

The Arab League  
Council of Arab Health Ministers  
The Arab Board of Health Specializations  
General Secretariat



جامعة الدول العربية  
مجلس وزراء الصحة العرب  
المجلس العربي للاختصاصات الصحية  
الأمانة العامة

# المجلس العلمي للأشعة والتصوير الطبي

## Scientific Council of Radiology and Medical Imaging

### دليل اختصاص تشخيص وتصوير امراض الثدي

#### Guidebook of Breast Imaging

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## **Introduction:**

The phenomenal growth in imaging technology has expanded the radiologist's role in imaging conditions and diseases that affect the female population. Breast imaging is continuously expanding with the latest applications of CT, MRI, Ultrasound imaging and nuclear medicine. The Breast Imaging Fellowship Programme will provide up-to-date training for radiologists who aim to become sub-specialists in these uniquely breast related conditions.

The goals of the Fellowship in breast imaging are to provide the trainee with the opportunity to develop diagnostic, procedural, and technical skills essential to the performance of breast diagnostic imaging in including:

- To gain knowledge in the technical aspects of imaging.
- To gain clinical experience in interpretation of images.
- To achieve competence allowing independent performance of Breast imaging

## Specific Objectives:

- A. Acquire knowledge of relevant embryological, anatomical, pathophysiological, biochemical and clinical aspects of female breast.
- B. Obtain in-depth understanding of the major imaging techniques relevant to breast diseases.
- C. Grasp in-depth knowledge of the indications, contra-indications, complications and limitations of surgical, medical and radiological interventions and procedures pertaining to such diseases.
- D. Master clinical knowledge relevant to medical and surgical female diseases so that the fellow may confidently discuss the appropriate imaging strategy for the clinical problem with the referring clinician.
- E. Obtain a detailed knowledge of current developments in the subspecialty.
- F. Acquire direct practical exposure with appropriate graded supervision in all forms of current breast imaging procedures.
- G. Acquire appropriate competency and accuracy in the selection, performance, supervision and reporting of breast imaging investigations and minor imaging-guided interventions.

## **Requirements of Institute of Training & Required Personnel:**

The training center/s must be approved for training by the Arab Board A” Fellowship Director” must be identified/appointed by the training institution. S/He should be a consultant radiologist with wide experience in breast imaging and gynecological imaging, and with appropriate academic background

### Facilities:

- The major imaging modalities that are required for general radiology training plus digital mammography, stereotactic biopsy system, Ultrasound with elastography and colour Doppler & breast MRI, PET-CT scanner, Nuclear Imaging
- PACS.
- Appropriate clinical services for the subspecialty
- Appropriate number of supervisors relative to trainees. Minimum of 2 Consultants in the unit. Ratio: Two consultants: One fellow

### Volume needed for training:

- To obtain the appropriate breadth of exposure to the full spectrum of diseases in breast imaging in both inpatient and outpatient settings.
- Facilities should have a sufficient volume and variety of patient material to provide training. To obtain practical experience, the suggested minimum number of studies performed and interpreted under supervision in fellowship settings are outlined below .
- A teaching file of representative cases in each modality, with case histories and images, should be available to the trainee, either from the training institution itself or on electronic media. Training should include daily interpretation sessions and clinical case discussions.

### Eligibility Criteria for training:

The applicant:

- Must have successfully completed The Arab Board of Radiology & Medical Imaging ( eligibility of graduates from other training programmes will be re-evaluated in two years from the start of the subspecialty programme)
- Is licensed to practice medicine in the country/ies of training
- Must have completed one year of radiology practice
- Provides written permission from the sponsoring body allowing him/her to undertake full time training for the full one/two year programme
- Provides two letters of recommendation from the institute where he last worked
- Registers as a trainee with the Arab Board for Health Specialties

## **Application for Certification in Breast Imaging Programme in Radiology & Medical Imaging:**

- All applications must be completed online, and all supporting documentation must be uploaded through the online application system where requested.
- Fees paid.

**Timetable for Training:**

- The length of the breast imaging fellowship is one year .
- Training Guidelines and the curriculum are specified below.

**Examination Process:**

- Examination schedule: Once yearly in October
- Examination format: One hour oral examination by specialist panel
- Each candidate is allowed three chances at passing the exam

**Setup for the Training:**

Formal rotations are highly desirable where the trainee spends defined periods dedicated to a specific modality & which should be arranged by the fellowship director.

**Methods of Training:**

- Lectures
- Individual interpretation session of representative cases (a teaching file).
- Daily self-studies of course materials and reference textbooks or papers (acquiring knowledge of basic principles, applied anatomy, pathophysiology, diagnostic criteria, and clinical applications).
- Daily interpretation sessions
- Weekly conferences with faculty (discussion of current cases, Tumor board, Q&A, differential diagnosis).
- Individual skill assessment (performing a procedure under direct supervision).

**Methods of Evaluation of Trainees:**

1. On-going evaluation: ( under the supervision of the Fellowship Director)
  - Performance and interpretation skills assessment by the training personnel (monthly).
  - Interpretation skills assessment using case reviews (monthly).
  - The trainee's professionalism, attitude to work, team work, responsibility and adherence to ethical principles in medical practice will be included in the assessment
  - An evaluation of each rotation will be made by the fellow in writing.
2. Final evaluation of proficiency in interpretation (Arab Board subspecialty certification examination):
  - Individual consultants should provide written evaluation of trainees who have completed formal rotations in the subspecialty. The evaluations will be collected and endorsed by the fellowship director
  - After finishing training, the trainee should pass the exit examination
  - Evaluation forms required for a CME activity filled out by the trainee upon course completion.

**Methods of Upgrading Knowledge/CME:**

- During the training course, trainees are required to perform self- studies of selected textbooks and papers, and participate in weekly discussions with faculty of current cases.

- Trainees are expected to participate in research and audit.
- The trainee is expected to present 10 full case conferences/lectures during each year of training. S/he is required to demonstrate ability to instruct and teach junior colleagues and medical students
- The trainee is expected to be cognizant of radiation protection guidelines and practice
- The trainee is expected to be familiar with national and international guidelines regarding breast imaging
- Upon completion of the course trainees are expected to prepare for the Arab Board certification examination in breast imaging

**Leave / Vacation:**

- The trainee is entitled to three weeks of leave per year
- One week of educational leave is available to attend courses or scientific meetings

**I. STRUCTURE OF THE TRAINING PROGRAMME:**

This is a one year fellowship programme that consists of the following structure:

**A. Breast Imaging (5 months):**

This should involve exposure to all aspects of radiology of the breast including mammography (screening and diagnostic), breast ultrasonography, MRI, and breast related interventions such as aspirations, wire localizations and/or stereotactic biopsies. (*Interpret 2000 mammogram, 500 breast ultrasound examinations, 30 stereotactic breast biopsies, 100 ultrasound-guided breast procedures( biopsies, cyst aspirations, localization procedure, and axillary lymph node sampling), Review the radiologic-pathologic correlation of at least 200 breast lesions.*)

**B. Breast Ultrasonography (1 month):** Covers all aspects of breast diseases and US guided procedures.

**C. CT(1 month):** Covers all aspects of breast malignancy staging procedures and the diseases related to the adult female, such as gynecological diseases (50 CT).

**D. MRI (1 month):**Covers all aspects of breast malignancy staging procedures and the diseases related to the adult female, such as gynecological diseases(50 MRI).

**E. Ultrasound of the Female Pelvis,(6 weeks):**Should be focused onto imaging of the female pelvis. Other sonographic examinations with relevance to female diseases should also be included. (*200 pelvic ultrasound examinations, including transvaginal imaging*).

**F. Bone Densitometry (two weeks):**May be integrated into one of the first three components described above.

**G. Elective ( 1 month)**

## II. DIDACTIC & RESEARCH ACTIVITIES

Fellows are required to attend and participate in the following activities:

- A. **Resident Tutorials:** fellows will conduct a minimum of five teaching tutorials for residents. They must also attend all tutorials given by faculty members of the Breast Imaging Section.
- B. **Formal Lectures:** fellows will present a minimum of two formal lectures on topics related to Breast Imaging. They will also attend lectures presented by faculty within the department related to this specialty.
- C. **Clinical-Radiological Conferences:** fellows will initially attend and ultimately moderate weekly clinical-radiological conferences held by the department related to breast Imaging under the supervision of faculty members.
- D. Fellows are strongly encouraged to attend at least one scientific meeting or symposium related to Breast or Women Imaging.
- E. Fellows are encouraged to conduct at least one research project during their training.

## III. PROGRAMME CONTENT

- A. Breast Diseases.
- B. female pelvis
- C. Physics as applied to mammography, ultrasound, CT, MRI.
- D. Radiation Protection.
- E. Use of drugs in radiology, including sedation.
- F. Diagnostic imaging:
  1. Breast imaging mammography, ultrasound and MRI.
  2. Breast interventional – both ultrasound and & stereotactic guided:
    - Wire localization
    - Core biopsy
    - Vacuum-assisted biopsy
    - Galactography
  3. Abdominal and pelvic procedures
  4. Cyst aspiration
  5. Sentinel lymph node imaging
- G. Women's Body Imaging
  1. Ultrasound of abdominal-pelvic gynecological diseases.
  2. CT abdominal- pelvic gynecologic studies.
  3. MRI abdominal-pelvic gynecologic studies.
  4. PET scan in evaluating gynecological and breast malignancies.
  5. Nuclear imaging for evaluating gynecological and breast malignancies for metastases and sentinel node.
  6. BMD studies for osteoporosis.

## **IV. CURRICULUM**

Breast anatomy, physiology, and pathology

- Breast development
- Normal breast anatomy and histology; alteration with age, pregnancy, menstrual cycle, and hormonal effects; male breast anatomy

**Pathologic appearance and clinical significance of:**

- Benign breast lesions
- Atypical ductal hyperplasia (ADH), atypical lobular hyperplasia (ALH), lobular carcinoma in situ (LCIS), and other histologic risk factors
- Ductal carcinoma in situ (DCIS), including its histologic subtypes
- Invasive ductal carcinoma not otherwise specified (NOS); subtypes of invasive ductal carcinoma (mucinous, medullary, papillary, tubular); invasive lobular carcinoma
- Other types of breast cancer, such as Paget's disease and inflammatory carcinoma
- Other malignancies involving the breast, including phyllodes tumor, lymphoma, leukaemia, sarcomas, and metastases
- Histologic grading
- Pathologic staging
- Multifocal and multicentric carcinoma
- Margin analysis for specimens containing malignancy

**Epidemiology**

- Risk factors for breast cancer
- Indications for genetic screening
- Breast cancer incidence and mortality, including longitudinal trends
- Breast cancer staging and survival rates by stage

**Mammographic equipment and technique**

- Both screen-film and full-field digital mammography
- Features of dedicated mammographic units, including target, filtration, automatic exposure control (AEC), and grids
- Factors affecting optical density, contrast, sharpness, and noise

- Selection of technique factors, including effects of milliamp-seconds (mAs), kilovolt peak (kVp), target and filter material choice, and density settings on image quality and radiation dose
- Effect of breast thickness and composition on technique, image quality, and radiation dose
- Mammographic positioning for CC and MLO views
- Mammographic positioning for women with breast implants
- Rationale for breast compression
- Clinical image assessment for proper breast positioning, compression, exposure, contrast, sharpness, and noise
- Screen-film mammography
- Characteristics of mammographic screen-film systems
- Image processing
- Effect of screen-film speed, optical density, and film processing on radiation dose
- High-intensity view boxes, view box masking
- Full-field digital mammography
- Characteristics of full-field digital mammographic systems, including advantages and limitations
- Effects of post-processing on the digital mammographic image
- Effect of signal-to-noise ratio on radiation dose
- Dedicated high-luminance, high-resolution viewing monitors

### **New mammography techniques**

3D digital tomosynthesis (indications and clinical applications)

Contrast Enhanced mammography (indications and clinical applications)

Spectral mammography.

ACR Practice Guideline for the Performance of Whole Breast Digital Mammography

### **Mammography quality assurance**

- Familiarity with content in the ACR Mammography Quality Control Manual
- Purpose and frequency of performance of quality control tests performed by the technologist and physicist



- Demonstrate proficiency in recognizing the mammographic appearance of artifacts for both screen-film and digital mammography
- Regulations
- Equipment, quality control, and personnel (radiologist, technologist, physicist) requirements for accreditation
- Responsibilities of the lead interpreting physician
- Medical audit
- Audit definitions as provided by BI-RADS
- Desirable goals and benchmarks for standard outcome parameters, for both screening and diagnostic mammography

### **Mammographic interpretation**

- Optimal viewing conditions, including low ambient light environment
- **Demonstrate proficiency in:**
  - Recognizing normal mammographic anatomy
  - Recognizing the mammographic features of characteristically benign and suspicious breast calcifications
  - Recognizing the mammographic features of characteristically benign and suspicious breast masses
  - Recognizing the mammographic appearance of indirect signs of malignancy (architectural distortion, asymmetries, etc)
  - Recognizing the mammographic features of the surgically altered breast, including implants
  - Recognizing the mammographic features of probably benign (BI-RADS category 3) lesions
  - Principles, methods, strengths, and pitfalls of computer-aided detection (CAD) and double reading

### **Screening mammography**

- Randomized clinical trials, case-control studies, service-screening studies: purpose, methods, results

- Pitfalls in evaluating screening results: lead-time bias, length-bias sampling, selection bias, prevalence versus incidence, screening, interval cancer rate, survival rates
- Relative screening efficacy of clinical breast examination, breast self-examination, and mammography
- Benefit-risk assessment, including radiation risk and false positives
- Cost-effectiveness
- Controversies regarding screening women aged 40-49 years; younger than age 40
- Screening guidelines of ACR, American Cancer Society, etc.
- Logistics and throughput issues in the performance and interpretation of screening mammography examinations
- ACR Practice Guideline for the Performance of Screening Mammography

### **Diagnostic (problem-solving) mammography**

- Techniques and indications for and value of supplementary mammographic views

#### Demonstrate proficiency in:

- Performing the work-up of lesions seen on only one standard (MLO or CC) screening view
- Three-dimensional lesion localization
- Correlation of palpable with imaging findings
- Evaluation and management of a palpable mass (or other focal symptoms) when there are no associated mammographic findings
- Assessment of extent of disease for suspicious and for known-malignant lesions
- ACR Practice Guideline for the Performance of Diagnostic Mammography

### **Breast ultrasound**

- Equipment and physical principles
- Techniques
- Indications

#### Demonstrate proficiency in:

- Scanning the breast
- Recognizing normal sonographic anatomy
- Recognizing features of simple cysts, complicated cysts, complex masses
- Recognizing differential features of benign and malignant solid masses

- Correlation with findings at mammography and clinical breast examination
- Limitations in the detection and assessment of microcalcifications
- Controversies regarding the role of screening whole-breast ultrasound examination
- The use of elastography and Doppler
- ACR Practice Guideline for the Performance of a Breast Ultrasound Examination

### **Breast MRI**

- Equipment and physical principles
- Techniques
- Indications
- Strengths and limitations of kinetic and morphologic analysis

#### Demonstrate proficiency in:

- Recognizing normal MRI anatomy
- Recognizing differential features of benign and malignant masses
- Recognizing differential features of benign and malignant non-mass-like enhancement
- Evaluating implant integrity
- Correlation with findings at mammography, ultrasound, and clinical breast examination
- Limitations in the detection and assessment of lesions presenting as microcalcifications
- Controversies regarding the role of screening breast MRI examination
- ACR Practice Guideline for the Performance of MRI of the Breast

### **Reporting and medicolegal aspects of breast imaging**

#### Demonstrate proficiency in producing breast imaging reports, including:

- ACR BI-RADS lexicon terms for mammography, ultrasound, and MRI
- Lesion location
- Categorization of breast composition (BI-RADS breast density descriptors)
- Final assessment categories (ACR BI-RADS)
- Concordance between lesion descriptors and assessment categories
- Concordance between assessment categories and management recommendations
- Medicolegal aspects of all breast imaging and interventional procedures
- Understanding the supervisory responsibility for approving the technical quality of a given examination

- Communication issues and follow-up of abnormal findings
- Informed consent for invasive procedures

### **Interventional procedures**

#### **Principles, indications and contraindications, equipment, preparation, technique, advantages, disadvantages, accuracy, and auditing for:**

- Needle-wire localization guided by mammography and ultrasound
- Ultrasound-guided core biopsy (also fine-needle aspiration [FNA], if available)
- Stereotactically guided core biopsy (also fine-needle aspiration [FNA], if available)
- Ultrasound-guided cyst aspiration
- Targeted ultrasound to substitute ultrasound guidance for MRI guidance
- MRI-guided core biopsy and needle-wire localization
- Use and limitations of using markers to indicate the site of percutaneous biopsy
- Specimen radiography, including paraffin block radiography
- Galactography
- Assessment of imaging-pathologic concordance
- Post-procedure follow-up imaging
- ACR Guideline for the Performance of Ultrasound-Guided Breast Interventional Procedures
- ACR Guideline for the Performance of Stereotactically-Guided Breast Interventional Procedures
- ACR Ultrasound-Guided Breast Biopsy Accreditation Module (part of the ACR Breast Ultrasound Accreditation Program)
- ACR Stereotactic Breast Biopsy Accreditation Program

### **Therapeutic and management considerations**

- Basic understanding of breast cancer treatment options
- Role of breast imaging in planning and monitoring of breast cancer treatment and post-treatment follow-up
- ACR Practice Guideline for the Management of Ductal Carcinoma In-Situ of the Breast (DCIS)

- ACR Practice Guideline for Breast Conservation Therapy in the Management of Invasive Breast Carcinoma
- ACR Appropriateness Criteria for: Breast Microcalcifications; Nonpalpable Breast Masses; Palpable Breast Masses; Stage I Breast Carcinoma

### **Interpersonal and Communication Skills**

Communicate effectively with patients, colleagues, referring physicians, and other members of the health care team concerning breast imaging appropriateness, informed consent, safety issues and results of imaging tests and procedures.

Practice performance measurements: Breast imaging section evaluation (to include communication issues such as discussing abnormal breast imaging results with patients and referring physicians).

### **• Professionalism**

Commit to high standards of professional conduct demonstrating altruism, compassion, honesty and integrity.

Practice performance measurements: Breast imaging section evaluation (to include compliance with breast imaging section policies).

### **• System-Based Practice**

Understand the factors that optimize coordination of care within a local health care system as well as the global health care system in general by understanding appropriate utilization of imaging resources.

Practice performance measurements: Breast imaging section evaluation (to include participation in multidisciplinary breast care conferences).

## **V. REFERENCES**

**Suggested books for reading** (latest edition of the following books).

- Breast Imaging .3<sup>rd</sup> Edition. Daniel B. Kopans. Lippincott Williams & Wilkins, 2006, ISBN 13: 978-0781747684.
- Diagnostic Imaging : Breast. 2<sup>nd</sup> Edition, Wendie A Berg & Wei Tse Yang. Amirsys, 2013 .ISBN 978-1-931884-73-0.
- Breast Imaging Case Review Series . 2<sup>nd</sup> Edition, Cecilia M. Brennecke. Elsevier, 2012. ISBN 978-0-323-08722-3.

- Breast Imaging:the Requisites. 2<sup>nd</sup> Edition, Debra M. Ikeda. Mosby Elsevier, 2010. ISBN-13: 978-0323051989.
- Breast Imaging Companion .Gilda Cardenosa, Wolters Kluwer/ Lippincott Williams & Wilkins, 2007 ISPN-13 978-0781781764919.
- Breast Ultrasound . A. Thomas Stavros, Lippincott Williams & Wilkins, 2004, ISPN 13-978-0-397-51624-7.
- Breast MRI .Virginia M. Molleran and Mary C.Mahoney, Elsevier, 2013. ISPN 978-1-4557-4061-1.
- Diagnostic Imaging : Gynecology, 2<sup>nd</sup> Edition. Akram M Shaaban,Amirsys, 2014. ISPN-13: 978-1416033387.
- MRI and CT of the Female Pelvis by Bernard Hamm and RosemarieForstner, Eds. Springer, 2010.ISPN 978-3-540-22289-7.

## VI. BREAST IMAGING FELLOWSHIP OVERVIEW

Positions	One fellow per 2 consultants.
Duration	One year
Requirement	Arab BoardCertification in Radiology
Rotations	5 months breast imaging, 1month breast ultrasound, 1 months CT, 1 months MRI,6 weeks pelvic US, 2weeks BMD exposure, One month elective
Academic Activities	Participate actively in weekly breast cancer rad-clinical meeting
Research	Should generate at least one research project during training
Examinations	Oral examination will be held at end of training.

**Qualification Degree :** Arab Board Fellowship of Breast Imaging

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