of acquired diaphragmatic abnormalities.

ESOPHAGUS

Learner Objectives:

- Discuss the anatomy of the esophagus and its relations to adjacent structures.
- Evaluate the physiological function of the esophagus.
- Discuss the radiographic evaluation of the esophagus.
- Discuss the pathophysiology, complications, and diagnosis of esophageal reflux.
- Describe the indications and principles of anti-reflux operations.
- Identify the clinical presentation, diagnosis, and treatment of esophageal motility disorders.
- Describe the clinical presentation, diagnosis, and management of esophageal perforation.
- Explain the indications, methods, and operative approaches for esophageal replacement.
- Describe the benign esophageal neoplasms; clinical presentation, diagnosis, and treatment.
- Describe the types of malignant esophageal neoplasms; clinical presentation and diagnosis.
- Apply the staging system and select the proper treatment for malignant esophageal neoplasms.
- Discuss the role of chemotherapy and radiotherapy in esophageal cancer.
- Identify the operative approaches and complications of esophageal resection and reconstruction.

Clinical Skills:

- Interpret esophageal contrast studies, CT scans, manometry, and pH studies.
- Perform flexible endoscopy of the esophagus for diagnosis, biopsies, dilatation, or stenting.
- Perform anti-reflux operations and management of strictures.
- Demonstrate knowledge in the ability to perform resection and reconstruction.
- Evaluate and manage patients with esophageal motility disorders.
- Manage the complications of esophageal operations.
- Diagnose, manage, and perform operations for esophageal perforation and trauma.
- Evaluate malignant and benign esophageal tumors and recommend overall management.
- Manage nutritional needs after esophageal surgery.

THORACIC TRAUMA

Learner Objectives:

- Evaluate patients with blunt or penetrating chest injury.
- Discuss clinical presentation and radiologic findings of chest injury.
- Demonstrate the principles of airway management.
- Assess the physiology and mechanics of operative drainage of the thoracic cavity.
- Apply operative and non-operative management of chest injuries.
- Discuss the pathophysiology of flail chest.
- Recognize the delayed presentation of diaphragmatic injury, its diagnosis, and management.

Clinical Skills:

- Evaluate and treat chest wall injuries.

- Manage the airway of patients with chest injuries.
- Carry out emergency operations for chest injuries.

LUNG TRANSPLANTATION

Learner Objectives:

- Recognize the methods for harvesting and preserving donor lungs.
- Describe the indications for lung transplantation.
- Clinical Skills:
- Manage donor lung harvest and preservation.
- Participate in lung transplantation.
- Perform trans-bronchial biopsy.

SPECIFIC PROCEDURES:

Bronchoscopy

Learner Objectives:

Identify indications, techniques, and complications of rigid and fiberoptic bronchoscopy.

Clinical Skills:

Evaluate and manage patients requiring bronchoscopy.

Manage rigid and fiberoptic bronchoscopy using different anesthetic techniques.

Esophagoscopy

Learner Objectives:

- Recognize indications, techniques, and complications of esophagoscopy.

Clinical Skills:

- Evaluate and manage patients requiring esophagoscopy.
- Manage esophagoscopy using different anesthetic techniques.
- Perform biopsies, dilatation, and stenting via esophagoscopy.

Tube Thoracostomy

Learner Objectives:

- Recognize the indications and contraindications for tube thoracostomy.
- Review the techniques and complications of tube thoracostomy and their management.

Clinical Skills:

- Evaluate patients for tube thoracostomy.
- Perform tube thoracostomy under local and general anesthesia.
- Treat the complications of tube thoracostomy.

Cardiac Surgery Rotation:

Mandatory rotation of 2 blocks during the second year of fellowship.

Learner Objectives: At the end of this rotation the learner will be able to:

Discuss the risks and complications of coronary artery bypass operations, coronary angiography, and percutaneous coronary artery balloon angioplasty.

Discuss the standard techniques for extracorporeal bypass and its cannulation.

Describe the indications for cardiopulmonary support with mechanical devices or ECMO and the principles of weaning patients from these devices.

Clinical Skills:

At the end of this rotation the learner will be able to:

Participate in the performance and evaluation of exercise tolerance tests, echocardiograms, and cardiac catheterizations.

Recognize the set-up of an extracorporeal circuit.

Use extracorporeal circuits in clinical practice.

Perform different thoracic incisions.

Take part in cannulation for extracorporeal bypass using appropriate access routes.

Manage the complications and the anticoagulation of patients on mechanical support and ECMO.

Thoracic Radiology Rotation:

- Elective rotation of 1 block during the first year of fellowship.

Learner Objectives and Clinical Skills: At the end of this rotation the learner will be able to:

- Recognize normal anatomy and variants of the lungs, airways, pleura, other mediastinal structures, and thoracic bony structures.
- Demonstrate proficiency in the recognition of pulmonary, cardiovascular, and other thoracic pathology and be able to formulate a differential diagnosis.
- List indications for thoracic interventional procedures.
- Explain differential diagnoses for peripheral pulmonary nodules and use the appropriate additional techniques for transthoracic biopsies.
- Integrate clinical, radiological, laboratory and anatomical pathology information to reach the specific diagnosis.

Intervention Pulmonary Rotation:

- Elective rotation of 1 block during the first year of fellowship.

Learner Objectives and Clinical Skills: At the end of this rotation the learner will be able to:

- Recognize the indications, contraindications, technical aspects, complications, and quality assurance issues of bronchoscopy.
- Perform bronchoscopy (diagnostic and therapeutic) at a high level.
- Recognize the indications, benefit, contraindications, complications, and general techniques of EBUS.
- Select diagnostic procedures appropriately.
- Interpret pulmonary function tests, V / Q scanning, and pleural fluid analysis.

Upper GI Endoscopy and Manometry Rotation:

- Elective rotation of 1 block during the first year of fellowship.

Learner Objectives and Clinical Skills: At the end of this rotation the learner will be able to:

- Participate in diagnostic and therapeutic upper GI endoscopy, including dilatation, stenting, and taking biopsies.
- Interpret upper GI endoscopic findings.
- Independently interpret an esophageal manometry and pH monitoring report.

Thoracic Oncology and Pathology Rotation:

- Elective rotation of 1 block during the first year of fellowship.

Learner Objectives and Clinical Skills: At the end of this rotation the learner will be able to:

- Implement thoracic anatomy knowledge when evaluating thoracic surgical specimens.
- Apply the histopathology of the lung, pleura, and thymus when interpreting histological slides from surgical specimens.
- Describe the staging of lung, pleura, and mediastinal tumors.
- Recognize the most common metastatic neoplasms of the lung.

X. Continuum of learning in thoracic surgery

The trainees in thoracic surgery are certified general surgeons who are undergoing a three-year journey to become a sub-specialty consultant; as such, they are now focused on a small complex part of a much larger specialty. This requires the trainees to be aware that although they are board-certified general surgeons, in many ways they start as complete novices in thoracic surgery and must build a new knowledge and clinical skillset from scratch in a relatively short time period.

The majority of the 3-year period will be spent in the practice of thoracic surgery at different hospital locations to gain exposure to a variety of services within thoracic surgery. There are also elective/mandatory rotations (see the chapter on rotations) that are related to the specialty, the most notable being cardiac surgery (2 blocks).

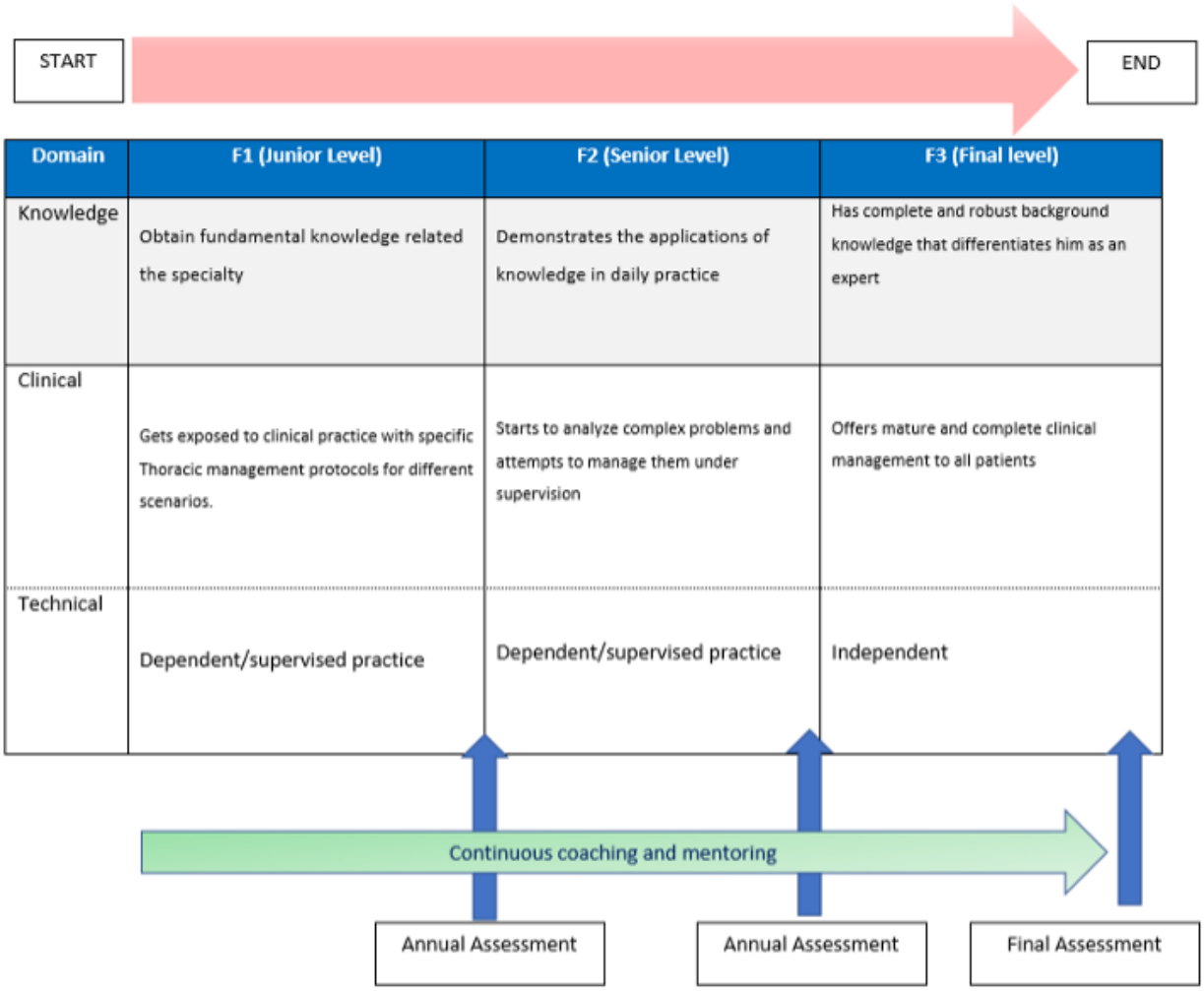
As learning must occur in a continuous and registered fashion across the three domains over this period, we have highlighted some recommendations for the trainees and mentors regarding the goals that need to be met and at what intervals they need to occur (Fig. 1). For the knowledge domain, the expectation is that the basic reading (fundamental topics) should be completed over the first year, while the 2nd and 3rd years are more involved in specialized reading and journal article review. There is a weekly academic day in which the trainees are expected to interact with their mentors to ensure continued progress in the knowledge domain; these are mainly in the format of presentations and Q&A sessions as well as other scheduled activities.

For the clinical domain, which constitutes the majority of the training, the trainee will engage in work experience activities such as: seeing consults, running clinics, attending the tumor boards, quality assurance, and mortality and morbidity reviews.

For the technical domain, every trainee is required to keep a logbook of operative work to help follow up on their competencies. A suggested baseline reference is presented below with recommended activities including consultations and clinical research. Competencies for each specific procedure are to be gradually improved as their experience and exposure increases.

At the end of every academic year there will be an end-of-year exam to help assess the progress and give the trainee the opportunity to reflect upon what was learned and what still needs to be achieved.

Fig1- Continuum of learning in Thoracic.



Domain	F1 (Junior Level)	F2 (Senior Level)	F3 (Final level)
Knowledge	Obtain fundamental knowledge related the specialty	Demonstrates the applications of knowledge in daily practice	Has complete and robust background knowledge that differentiates him as an expert
Clinical	Gets exposed to clinical practice with specific Thoracic management protocols for different scenarios.	Starts to analyze complex problems and attempts to manage them under supervision	Offers mature and complete clinical management to all patients
Technical	Dependent/supervised practice	Dependent/supervised practice	Independent

Teaching methods in thoracic surgery

The teaching process in postgraduate fellowship training programs is based mainly on the principles of adult learning theory, requiring that the fellows feel the importance of learning and taking active roles in the content and the process of their own learning. The training program implements the adult learning concept for each feature of the activities where the fellows are responsible for their own learning requirements. Formal training time would include the following three formal teaching activities:

- Program-Specific Learning Activities
- Universal Topics
- General Learning Opportunities

A. Program-specific learning activities

Teaching tools employed by the coaching instructor to direct the learning of the thoracic surgery trainee can vary depending on the learning domains as well as the specific teaching goals that need to be achieved. It is worthwhile for the mentor and trainee to be aware of the different teaching methods and to employ the most appropriate modality to help learning progress within each domain and to tailor it to the specific trainee.

The three distinct domains are:

- Knowledge domain
- Clinical domain
- Operative (technical) domain

I. Knowledge domain:

The knowledge domain pertains to all the information related to thoracic surgery at a basic and theoretical level; this would include thoracic anatomy, embryology, histology, pathology, physiology, and other principles of thoracic surgery. Most of the learning occurs as adult self-learning by the trainee that is reviewed and assessed by the mentor within a structured “reading and topics” program as well as scheduled exams (MCQ, Short Answer, and OSCE).

The trainee should refer to the recommended textbooks as well as their scheduled topic presentations. Supplemental article reading should be encouraged.

Recommended Textbooks:

- Shield’s Textbook of Thoracic Surgery
- Pearson’s Textbook of Thoracic Surgery
- Ferguson’s Atlas of Thoracic Surgery
- Grillo’s Trachea
- Sugarbaker’s Adult Chest Surgery
- Video Assisted Thoracic Surgery (Alan Sihoe, Jianxing He)

- Sabiston's Surgery of the Chest
- ESTS Thoracic Surgery Textbook

Every trainee should endeavor to complete the basic sciences chapters related to thoracic surgery before completing their first year, with the second and third years being more focused on specific topics and problems in thoracic surgery. The mentor should strive to allow for a once-weekly formal lecture given by the trainee on the most common topics in thoracic surgery and to encourage the trainee's participation in journal club according to their level.

Program Academic Half-Day:

Every week, a formal protective training time should be supplemented by at least 4 hours (commonly referred to as an academic half-day). Formal teaching time is an activity that is planned in advanced with an assigned tutor, time slot, and venue. Formal teaching time excludes bedside teaching, clinic postings, etc. The academic half-day covers the core topics, which are determined and approved by the scientific council and aligned with the competencies and teaching methods. The core topics will ensure that important clinical thoracic surgery problems are well taught. It is recommended that the lectures be conducted in an interactive, case-based discussion format. The learning objectives of each core topic need to be clearly defined, and it is preferable to use pre-learning materials. Whenever applicable, core topics should include workshops, team-based learning (TBL), and simulations to develop skills in core procedures. Regional supervisory committees in coordination with academic and training affairs, program directors, and chief fellows should work together to ensure the planning and implementation of academic activities as indicated in the curriculum. There should be an active involvement of the trainee in the development and delivery of the topics under faculty supervision; the involvement might be in the form of, e.g., delivery, content development, or research. The supervisor's educator should make sure that the discussion of each topic is stratified into the three categories of the learning domain: knowledge, skill, and attitude.

The academic half-day activities must reserve time for other forms of teaching methods such as Journal Club and clinical/practical teaching. Through the Fellowship Training Committee, the program directors and chief fellow in coordination with academic and training affairs and regional supervisory committees, should work together to ensure the planning and implementation of academic activities as indicated in the curriculum. This should aim for the efficient use of available resources and the optimized exchange of expertise.

Morning report:

The morning report is a case-based teaching session. The goals for morning report are to teach efficient handover strategies, build case presentation skills, allow discussion of the management of interesting cases, and enhance problem-solving and multidisciplinary team skills.

II. Clinical domain:

The clinical domain pertains to all the practical functions of the thoracic surgeon outside of the operating room, such as seeing in-hospital consultations, emergency care, radiological assess-

ment, cancer care, and preoperative assessment and planning, as well as interprofessional skills such as communication, patient education, and overall attitude. There are several opportunities during the fellowship program to practice and learn many of these skills, including:

- Clinical daily practice
- Multidisciplinary tumor board
- Multidisciplinary pulmonary radiology meetings
- Mortality and morbidity meetings
- Quality assurance programs
- Clinical research and publications
- Journal Club

III. Operative (Technical) domain:

The operative domain is what differentiates surgical teaching from medical teaching; similar to other surgical sub-specialties, thoracic training has a very steep learning curve due to the complexity and variety of the diseases and procedures performed. This becomes quite apparent when you realize that the thoracic surgeon is expected to be proficient in endoscopic procedures such as flexible and rigid bronchoscopy as well as open and minimally invasive thoracic operations with technical experience in all three anatomical cavities. All of this is compounded by limitations in fellowship training time, operative time, and overall case-load limitations.

To help maximize the learning benefit from each case, direct coaching and teaching must occur at every opportunity and the trainee must be prepared to engage in active learning.

Below we highlight some of the methods that can be employed to help in the training of the thoracic fellow, with a brief description of their use and limitations.

A. See one, assist one, do one (Halstead method):

This classical method can be utilized for high-volume, low-risk procedures that require little direction and explanation. This would include procedures such as diagnostic bronchoscopy, chest tube insertion, percutaneous tracheostomy, and video-assisted sympathectomy.

This method is useful in promoting independence and confidence in the trainee, particularly early in their training and experience. However, it is not particularly useful for complex technical procedures.

Furthermore, there is very little direction by the mentor or reflection on the learning experience by the trainee in this modality of teaching. We recommend that this be utilized in conjunction with other methods of teaching.

B. Simulation and wet labs:

Available simulation centers and wet labs can be utilized to improve technical expertise in thoracic surgery.

Simulation centers are extremely useful to help perfect specific technical skills, for example interventional bronchoscopy or minimal invasive suturing and knotting. Such skills in real patients need to be performed quickly and without fault as they are a minor part of a complex procedure

and it would be inappropriate to learn at the expense of the patient; therefore, for specific steps that are repetitive and found within complex operations it is ideal to utilize a simulation center where available.

For more complex situations that do not occur frequently, e.g., lifesaving procedures such as hilar control maneuvers in catastrophic bleeding, it is best to practice these procedures on wet-lab or animal models. Fortunately, it is available in KFSHRC, and the trainee and mentor should explore the possibilities of utilizing this modality for specific learning purposes that cannot be achieved in the usual operative room experience.

C. BID model (Brief-Intraoperative Teaching-Debrief):

The most widely utilized teaching method in surgery, and the most appropriate in thoracic surgery would be the Brief/Debrief method.

Here the mentor would spend a few minutes prior to the procedure to ask the trainee about their specific learning goals. This requires the trainee to be aware of the case details as well as the technical aspects of the procedure prior to the discussion and also to be self-aware about their technical proficiency.

This discussion can occur informally during positioning of the patient in the operating room or during scrubbing. For example, during scrubbing the mentor can ask, "So what are you interested in seeing or doing in this case?," to which the trainee would respond, "I would like to get a chance to practice my hilar dissection," or the mentor can be more direct and highlight their needs and ask, "Any specific structure you want to focus on?" and they can reply, "I want to start with the inferior pulmonary ligament and then dissect the inferior pulmonary vein." During this brief exchange, the trainee demonstrates self-reflection and creates the goals of learning directly by identifying their own technical deficiencies, in this case "dissecting the pulmonary vein."

The mentor's responsibility after this exchange is to help create the learning environment to achieve that goal; during the procedure there should be direct instruction on how to do this proficiently in a stress-free manner.

After the procedure, the mentor and trainee should debrief on the procedure. This is usually an informal exchange that occurs in the recovery room or between cases, where the mentor can ask, "What are your thoughts on the procedure?" or "What do you think you did well with and what would you like to improve?" This gives the opportunity for the trainee to reflect and compare their knowledge and technical expertise prior to and after this procedure; it also gives them the opportunity to create and share future goals with their mentor.

D. The "teaching moment":

During unexpected operative encounters (e.g., rare congenital anomalies, unexpected bleeding, or a rare case), the mentor should engage with the trainee to create a teaching moment and highlight the connections to other knowledge and clinical domains when possible. Example, an encounter with an azygous lobe should initiate a discussion about other common congenital anomalies encountered in the right upper lobe and their clinical significance.

Although these unexpected opportunities are very frequent, they are unstructured, but nevertheless they can be a valuable tool to enrich the trainee's knowledge and curiosity.

B. Universal topics

Universal topics are educational activities that are developed by SCFHS and are intended for all specialties. Priority will be given to topics that are of:

- High value
- Interdisciplinary and integrated
- Require expertise that might be beyond the availability of the local clinical training sites

Universal topics have been developed by SCFHS and are available as e-learning via access to the online modules personalized for each trainee. Each universal topic will have a self-assessment at the end of the module. As indicated in the Executive Policies of Continuous Assessment and Annual Promotion, universal topics are a mandatory component of the criteria for the annual promotion of trainees from their current level of training to the subsequent level. Universal topics will be distributed over the whole period of training.

Training Year	Modules	Topic names	Number	Name
	Number	Name		
F1	Module 4	Medical and Surgical Emergencies	Topic 16	Management of acute breathlessness
F2	Module 2	Cancer	Topic 6	Principles of management of cancer
F3	Module 7	Ethics and Healthcare	Topic 34	Ethical issues: transplantation/organ harvesting; withdrawal of care

C. General learning opportunities

These comprise other formal practice-based learning (PBL), such as:

- Grand rounds
- National and international thoracic meetings and workshops
- Continuous professional activities
- Involvement in quality improvement committees and meeting

Assessment and evaluation

1. Purpose of 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. On the other hand, the assessment will provide feedback to learners and faculty regarding curriculum development, teaching methods, and the quality of the learning environment. A reliable and valid

assessment is an excellent tool to assess the curriculum alignments between the objectives, learning methods, and assessment methods. Finally, assessment assures patients and the public that health professionals are safe and competent to practice.

Assessment can serve the following purposes:

Assessment for learning: Trainers will use information from the trainee's performance to inform their learning for improvement. It enables educators to use information about the trainee's knowledge, understanding, and skills to provide them feedback about learning and how to improve.

b. Assessment as learning: Involves trainees in the learning process, enabling them to monitor their own progress. Trainees use self-assessment and educators' feedback to reflect on their progress. It develops and supports trainees' metacognitive skills. Assessment as learning is crucial in helping fellows become lifelong learners.

c. Assessment of learning: Used to demonstrate achievement of learning. This is graded assessment and usually counts towards the trainee's end-of-training degree.

d. Feedback and evaluation: Assessment outcomes will represent a quality metric that can improve learning experience.

2. Formative assessment

2.1 General principles

Trainees, as adult learners, should strive for feedback throughout their journey of competency from "novice" to "mastery" levels. Formative assessment (also referred to as continuous assessment) is the component of assessment that is distributed throughout the academic year, aiming primarily to provide trainees with effective feedback. Input from the overall formative assessment tools will be utilized at the end of the year to make the decision of promoting each individual trainee from current to subsequent training level. Formative assessment will be defined based on the scientific committee.

According to the executive policy on continuous assessment (available online: www.scfhs.org), formative assessment will have the following features:

Multisource: A minimum of four tools.

Comprehensive: Covering all learning domains (knowledge, skills, and attitude).

Relevant: Focusing on workplace-based observations.

Competency-milestone oriented: Reflecting the trainee's expected competencies that match their developmental level.

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

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

2.2 Formative assessment tools

The evaluation and assessment of a trainee throughout the program follows the SCFHS rules and regulations (please refer to the SCFHS website).

The formative assessment tools are as follows:

Assessment Domain	Formative Assessment Tools	Frequency
Knowledge	Structured Oral Exam (SOE) Annual written progress test (end-of-year written exam) Participation in structured academic activities	For F3 For F1, F2, and F3 For F1, F2, and F3
Skills	Logbook Observation of procedural skills in animal lab Participation in research activities (at least one proposal, abstract, or publication)	For F1, F2, and F3
Attitude	ITER: In-Training Evaluation report	For F1, F2, and F3

The evaluation of each component will be based on the following criteria:

Percentage	< 50%	50–59.9%	60–69.9%	> 70%
Description	Clear fail	Borderline fail	Borderline pass	Clear pass

Assessment of knowledge:

Knowledge is evaluated through the Structured Oral Examination (SOE), end-of-year written exam, and academic activity assignments.

- Assessment through SOE is conducted once (at the end of the third year).
- The end-of-year written examination will be for all levels (F1, F2, and F3 trainees). The trainee must pass the written examination to be promoted from one year to the next. The passing scores are established in accordance with the Scientific Committee. The examination details and a blueprint are included in this curriculum.
- Each candidate must be assigned to academic activities (lecture presentations and student or resident teaching)

Assessment of skills:

Skills are evaluated through the logbook procedures performed by the trainee and the researchers conducted during his/her fellowship.

- The logbook must be submitted every 6 months for evaluation by the program director.
- Research: The trainee will be required to participate in ongoing clinical or basic science research in the field of thoracic surgery and produce at least one research proposal, one abstract, or one publication during his/her training. It is expected that the trainee will contribute substantially to research and publication.
-

Activity/Procedure ++	Number
Consultation and management of patients independently	150
Research/Publication or presentation in a national or international forum	1
Pectus repair	10
Thoracotomy	25
Chest wall tumor/infection resection	15
Mediastinoscopy—VATS lymph node sampling	20
Flexible bronchoscopy	50
Rigid bronchoscopy	10
UGI endoscopy	50
Lung biopsy	20
Video-assisted thoracic surgery	20
Pleura decortication	20
Lobectomy	20
Pneumonectomy	5
Diaphragm procedures	10
Esophagectomy	10
Myotomy for achalasia	15
Laparoscopic fundoplication	15
Lung volume reduction surgery	5
Excision of mediastinal mass or cyst	20
Tracheostomy	10
Tracheal resection	5

Fig. 2. Recommended Activity/Procedure Log

++ procedures can be combined.

Assessment of attitude: In-Training Evaluation Report (ITER)

- The performance of the trainee will be evaluated jointly by the training instructors, who will assess the following competencies:
- Performance of the trainee during daily work and on-call.
- Performance and participation in academic activities.
- Performance of the trainee during patient interactions in the outpatient setting. Trainers must provide timely and specific feedback to the trainee every month during the rotation.
- Performance of the trainee during procedures. Timely and specific collegial feedback must be provided to the trainee after each procedure. This is mandatory.

The competencies must be evaluated during each rotation:

5.1. The assigned training instructors at the end of any rotation will provide a standardized evaluation of the trainee (see Appendix G: Standard In-Training Evaluation Form).

5.2. An evaluation form must be completed and submitted every 3 months.

5.3. The evaluation form must be submitted to the program director within 2 weeks of the end of each 3-month rotation.

5.4. The program director will ultimately convey the content of the evaluations to the Training Committee within 4 weeks following the end of the rotation.

5.5. The trainee must be counseled in an interview with the program director regarding the content of the evaluation, sign the evaluation form, and write his/her comments.

5.6. The trainee must complete 360-standard evaluation forms (Appendices 3 and 4) to evaluate all his/her training instructors at the end of the rotation.

5.7. The result of those trainees' evaluations must be conveyed by the program director to the concerned training instructors.

To achieve unconditioned promotion, the trainee must score a minimum of "borderline pass" in all components.

The program director can still recommend the promotion of candidates if the above are not met according to the SCFHS policies and procedures of assessment.

3. Summative assessment

3.1 General principles

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

3.2 Certification of Training Completion

In order to be eligible to sit for the final specialty examinations, each trainee is required to obtain a "Certification of Training Completion." Based on the training bylaws and executive policy (please refer to www.scfhs.org), trainees will be granted a "Certification of Training Completion" once the following criteria are fulfilled:

- Successful completion of all training rotations.
- Completion of training requirements as outlined by the scientific council/committee of specialty (logbook, research, etc.).
- Clearance from SCFHS Training Affairs, which ensures compliance with tuition payment and completion of universal topics wherever applicable.

A “Certification of Training Completion” will be issued and approved by the supervisory committee or its equivalent according to the SCFHS policies.

3.3. Final specialty examination

The final specialty examination is the summative assessment component that grants trainees the specialty certification. It has two elements:

Final written exam: In order to be eligible for this exam, trainees are required to hold the “Certification of Training-Completion.”

Final written examination blueprint

This blueprint applies to the annual and final written examinations.

Domains	Percentage of questions (%)
Lung and pleura	25%
Mediastinum	20%
Esophagus	20%
Trachea and bronchus	10%
Chest wall	10%
Diaphragm	5%
Miscellaneous	10%
Total questions	**(100%)**

Final Clinical and Oral Examination (FCOE):

Trainees will be required to pass the final written exam in order to be eligible to sit for the final clinical exam. This is a certifying examination conducted in the SOE format. This examination assesses a broad range of high-level clinical skills, including data gathering, problem solving, option generation, risk management, patient management, communication, and counseling. The examination is held once a year in the form of patient management problems. Eligibility and the passing score are established in accordance with the SCFHS training and examination rules and regulations. The FCOE is made up of 4 stations: 1 long case, 2 short cases, and 1 operative case.

Final Clinical Exam Blueprint

OSCE case	No.	Fields	Mark
Long	1	Decision-making skills	40
		Emergency management	
		Clinic management	
		Judicious use of investigations	
		Ability to generate treatment options	
		Handling of peri-operative complications	
Short	2	Clinical knowledge	40 (20 per short case)
		Assessment of treatment risks	
		Clinical practice guideline knowledge	
		Assessment of treatment success	
		Knowledge of medical treatment	
Operative	1	Operative knowledge	20
		Procedure skill	
		Handling of intraoperative complications	
total	4		100

For further details on final exams, please refer to the general bylaws and executive policy of assessment (available online: www.scfhs.org).

Learning Domain	Summative Assessment Tools	Passing Score
Knowledge	Final Written Examination	At least borderline pass in each tool in accordance with the standard setting method used by the executive administration of the assessment
Skills	Objective Structured Clinical Examinations (OSCE) Structured Oral Examinations (SOE)	At least borderline pass in each tool in accordance with the standard setting method used by the executive administration of the assessment
Attitude	ITER: In-Training Evaluation Report	Successfully pass ITER

XIII. Program evaluation

SCFHS will apply variable measures to evaluate the implementation of this curriculum. Training outcomes of this program will undergo quality assurance within the framework endorsed by the Central Training Committee at SCFHS. Trainees assessment (both formative and summative) results will be analyzed and mapped to curriculum content. Other indicators that will be incorporated are:

- Report of the annual trainees' satisfaction survey.
- Reports from trainees' evaluation of faculty members.
- Reports from trainees' evaluation of rotations.
- Reports from the annual survey of program directors.
- Data available from program accreditations.
- Reports from direct field communications with trainees and trainers.

Goal Based Evaluation: The intended milestones achievement will be evaluated at the end of each stage to assess the progress of the curriculum delivery, and any deficiency will be addressed in the following stage utilizing the time devoted for trainee-selected topics and professional session.

In addition to subject-matter opinion and best practices from benchmarked international programs, SCFHS will apply a robust method to ensure that this curriculum will utilize all the data available during the time of revision of this curriculum in the future.

XIV. Appendix

Glossary:

-A fellow: A trainee who completed training under a board in general surgery and is under training in the Saudi Fellowship in thoracic surgery.

-A program director: A consultant thoracic surgeon who oversees the trainees and maintain the academic curriculum and educational standards.

-A training instructor: Any thoracic surgeon at a training center who provides training to the trainee.

-A training center: An accredited healthcare facility where training is conducted and delivered as part of the Saudi Fellowship in Thoracic Surgery.

-The Scientific Committee for the Saudi Fellowship in Thoracic Surgery: The body governing the said fellowship.

-The Examination Committee for the Saudi Fellowship in Thoracic Surgery is the body responsible for conducting the final written and clinical examination upon completion of the training.

In-Training Evaluation Report (ITER) form

Saudi Commission for Health Specialties M.F.ThorSX-PI.KFSHRC-Riyadh	Evaluated By: evaluator's name Evaluating : person (role) or moment's name (if applicable) Dates : start date to end date	

* indicates a mandatory response

	N/A (0)	Clear Fail (1)	Borderline (2)	Clear Pass (3)	Exceed Expectations (4)
*A. MEDICAL EXPERT: History & Physical Examination: 1. Comprehensive, accurate & concise with all relevant details	○	○	○	○	○
*Diagnostic Tests: 2. Used in a cost-effective manner & understands limitations & predictive value.	○	○	○	○	○
*Clinical Decision: 3. Able to formulate appropriate differential diagnosis.	○	○	○	○	○
*4. Able to analyze, integrate, and formulate effective management strategies.	○	○	○	○	○
*Medical Knowledge: 5. Broad Clinical & Basic knowledge of a wide variet of medical problems and develops a plan of secondary prevention.	○	○	○	○	○
*Emergency Management: 6. Able to 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. Able to 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.. Perform diagnostic & therapeutic procedures, undestands indications, limitations & complications.	○	○	○	○	○
*B. COMMUNICATOR 11. Communicates effectively with patients, their families, and HCPs.	○	○	○	○	○
*12. Able to maintain clear, accurate & appropriate records.	○	○	○	○	○
*13. Written orders and progress notes are well organized & legible.	○	○	○	○	○
*14. Ability to present and discuss clinical data in an organized problem-oriented manner with attending , and the health care team	○	○	○	○	○
*C. COLLABORATOR: 15. Ability to function in a multidisciplinary team setting .	○	○	○	○	○
*D. LEADER : 16. Display appropriate time management skills , prioritizes tasks and performs procedural interventions in a timely and efficient manner	○	○	○	○	○
*17. Appropriate & efficient use of health care resources.	○	○	○	○	○

	N/A (0)	Clear Fail (1)	Borderline (2)	Clear Pass (3)	Exceed Expectations (4)
*E. SCHOLAR : 18. Ability to execute a systematic research for evidence (literature , review , chart audit , etc.) in order to optimize clinical decision making & clinical care .	○	○	○	○	○
*19. Accepts and acts on constructive feedback.	○	○	○	○	○
*20. Contributes to the education of patients, junior fellows , residents, interns , and students.	○	○	○	○	○
*21. Contributes in scientific research.	○	○	○	○	○
*F. HEALTH ADVOCATE : 22. Able to identify the psychosocial, economic, environmental & biological factors influence the health of individual patients and communities.	○	○	○	○	○
*23.Recognizes and acts upon opportunities for health promotion and anticipatory guidance , (e.g. recommending immunization)	○	○	○	○	○
*G. PROFESSIONAL : 24. Delivers the highest quality of care with integrity & compassion. Recognizes limitations and seeks advice and consultations when necessary.	○	○	○	○	○
*25. Reflects the highest standards of excellence in clinical care and ethical conduct.	○	○	○	○	○

*Comments (areas of strengths/areas for improvement)

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

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Saudi Commission for Health Specialties

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