Ministry of Higher Education and Scientific Research

Iraqi Board for Medical Specializations

المجلس العراقي للاختصاصات الطبية

Study Guide of the Scientific Council of Radiology

General Medical Radiodiagnosis Training Program/ Iraqi Board

Introduction:

The clinical council of the Iraqi board of radiology is a nonprofit physician-led organization. It oversees the certification and ongoing profession development of specialists in diagnostic radiology.

Mission and Vision:

The mission of the Clinical Council is to promote and develop the highest standards of Radiology and related sciences through education and research so the main purpose and proper functions of the clinical Council are summarized in the followings:

- Improves graduate medical education in Radiology
- Elevate the standard of training
- Formulate means by which to evaluate the competence of those wishing to be recognized as specialists in the field

General Objectives

Learning objectives are established for the program, the curriculum and for each subspecialty area. The following are general objectives:

1. A thorough understanding of the indications for various examinations and familiarity with the principles and limitations of these studies, including benefits and risks to the patient.

2. Familiarity with the anatomy, physiology, pathophysiology, and post therapeutic findings which may be identified through various Radiology examinations.

3.Understanding of the technology and techniques of Radiology.

4. Learning effective communication with radiologic technologists, other department personnel and referring physician.

5. Indications and contraindications of contrast studies as well as risks and benefits to the patients and available alternatives

6. Learning fluoroscopic and radiological interventional procedures.

Objectives of the Study Program:

1. Prepare highly skilled radiologists proficient in both theoretical and practical diagnostic methods in all radiological subspecialties.
2. Train graduates to conduct research, stay updated with scientific advances, and contribute to teaching and training radiological staff in Iraq.

Study Duration:

Five years (orientation-based).

Training Centres

The clinical Council accepts teaching Hospitals as training centres after a thorough evaluation. There are minimum requirements, which include such factors as hospital size, facilities, and the availability of full-time faculty in multiple specialities. The suitability of the hospital is verified by means of visits from a local committee and the training committee from the Clinical Council as a final step. Revaluation of each training centre is carried out every five years.

Training is conducted at the following recognized centers:

1. Medical City Complex (Baghdad)
2. Al Kadhimiya Teaching Hospital (Baghdad)
3. Al Yarmouk Teaching Hospital (Baghdad)
4. Al. Najaf City center.
5. Musol city center .

6. Al. sulamaniah City center. (Kurdistan)
7. Duhok City center.(Kurdistan)
8. Erbil City center (Kurdistan)

All the above training centers are accredited centers & recognized by the Council and Ministry of Higher Education.

Admission and Curriculum

Admission Requirements:

The student must meet the general admission criteria of the Iraqi Board for Medical Specializations.

Admission Rules:

Requirements for registration for training in the clinical council of Radiology:

1. Doctor of Medicine from a medical school recognized by the ministry of higher education and scientific research in IRAQ.
2. Must be licensed to practice medicine by Iraqi Medical Association Syndicate.
3. Must have completed at least one year of internship after graduation.
5. Must provide three letters of recommendation from three consultants with whom she/he has worked confirming his/her ability and capability of training in Radiology.
6. Must submit a letter of approval from his/her sponsor confirming permission to join Clinical Council of Radiology training program on full time basis for the entire period of the study.
7. Proficiency in the English language as recommended by the Ministry of Higher education and Medical Research.
8. Computer course certificate accredited by the ministry of higher education and scientific research.
9. Completion and submission of required registration papers to Iraqi Board for Medical Specialization.
10. Must pass the Clinical Council of Radiology and Medical Imaging entry selection examination before being scheduled for interview.
11. Must pass the interview.

Certificate:

Certificate of fellow of Iraqi Board of Medical Specialties in Radiodiagnosis. (FIBMS-RD).

Regulations

General Rules of the training

1. The period of training is five years
2. The training is conducted only in the approved centre or centres.
3. Residents should work on full-time basis throughout the whole period of study.
4. Residents must attend lectures, and other educational and scientific meetings organized by various departments of the training hospital which pertain to the area of specialization
5. Students will keep Log Book of certain required interventional and diagnostic procedures. The Log Book must be approved by the specialty training subcommittee and it must be assigned by the supervising faculty at the end of each rotation.

6. Each resident will be required to publish at least one article in a local or international journal during the period of the study to issue his certificate & documents of the graduation.
7. Independent learning will be strongly advocated from the first year to wean off the residents from spoon feeding, they may have been used to.
8. Upon completion the training program whether passed the final examination or not, the student should leave the program and return to their sponsors and original hospitals.

General Curriculum Structure:

Year One: (Orientation Year)
Students are considered junior residents and study both theory and practice.

Part I (First Semester): Includes the following subjects:

1. Radiological Physics – 90 hrs
2. Gross Anatomy – 90 hrs
3. Radiographic Anatomy – 90 hrs
4. Basic Principles in Radiology – 40 hrs
5. Radiography – 90 hrs
6. Radiological Procedures – 40 hrs
7. Drugs used in Radiology – 20 hrs
8. Radiological Contrast Media – 20 hrs
9. Pathology – 90 hrs
10. Nuclear Medicine – 20 hrs

Program Structure
First Year:
The trainee will spend a period of 12 months in one of the selected training centers .During this period
the candidate is exposed to the basic radiological information essential to establish his career as a radiologist .
Data are obtained mainly through lectures which should cover the following aspects:
1.Physics
2.Radiological Anatomy
3.Radiological Technique and Positioning
4.Dark Room principles
5.Emergency and intensive care Radiology
6.Radiobiology , radiation protection and dosimetry **.**
1. Radiology Physics
The physical principles of Conventional Radiology, Ultrasound , Computed Tomography (CT), Magnetic
Resonance Imaging (MRI) and Nuclear Medicine Imaging are included with integration of these principles on the quality of the generated images and the resultant diagnostic data.
Conventional Radiology
Basic Concepts
• Introduction to medical imaging

• Radiation and atom
• Interaction of radiation with matter
• Computers in Medical Imaging -Diagnostic Radiology
• X-ray production , tubes ,generators
• Screen-film radiography
• Film processing
• Flouroscopy {Suites, equipments , modes of operation, image quality , radiation dose }
• Image quality {contrast , resolution , noise ,operating curves}
• Digital Radiography { Implementation , CR devices, Image processing, patient's dose, contrast vs. resolution in digital imaging }

Nuclear medicine

• Radioactivity and nuclear transformation
• Radionuclide production and Radiopharmaceuticals
• Radiation detection and measurements { Types of detectors, counting statistics-Nuclear imaging , Scintillation cabers, computers, Emission Tomography }
• SPECT
• PET

Computed Tomography

Basic principles
• Geometry and historical development
• Detectors and Detector Arrays
• Details of Acquisition
• Tomographic Reconstruction
• Digital Image Display
• Radiation Dose
• Image Quality
• Artifacts

Ultrasonography

• Characteristics of Sounds
• Interaction of US with matter
• Transducers
• Beam Properties
• Image Data Acquisition
• Two-Dimensional Display and Storage
• Image Quality and Artifacts
• Doppler US
• System Performance and quality assurance
• Acoustic Power and bio effect

Magnetic Resonance Imaging

• Magnetization properties
• Generation , detection and localization of MR Signal
• Pulse sequences, Spin echo, Inversion Recovery and Gradient Recalled Echo
• Signal from Flow and MR Angiography
• Perfusion and Diffusion Contrast

• Magnetization Transfer Contrast
• K-space, Data Acquisition and Image Reconstruction
• Three-Dimensional Fourier Transfer image acquisition
• Image characteristics
• Artifacts
• Instrumentation
• Safety and BioEffect

Mammography

• Xray Tube design
• Xray Generator and photo timer system
• Compression, scattered radiation and magnification
• Screen-film cassette and image processing
• Ancillary procedures (Stereotactic biopsy)
• Digital Mammography
• Radiation dosimetry
• Regulatory retirements (Accreditation , Quality Assurance)

2. **Radiological Positioning and Techniques**

Radiography of different anatomic regions in the human body (Skull,Spine,Chest, Abdomen, and Pelvis,
Upper and Lower limbs), is outline with fair knowledge of the exposure factors and accurate positions of
each anatomic part.

The current radiological techniques for conventional radiology and imaging including patient preparation, examination technique and contrast material used , patient after care and the possible complications of each techniques as well as management of these complications .

Contrast media: Types (positive ,negative), chemical components, indications and Contraindications for use , reactions to certain types and management of these reactions.

3.Radiological Anatomy :

Anatomy as demonstrated on the radiological and imaging procedures including conventional radiography, contrast studies ,CT scan, US and MRI.

The anatomy regions of interest should cover :

• The skull and its contents including the brain and cerebral vessels ,skull base , pharynx and temporal bone.
• the face and facial bones, orbits , sinuses , jaws & salivary glands .
• The neck , thyroid, larynx & extra cranial vessels .
• The spine, spinal cord and meninges
• Musculoskeletal system including bones, joints, ligaments and muscles
• Heart and great vessels .
• Chest including lungs, mediastinum , and chest wall
• GIT system including solid organs (Liver, spleen ,pancreas)
• Genitourinary system {kidneys, Ureters, urinary bladder , prostate, seminal vesicles,Uterus and adnexia}
• Peripheral vessels and lymphatic of the upper and lower limbs .
• The breast

4.Ultrasonography

Ultrasonography , and basic principles of Doppler and color Doppler sonography are also included .

5. Darks Room Principles;

Dark room construction, the radiographic film, the film cassette , intensifying screen and film screen combination , the processing machines and techniques , film criticism ,and common faults in film processing , Film copy and subtraction techniques .

6. Radiobiology (Radiation protection ,Dosimetry and biology)

Radiation protection

- Sources of exposure to ionizing radiation
- Radiation detection equipment in radiation safety
- Radiation protection and exposure control
- Personnel dosimetry
- Regulatory agencies and radiation exposure limits

Radiation Dosimetry of the patient

- X-ray Dosimetry
- Radiopharmaceutical dosimeter: The MIRD method (Medical Internal Radiation Dosimetr)

Radiation Biology

- Interaction of radiation with tissue
- Cellular Radio-biology
- Response of organ systems to radiation
- Acute radiation syndrome
- Radiation-induced carcinogenesis
- Hereditory effects of radiation exposure
- radiation effects in utero

Recommended Books for the first Year Topics:

- **Imaging Atlas of Human Anatomy By Petter Abrahams MD**
- **Farrs physics for medical imaging by Penelope Allisy Roberts and Jery Williams**
- **Essential; physics of medical imaging 2nd edition By Bushberg JT MD**
- **The principles of Dark Room Technique By Nabil Khattar MD**
- **A practical guide to special Techniques in Diagnostic Radiology By Nabil Khattar MD**
- Radiologic science: Physics , Biology and protection By Stewart C Bushong MD
- Clark's positioning in Radiology By Louis Kreel MD
- A Guide to radiological procedure by Stephen Chapman, Richard Nakielny

Second Part of the Program (Final Months):

Covers practical applications in:

1. Conventional Radiology
2. Ultrasound, Doppler, and Echo
3. Nuclear Medicine
4. CT (Computed Tomography)
5. Diagnostic & Interventional Angiography
6. MRI (Magnetic Resonance Imaging)
7. Mammography

Note:

The Part 1 Exam is held at the end of the first year, specifically in the tenth month.

Second Year (Year 2):

- It is considered a transition year with a focus on centralized study in radiological subspecialties including internal medicine.
- Includes:
  a. Theoretical lectures
  b. Practical applications
  c. Study groups
  d. Journal club
  e. Scientific meetings
  f. Clinical lectures in relevant medical departments
- Periodic exams are held during and after this phase.
- Grades contribute to the final score for the written comprehensive exam.

Second and Third Years:

• Basic Radiology (Theoretical & Practical)
• Neuroradiology
• Radiology of the face and neck
• Musculoskeletal Radiology
• Radiology of the chest and heart
• Gastrointestinal Radiology
• Genitourinary Radiology
• Vascular and Interventional Imaging

Basic Radiology including Radiological and Imaging procedures currently used for , diagnosis of diseases
affecting each system of the body including conventional X-ray, tomography, contrast studies, ultrasound & Doppler, CT, MRI, and nuclear Imaging

1. Neuro-Radiology

• Imaging Modalities in Neuroradiology
• Physical principles of MRI
• Normal brain anatomy CT and MRI
• Daignosis of cerebrovascular accident
• Imaging of brain tumor
• Intracranial infections
• Posterior fossa lesions
• Intracranial vascular malformation
• Intracranial cysts and calcification
• white matter diseases
• Intracranial traumatic lesions
• Advanced diagnostic techniques, MDCT, MRA, MR diffusion, spectroscopy, DTI and perfusion studies
• Diagnostic value of neuro-MR spectroscopy

• Congenital brain lesions (Hydrocephalus,neuronal migration disorder)
• Transcranial US
• Interventional neuroradiology
• Nuclear Neuroradiology
• Normal anatomy of the spine by Plain Xray ,CT and MRI
• Imaging of degenerative spinal disease
• Post-operative spine
• Diagnosis of spinal inflammatory diseases
• Imaging of spinal neoplasm
• Traumatic Spine lesions
• Spinal dysraphism
• Spinal interventions
• Spinal congenital anomalies

2. Face & Neck

• Imaging Modalities
• Physical principles of MRI in head and neck imaging
• Head and Neck Ultrasound
• Imaging of maxillofacial trauma
• Head and neck inflammatory disease CT and MRI
• Imaging of orbital pathology
• Anatomy and pathology of the petrous bone
• Parapharyngeal space CT and MRI
• Tongue and floor of the mouth lesions CT and MRI
• Salivary glands CT ,MRI and US
• Mandibular pathology imaging
• Sinonasal disease imaging
• Imaging of Larynx
• Anatomy and pathology of cervical lymph nodes imaging
• Thyroid and parathyroid anatomy and pathology
• head and neck nuclear imaging
• Head and neck interventional techniques
• Imaging modalities in musculoskeletal pathologies

3. Musculoskeletal

• Physical principles of musculoskeletal MRI
• Diagnosis of Skeletal trauma
• Bone and joint infection X-ray, CT and MRI
• Imaging of bone tumors
• Diagnosis of metabolic and endocrine bone disorders
• Hematological bone diseases
• Polyarthropathies
• Musculoskeletal ultrasound
• Musculoskeletal Nuclear Imaging

Major Joints MR Imaging

Knee Joint

- Normal anatomy, examination Protocols

- Ligamentous pathology,Meniscal lesions
- Synovial lesions, miscellaneous lesions
- Normal variants and Pitfalls

Elbow Joint
- Normal anatomy, examination techniques
- Ligamentous injury and nerve entrapment syndrome
- Tendon pathology
- Normal variants and Pitfalls

Ankle Joint
- Normal anatomy, examination techniques
- Ligamentous injury and nerve entrapment syndrome
- Tendon pathology, osteochondral lesions
- Bone marrow lesions and avascular necrosis
- Normal variants and Pitfalls

Wrist Joint
- Normal anatomy, examination techniques
- Ligamentous Pathology and TFCC injuries
- Carpal and Ulnar Tunnel syndromes
- Tendon pathology
- Bone marrow lesions and avascular necrosis

Hip Joint
- Normal anatomy, examination techniques
- Avascular necrosis and Migratory osteoporosis
- Tendon pathology
- Bone marrow lesions , fractures and Labral lesions

Shoulder Joint
- Normal anatomy, examination techniques
- Rotator Cuff lesion,Labral pathology
- SLAP injury ,Impingement
- Rotator Interval pathology and capsulitis
- Pitfall and normal variants

4.Pulmonary and Heart Radiology

Pulmonary Radiology (anatomic and functional imaging of congenital disorders , pulmonary neoplasms,
acute respiratory failure , drug induced chest disorders ,imaging of transplanted lung ..)

• How to interpret chest XRay , normal and pathology
• Normal CT anatomy of the chest
• Diagnosis of focal lung diseases
• Diagnosis of diffuse lung diseases Xray and HRCT
• imaging of Pleura and Chest wall pathologies
• Pulmonary vascular diseases
• Imaging diagnosis and staging of lung Ca
• Value of MRI in chest diseases
• Mediastinum Anatomy and pathology
• Intensive Care radiology

• Pulmonary TB
• Interventional chest Radiology
• Chest scintigraphy
• Chest Trauma
• Air way disease
• Pulmonary circulation
• Cardiac Imaging
• Principles and diagnostic values of echocardiography
• CT coronary Angiography , techniques , Anatomy and pathologies
• Cardiac MRI and Nuclear imaging
• Congenital Heart diseases
• Acquired heart diseases
• Ischemic heart disease
• Pericardial lesions and cardiomyopathies

5.Gastrointestinal and abdominal imaging

• Imaging modalities in GIT pathology
• Diagnosis of hypo pharynx and esophageal pathology
• Imaging of stomach and duodenum
• Diagnosis of small intestinal pathology
• Diseases of the colon
• Abdominal ultrasound techniques and diagnostic values
• Hepatic Imaging CT and MRI
• Biliary and Pancreatic imaging
• Imaging in Splenic pathology
• Imaging of acute abdomen
• Abdominal injuries
• Imaging of peritoneum and mesenteric pathology
• Abdominal nuclear medicine (liver , adrenal …)
• Abdominal interventional techniques
• Diagnostic modalities in uroradiology
• MR urography , diagnostic value and physical principles
• Imaging in renal physiology and kinetic of contrast agents

6. Genitourinary Imaging

• Imaging of renal pathology
• Congenital lesions
• Stones
• Infection and inflammatory diseases
• cystic renal diseases
• Renal neoplasms
• Diagnosis of ureteric pathology
• imaging diagnosis and staging of urinary bladder neoplasm
• Imaging of urethra
• Imaging of Prostate
• Transrectal Ultrasound
• Male infertility and impotence Imaging diagnosis ‘

• Imaging of the testis and scrotum
• Urinary tract nuclear scintigraphy
• Interventional Uroradiology
• Role of Imaging in renal transplantation
• Imaging of adrenal gland anatomy and pathology

7. Vascular and interventional Radiology

• Introduction to vascular Imaging , modalities and techniques
• Head and neck vascular pathology
• Imaging of aortic lesions
• Pulmonary and bronchial arterial pathology
• Imaging of mesenteric vascular diseases
• Peripheral arterial and venous diseases
• vascular aspects of male infertility
• Basics of vascular interventional Radiology

Fourth Year

1. Women Imaging

• HSG technique-indication-findings
• CT pelvis, anatomy , and pathology
• Obstetric US
• Gynecology US
• MR female pelvis and pelvic floor dynamics
• Mammographic techniques
• Benign and malignant Breast lesions
• Diagnostic Pitfalls in mammography
• Breast US normal and pathology
• MR breast technique
• Osteoporosis pathophysiology
• DEXA in evaluation of osteoporosis

2. Pediatric Radiology

• Introduction to pediatric Imaging
• Pediatric neuro-Radiology
• Normal brain and spine anatomy
• Imaging of hydrocephalus
• neuronal migrational disorders
• Imaging of intracranial infections
• Pediatric brain tumors
• Spinal dysraphism
• Pediatric chest Radiology
• Pediatric Abdominal Imaging
• Normal CT and MR anatomy
• Acute abdomen
• Abdominal masses
• Genitourinary imaging
• Pediatric musculoskeletal Imaging
• Musculoskeletal infection

• Bone tumor
• skeletal dysplasia
• Metabolic bone diseases

3. Radiology of Specific Entities

A) Intensive care Radiology
• Portable radiographic techniques
• Congestive heart failure and adult respiratory distress syndrome
• Radiologic evaluation of patients after cardiac surgery
• Non-cardiac thoracic surgical procedures, post-operative Radiology
• Abdominal Imaging in sepsis of unknown origin
• Imaging in immune suppressed patients
• Diagnosis of chest complications in critical care units
• Interventional procedures in ICU patients (venous line placement, trans-pleural biopsies, drainage procedures, intervention for visceral bleeding, veno-occlusive disease, and massive pulmonary embolism , ..).

B) Emergency Radiology
• Imaging of acute cerebrovascular diseases
• Diagnosis of maxillofacial injuries
• Spinal and paravertebral post traumatic pathology
• Imaging of non-aortic thoracic injuries
• Traumatic aortic injuries and emergent aortic syndromes (rupture, dissection, intramural hematoma, ulcer)
• Imaging of abdominal trauma
• Acute non traumatic abdominal Imaging
• Urinary tract emergencies (stones, urine retention, infection,)
• Emergency MRI
• Pediatric Emergency Imaging (abdominal pain, respiratory infection, skeletal trauma) .
• The use of tele radiology in medicine

C) Oncological Imaging
• Staging and classification of tumors
• Imaging strategies for oncologic diagnosis
• Oral cavity, tongue and mouth flora neoplasms
• Hodgkin's and non- Hodgkin's lymphomas
• Soft tissue tumors of the appendicular skeleton
• CT radiation therapy treatment planning
• Radiosurgery
• Interventional Radiology for cancer diagnosis and management
• RECIST ,Modified RECIST and Other systems for tumor response evaluation

3. Fourth & fifth Stages (Years 4 & 5):

This phase is considered a senior clinical stage and is treated as such. It consists of subspecialty rotations approved by the Council, such as:

1. Chest, heart, and vascular radiology – 3 months
2. Abdominal and hepatobiliary radiology – 3 months

3. Pediatric radiology – 3 months
4. Neurological radiology – 3 months
5. Musculoskeletal radiology – 2 months
6. Genitourinary radiology – 2 months
7. Obstetrics and gynecology radiology – 2 months
8. ENT, maxillofacial, and facial trauma imaging – 1 month
9. Spiral CT training – 2 months
10. MRI training – 1 month
11. Doppler and echocardiography training – 1 month
12. Mammography training – 1 month

Note:

a. Training in general and internal diagnostic imaging is covered throughout all stages.

b. Includes direct equipment usage, exposure to new techniques, and involvement in clinical activity under supervisor evaluation.

c. Includes participation in the Council's academic and clinical events.

3. Submitting periodic reports including an assessment of the student's level, motivation, performance, and clinical competence, according to a form prepared for this purpose.

4. Submitting a recommendation to the Scientific Council regarding the student's eligibility to sit for the first- and final-year exams.

Educational Supervisor, Qualification and quality:

1. A highly qualified Radiologist being a holder of MD, American Board, FRCR or PhD.
2. Titled as Professor or Assistant Professor in Diagnostic Radiology.
3. Has an experience of at least 5 years after the high qualification.
4. Should have a recognizable experience in teaching under and postgraduate training.

Responsibilities

1. Monitoring of the training program
2. organization of the annual assessment examinations.
3. Receive, asses and approve the periodic evaluation reports from the trainers
4. Ensure the provision and regularity of the scientific training activities.
5. Participate and monitor all training activities.
6. Participate in the arrangement of the training courses and preparatory courses for the examinations.
7. Inspect and monitor the trainee's Log Book.
8. Be accountable for the actual performance of the trainees.
9. Look after the trainees and give them the requirements of the training including technical experience with increasing responsibilities according to the trainee's abilities and progress.
10. Organization and provision of the scientific activities in the affiliated training centre with help from trainers and trainees.

11. Provide periodic evaluation reports of the trainee to the council of Iraqi Board of radiology.

Trainer, Qualification

1. A highly qualified Radiologist being a holder of MD, American Board, FRCR or PhD, with experience of at least 3 years after the high qualification

2. Trainers having only the master degree of Radio-diagnosis should have an experience of at least 5 years in the field of diagnostic Radiology.

Responsibilities and Duties of the Trainer

1. Responsible for the actual performance of the trainee. The Council defines the following qualifications for the supervisor:

2. Look after the trainee and give him/her the requirements of the training including technical experience with increasing responsibilities according to the trainee's abilities and progress.
3. Responsible for approval of the holidays and leaves.
4. Responsible for arranging the rotations for the trainees.
5. Responsible for appointment of the trainee to different levels of training
6. Organization and delivery of the training and educational activities in collaboration with the educational supervisor.

Academic Core Curriculum

The core curriculum includes experience and education in all subspecialty areas of diagnostic Radiology.

The structured curriculum is based on the guidelines of program of Royal College of Radiologists, UK, the American Board of Radiology and the Arab Board of Radiology.

Exam Guidelines:

1. The first and final exams are held twice a year, in April and October.
2. The student is allowed only four attempts for the first exam.
3. The final exam is only allowed after completing all academic requirements.
4. The supervisor submits a final report on the student's level, recommending approval or denial to take the final exam.
5. The grading system is as follows:
    - Excellent: 90
    - Very Good: 80
    - Good: 70
    - Acceptable: 60
    - Fail: 50
6. Multiple Choice Questions (MCQ) are scored out of 100.
7. A student must achieve at least 60% in each part of the exam and a final average no less than 70%.
8. The student cannot pass the final exam unless they succeed in both the practical and oral parts.
9. If a student fails in the written part, they must retake the whole exam (only three repeats allowed).

If the student fails in the first attempt at the final exam, they are allowed to retake it every 6 months as an external student. If they fail again, they are considered withdrawn from the program.

Research Instructions:

1. A committee of three council members, in addition to the supervisor, evaluates the student's thesis.
2. The thesis is to be defended no earlier than two months from the submission date.
3. The committee may issue one of the following recommendations:
   - Accept the thesis after minor modifications.
   - Accept after major modifications and reorganization within two months.
   - If not done within four months, the committee may reject the thesis.
4. The council must approve the final recommendation.
5. Two supervisors may share responsibility for a thesis if necessary.
6. The research topic must fall within the supervisors' specialty.

1. Organized training courses outside Iraq (in Arab or foreign countries) may be held under the supervision of the Radiology Scientific Council to benefit from international experts, especially in developing fields related to diagnostic radiology.

Note:

1. The selection of the training subspecialty depends on the student's preference and is approved by the Radiology Scientific Council. Future new radiology branches may be added based on resources and national needs.
2. Supervisors provide a "training level report" for the student, submitted to the Council to determine the student's eligibility to sit the final exam.
3. Upon approval for final exam entry, the student is granted one month of leave for review and preparation for Part 2 of the exam.
4. Focused training in the chosen subspecialty includes clinical work and a recommendation from the Council to allow the student to sit Part 2 of the exam.

Clinical Training Rotations – Year 3 & 4

Third and Fourth Stages (3rd and 4th academic years):

The student is considered a senior clinical trainee, and the training is distributed among various radiology subspecialties for durations specified below and as deemed appropriate by the council:

1. Chest, cardiac, and vascular radiology – 3 months
2. Abdominal and hepatobiliary radiology – 3 months
3. Pediatric radiology – 3 months
4. Neuroradiology – 3 months
5. Musculoskeletal radiology – 2 months
6. Genitourinary radiology – 2 months
7. Gynecologic and obstetric radiology – 2 months

8. ENT, facial trauma, and maxillofacial radiology – 1 month
9. Spiral CT (Helical CT) training – 2 months
10. MRI training – 1 month
11. Doppler & Echo Cardiography – 1 month
12. Mammography – 1 month

Note:

a. All general and internal imaging examinations are covered throughout the program.
b. Training includes hands-on use of equipment, direct observation, and participation in radiology activities under supervision.

Final Year Practical Applications (Year 5)

Final Stage (Last Months):

Includes practical applications in:

1. Conventional Radiology
2. Ultrasound, Doppler & Echo
3. Nuclear Medicine
4. CT (Computed Tomography)
5. Diagnostic & Interventional Angiography
6. MRI (Magnetic Resonance Imaging)
7. Mammography

* Radiological examinations used in general and interventional radiology are covered within the varied training detailed above.
* This training includes hands-on experience and direct exposure to all available devices and methods in each of the above branches, utilizing modern diagnostic techniques.
* The training also involves active participation in clinical activities, follow-up by supervisors, and attendance at the activities of the Scientific Council of Diagnostic Radiology. These participations and activities are documented in periodic reports sent by each branch. The scores from these are included in the final grade for the oral exam.
* The student is tasked with preparing an 8–10-page research paper ready for publication, which is discussed by council members at the end of the fourth year. The research topic should preferably align with the student's chosen sub-specialty for the fifth phase.

*** Phase 5 (Fifth Year): In this phase, the student is a fifth-year senior resident.**

* The student undergoes focused sub-specialty training for six months within the same specialization. Upon completion, the student receives a certificate of commendation endorsed by the Scientific Council. The training is in one of the following branches, based on the student's preference:
  * Neuro-Radiology.
  * G.I.T. Radiology.
  * Pediatric Radiology.

* Cardio-Vascular Radiology.
* Gyn. & Obstetric Radiology.
* Uro-Radiology.
* Chest Imaging.
* Musculoskeletal Imaging.
* ENT & Orbital Imaging.
* Oncology Imaging.

* The student attends all scientific meetings held in the fields of medicine and radiology as decided by the Scientific Council of Radiology.
* The student participates in and discusses focused lectures given by members of the Scientific Council and visiting professors hosted by the Iraqi Commission for Medical Specializations, both from within and outside of Iraq.
* The student prepares scientific seminars and events and attends conferences and seminars within and outside of Iraq.
* The student organizes refresher training courses outside of Iraq, for example in an Arab or foreign country, under the supervision of the Scientific Council of Radiology. This is to benefit from the experience of professors abroad and to keep the student updated on new developments in the field of diagnostic radiology.

* Notes:
* The choice of focused training in a sub-specialty is based on the student's desire and the approval of the Scientific Council of Radiology. Other clinical radiological branches may be introduced in the future, depending on the availability of resources and the country's needs, as approved by the Scientific Council of Radiology.
* Training supervisors submit a report on the student's scientific level to the Scientific Council of Radiology, which includes a recommendation on whether the student should take the final exam, in accordance with the Commission's instructions.
* If approved to take the exam, the student is granted a one-month leave for review and preparation for the Part 2 exam.
* The focused training material in the chosen sub-specialty branch is included with a specific weight (to be determined by the Scientific Council of Radiology) in the final Part 2 exam. This is for the purpose of granting the student a recommendation to work in that specific sub-specialty field by the council.

*** Trainee Evaluation**

* There will be a periodic evaluation at all training stages by the supervisors, using special evaluation reports. If a student fails to comply with their academic and training course, reports will be submitted to the Iraqi Commission for Medical Specializations for the necessary actions, in accordance with the Commission's regulations and instructions.
* Exams

* Part 1 Exam: This exam is held at the end of the first year to test the basic knowledge and skills the student acquired through the first-year curriculum. It takes place in the tenth month, one calendar year after the student's enrollment. If a student fails, a second attempt is scheduled six months after the first, in the fourth month of the following year. The exam is comprehensive and covers all subjects from the first year.

* Note: The student is allowed to take the Part 1 exam after completing the first year of study for a maximum of three attempts. The student's registration is terminated if they fail all three attempts. The exam consists of two multiple-choice papers and an oral exam.

* Part 2 Exam: This exam is held at the end of the fifth phase. The student can take the exam after completing the certificate requirements of documented systematic training and after a recommendation is submitted by the supervisor.

* The exam includes:
  * Two multiple-choice question (MCQ) papers.
  * A clinical, practical, and oral exam.
* The student is not granted the fellowship certificate until they pass the exam and complete the study requirements.
* 20% of the written exam grade comes from the average grades of the periodic exams.
* 20% of the clinical exam grade comes from the average of the student's evaluations by the center supervisors during their rotational training period.
* Note: Study instructions may be added, removed, or changed later, according to the official instructions issued by the Iraqi Commission for Medical Specializations regarding:
  * The authority of the scientific councils.
  * Study instructions.
  * Exam instructions.
  * Research.
  * Appendices.
  * Specifications and duties of training center officials and supervisors.

Text Books:

1. Grainger & Allisons Diagnostic Radiology: 2 volumes set by Andy Adam, Adrian K. Dixon, Ronald G. Grainger, David J. Allison
2. Fundamental of diagnostic Radiology: by William E. Brant and Clyde A. Helms
3. Clinical Imaging (an Atlas of differential diagnosis) by Ronald Eisenberg
4. Radiology Review Manual by Dahnert
5. Primer principles of Diagnostic Imaging, Mosby Elsevier, by Weiss Leder

Journals:

1.Radiographics
2.American Journal of Radiology (AJR)
3.Radiology
4.Clinical Radiology
5.Europian Radiology
6. British Journal of Radiology (BJR)
7.Imaging

The Clinical Council of the Iraqi board of Radiology;

1.Professor Dr. RAAD HEFDHI ABEDTWFEQ (Iraqi Board of Medical Specialization) : CEO of the Faculty of Radiology (Head of Scientific Council of Radiology)

2. Professor Dr. MOHAMED ABED KADHUM (Al. NAHRAIN Medical University): Program Director

3. Professor ABDULAMEER ABOUDY (University of KUFA- College of Medicine): Head of AL. NAJAF Centre.

4. Assistant Professor Kawa Abdulla Mahmud (University of Sulemani- College of Medicine): Head of Sulemani Centre

5. Assistant Professor AMMAR AL.MOOSAWI (AL. NAHRAIN Medical University) Head of Al.Imamain al. kadhimain cenre

5. Professor Dr. MUNA A. AL.GHANI (Al. MUSTANSRYAH University - College of Medicine) Head of Al. YARMUK Centre

6.Ass. Prof. Dr. SALEEM KHODHIER (University of Duhok- College of Medicine) Head of DUHOK Centre

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