

# Curriculum

## FNB Fellowship

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# Breast Imaging

- ◆ Introduction
- ◆ Objectives of the Programme
- ◆ Teaching and Training Activities
- ◆ Syllabus
- ◆ Competencies
- ◆ Log Book
- ◆ Recommended Books

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# INDEX

S. No	Contents	Page No.
I	Introduction	5
II	Objectives of the Programme	6
III	Teaching and Training Activities	7
IV	Syllabus	8
V	Competencies	14
VI	Log Book	15
VII	Recommended Books	16

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## I. INTRODUCTION

Breast cancer is one of the commonest cancer in women globally and in India accounts for 25% to 32% of female cancers in all cities across India, and the second most common in rural India. Breast Imaging is one of the key constituents of triple assessment for the effective breast cancer detection and management along with clinical and histopathological evaluation. Unfortunately, our health care system due to its limited resources is not able to grapple with this explosion. In addition, the presentation of breast cancer in Indian women is variegated, as India is an amalgam of different cultures, dietary habits & life styles. In India breast imaging is an upcoming modality, differing standards of imaging and reporting compound this problem. As a developing country India now has more and more digital mammographic units coming up which are on par with global standards, however dedicated breast imaging radiologists are few and mostly in metropolitan cities.

Breast Imaging is an emerging area of Radiology that places emphasis on the unique health needs of women and provides an increased focus on public awareness and screening programs. However, breast Imaging is a subspecialty involved in the diagnosis of not just various malignant disease, but also benign pathologies including breast disorders like nipple discharge, mastitis, besides benign breast lumps. Apart from imaging various diseases, the radiologist is also involved in diagnostic and therapeutic interventional procedures like image guided FNAC's, biopsies, aspirations, etc.

In India, there is no structured training programme in Breast imaging and this subspecialty is practiced primarily as part of general radiology practice. As radiologists acquire their skills during their radiology residency, cultivating an interest in women imaging at the resident level would improve the quality of health care they would provide after entering the workforce. The shortage of breast imaging specialists in India is an ongoing concern. It is therefore strongly desirable to start a dedicated postdoctoral fellowship programme in breast imaging.

The Fellowship Programme intends to provide a well-balanced clinical, research and teaching curriculum as it will take place in a high-volume academic environment. This two-year programme will provide training in all aspects mammography, ultrasound, computed tomography and magnetic resonance imaging. Access will also be provided to related interventional

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procedures. It would provide a means of increasing skilled professionals in this field.

## **II. OBJECTIVES OF THE PROGRAMME**

### **1. PROGRAMME GOAL**

The fellowship course in breast imaging is targeted to develop breast imaging experts with abilities to perform full range of diagnostic imaging and interventional procedures in this field. On completion of the course, the candidate should be capable of delivering the highest quality of patient care by making an early and accurate diagnosis and guiding subsequent management and become clinically competent, and be able to pursue both clinical and experimental research in this field.

### **2. PROGRAMME OBJECTIVES**

To train fellowship students in clinical, diagnostic, and interventional breast imaging so as to enable them to make imaging diagnosis independently of all breast diseases and perform all types of breast interventions, thus improving patient care. The structured training program would emphasize:

- i. Evidence-based decision-making.
- ii. Development of desired technical expertise with emphasis on safety, self-analysis and improvement.
- iii. Development of appropriate communication skills.
- iv. Development of efficient interdisciplinary collaboration.
- v. Use of research technology and skills in conducting clinical and experimental studies.
- vi. Development of professional leadership and management skills.
- vii. The candidates would also be trained for the following:
  - a. Understand ethical issues in human and animal research
  - b. Perform independently a research project and publish a scientific paper in an indexed journal.

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### III. TEACHING AND TRAINING ACTIVITIES

#### 1. Academic Training:

Journal Club	1 per month
Seminar	1 per month
Clinical Case Discussion	1 per week
Pathology Meeting	1 per week
Research Review	1 per 3 months
Clinico-Radiological Meeting	1 per week

#### 2. Clinical Training:

The candidate will work as a part of the breast imaging and interventional radiology services. The clinical training will involve patient evaluation and management of both indoor and outdoor patients including pre-operative, post-operative care. Once a week combined meetings will be held in collaboration with the Departments of Surgery, Medical Oncology and Pathology with the aim of gaining insights into multidisciplinary approach to disease management. Besides this, the candidate is also required to undergo a rotation in the Department of Surgery (15 days), Department of Medical Oncology (15days), Department of Nuclear Medicine (15days) and the Department of Pathology (15 days).

#### 3. Training Rotations:

Mammography (Diagnostic & interventions)	9 months
Ultrasound (Diagnostic & interventions)	7 months
MRI (Diagnostic / interventions)	6 months
Nuclear Medicine /PET CT	15 days
Breast Pathology	15 days
Breast Surgery	15 days
Medical and Radiation Oncology	15 days

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## IV. SYLLABUS

By means of clinical experience, lectures, conferences, journal and online references, the fellow should become familiar with and understand the following topics in breast disease:

### 1. Breast Anatomy & Physiology

- i. Breast development
- ii. Normal breast anatomy and histology; alteration with age, pregnancy, menstrual cycle, and hormonal effects; male breast anatomy, Regional lymph node anatomy & drainage.

### 2. Histopathology

- i. Pathologic appearance and clinical significance of:
  - a. Benign breast lesions - fibrocystic changes, usual duct hyperplasia, columnar cell lesions without atypia, fibro adenomas, and fat necrosis.
  - b. High Risk lesions - Atypical ductal hyperplasia (ADH), atypical lobular hyperplasia (ALH), lobular carcinoma in situ (LCIS), flat epithelial atypia, lobular neoplasia (atypical lobular hyperplasia and lobular carcinoma in situ), papillary lesions, radial scar/complex sclerosing lesions.
  - c. Ductal carcinoma in situ (DCIS), including its histologic subtypes.
  - d. Invasive ductal carcinoma not otherwise specified (NOS); subtypes of invasive ductal carcinoma (mucinous, medullary, papillary, tubular); invasive lobular carcinoma
  - e. Other types of breast cancer, such as Paget's disease and inflammatory carcinoma
  - f. Other malignancies involving the breast, including phyllodes tumor, lymphoma, leukemia, sarcomas, and metastases.
- ii. Histologic grading
- iii. Pathologic staging
- iv. Immunohistochemistry
  - v. Multifocal and multicentric carcinoma
- vi. Margin analysis for specimens containing malignancy

### 3. Radiologic-pathologic correlations

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Considerations to have sound ability in the in recognition of the above in all imaging modalities as stated earlier.

#### 4. Epidemiology

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

#### 5. Mammography

Both screen-film and full-field digital mammography

- i. Equipment features
  - a. Features of dedicated mammographic units, including target, filtration, automatic exposure control (AEC), and grids
  - b. Factors affecting optical density, contrast, sharpness, and noise
  - c. 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
  - d. Effect of breast thickness and composition on technique, image quality, and radiation dose
  - e. AERB guidelines for mammographic equipment and radiation protection issues.
- ii. Mammographic positioning
  - a. For CC and MLO views
  - b. Mammographic positioning for women with breast implants
  - c. Rationale for breast compression
  - d. Clinical image assessment for proper breast positioning, compression, exposure, contrast, sharpness, and noise
- iii. Screen-film mammography versus Full-field digital mammography
  - a. Characteristics of full-field digital mammographic systems, including advantages and limitations
  - b. Effects of post-processing on the digital mammographic image
  - c. Effect of signal-to-noise ratio on radiation dose
  - d. Dedicated high-luminance, high-resolution viewing monitors

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- iv. Mammography quality assurance
    - a. Demonstrate proficiency in recognizing the mammographic appearance of artifacts for both screen-film and digital mammography
    - b. Familiarity with content in the Mammography Quality Control
    - c. Purpose and frequency of performance of quality control tests performed by the technologist and physicist
  
  - v. Mammographic interpretation
    - a. Optimal viewing conditions, including a low ambient light environment
    - b. Demonstrate proficiency in:
    - c. Recognizing normal mammographic anatomy
    - d. Recognizing the mammographic features of characteristically benign and suspicious breast calcifications
    - e. Recognizing the mammographic features of characteristically benign and suspicious breast masses
    - f. Recognizing the mammographic appearance of indirect signs of malignancy (architectural distortion, asymmetries, etc)
    - g. Recognizing the mammographic features of the surgically altered breast, including implants
    - h. Recognizing the mammographic features of probably benign (BI-RADS category 3) lesions
    - i. Principles, methods, strengths, and pitfalls of computer-aided detection (CAD) and double reading
  
  - vi. Screening mammography
    - a. Randomized clinical trials, case-control studies, service-screening studies: purpose, methods, results
    - b. Pitfalls in evaluating screening results: lead-time bias, length-bias sampling, selection bias, prevalence versus incidence screening, interval cancer rate, survival rates
    - c. Relative screening efficacy of clinical breast examination, breast self-examination, and mammography
    - d. Benefit-risk assessment, including radiation risk and false positives
    - e. Controversies regarding screening women aged 40-49 years; younger than age 40
    - f. Screening guidelines of different countries

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- g. Logistics and throughput cost benefit issues in the performance and interpretation of screening mammography examinations
  - vii. Diagnostic (problem-solving) mammography
    - a. Techniques and indications for and value of supplementary mammographic views
    - b. Work-up of lesions seen on only one standard (MLO or CC) screening view
    - c. Three-dimensional lesion localization
    - d. Correlation of palpable with imaging findings
    - e. Evaluation and management of a palpable mass (or other focal symptoms) when there are no associated mammographic findings
    - f. Assessment of extent of disease for suspicious and for known-malignant lesions

## **6. Breast ultrasonography**

- i. Equipment and physical principles
- ii. Techniques
- iii. Indications
- iv. Recognizing normal sonographic anatomy
- v. Recognizing features of simple cysts, complicated cysts, complex masses
- vi. Recognizing differential features of benign and malignant solid masses
- vii. Correlation with findings at mammography and clinical breast examination
- viii. Limitations in the detection and assessment of microcalcifications
- ix. Controversies regarding the role of screening whole-breast ultrasound examination

## **7. Breast MRI**

- i. Equipment and physical principles
- ii. Techniques
- iii. Indications
- iv. Strengths and limitations of kinetic and morphologic analysis
- v. Recognizing normal MRI anatomy
- vi. Recognizing differential features of benign and malignant masses

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- vii. Recognizing differential features of benign and malignant non-mass-like enhancement
  - viii. Evaluating implant integrity
  - ix. Correlation with findings at mammography, ultrasound, and clinical breast examination
  - x. Limitations in the detection and assessment of lesions presenting as micro calcifications
  - xi. Controversies regarding the role of screening breast MRI examination

## **8. Reporting and medico-legal aspects of breast imaging**

- i. Demonstrate proficiency in producing breast imaging reports, including:
- ii. ACR BI-RADS lexicon terms for mammography, ultrasound, and MRI
- iii. Lesion location
- iv. Categorization of breast composition (BI-RADS breast density descriptors)
- v. Final assessment categories (ACR BI-RADS; MQSA regulatory requirements)
- vi. Management recommendations
- vii. Concordance between lesion descriptors and assessment categories
- viii. Concordance between assessment categories and management recommendations
- ix. Medico legal aspects of all breast imaging and interventional procedures
- x. Understanding the supervisory responsibility for approving the technical quality of a given examination
- xi. Communication issues and follow-up of abnormal findings
- xii. Informed consent for invasive procedures

## **9. Interventional procedures**

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

- i. Needle-wire localization guided by mammography and ultrasound
- ii. Ultrasound-guided core biopsy
- iii. Stereo tactically guided core biopsy
- iv. Ultrasound-guided cyst aspiration
- v. Targeted ultrasound to substitute ultrasound guidance for MRI guidance
- vi. MRI-guided core biopsy and needle-wire localization (Theoretical)

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- vii. Use and limitations of using markers to indicate the site of percutaneous biopsy
  - viii. Specimen radiography,
  - ix. Assessment of imaging-pathologic concordance
  - x. Post-procedure follow-up imaging

## 10. Therapeutic and management considerations

- i. Basic understanding of breast cancer treatment options
- ii. Role of breast imaging in planning and monitoring of breast cancer treatment and post-treatment follow-up
- iii. Role of breast imaging in management of Ductal Carcinoma In-Situ of the breast (DCIS)
- iv. Role of breast imaging in Breast Conservation Therapy in the Management of Invasive Breast Carcinoma.
- v. Strategies to encourage breast screening for detecting early breast cancer

## 11. Other

- i. Active participation in screening and diagnostic mammography interpretation
- ii. Active participation in breast MRI interpretation
- iii. Formal teaching conferences (lectures, case presentations)
- iv. Imaging-pathologic correlation conferences; multidisciplinary breast cancer case conferences
- v. Direct observation or videotape of mammographic positioning for routine and supplementary views
- vi. Breast imaging textbooks
- vii. Demonstrate proficiency in interacting with patients, including how to recommend biopsy, how to explain a cancer diagnosis, and how to develop sensitivity to patients' emotional needs
- viii. Experience interacting with surgeons, pathologists, medical oncologists, and radiation oncologists in providing multidisciplinary patient care
- ix. Familiarity with radionuclide breast scanning
- x. Familiarity with performing a medical audit
- xi. Teaching medical students and residents and general public.
- xii. Encourage participation in research projects

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- xiii. Familiarity with performing breast positioning and setting techniques for mammographic examination
  - xiv. Knowledge of quality control tests performed by medical physicist
  - xv. Observation of pathology, breast surgery, and radiation therapy practice
  - xvi. Educating general public on breast care and breast health, including the value of breast self-examination and breast feeding.

## **V. COMPETENCIES**

By the end of two year the fellow is expected to Perform independently and act as a competent breast imaging consultant to clinicians in performing ultrasound, CT, MRI and various interventional procedures.

### **1. Perform and interpret Mammography for various indications including familiarity with equipment, technical factors and various positioning techniques.**

- i. Perform and interpret ultrasound examinations of the breast
- ii. Supervise acquisition of MRI examination and
  - a. Assess for absolute and relative contraindications,
  - b. Protocol each case appropriately,
  - c. Supervise technical adequacy and completeness of cases at the technologist's request.
- iii. Interpret MRI examination of breast
- iv. Perform interventions including Stereotactic and ultrasound guided core biopsy and fine-needle aspiration, cyst aspiration, Ultrasound/mammography guided hook-wire localization, dictograph, etc.
- v. Assess and treat patients having an anaphylactic reaction or an adverse side effect from any supervised procedure
- vi. Teach residents and medical students as part of their daily assigned duties.
- vii. Perform and interpret examinations performed on-call.
- viii. Prepare and present women imaging rounds / tumor board meetings.

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## VI. LOG BOOK

A candidate shall maintain a log book of operations (assisted / performed) during the training period, certified by the concerned post graduate teacher / Head of the department / Lead consultant.

The expected case load a fellow is expected to cover in the time period is as follows:

1. 1000 Mammograms
2. 1500 Breast ultrasounds
3. 150 Ultrasound guided procedures (core biopsy, clip placements, wire localizations)
4. 20 Mammo guided procedures (wire placements, core biopsy, VAB)
5. 150 MRI

This log book shall be made available to the board of examiners for their perusal at the time of the final examination.

The log book should show evidence that the before mentioned subjects were covered (with dates and the name of teacher(s)) The candidate will maintain the record of all academic activities undertaken by him/her in log book.

1. Personal profile of the candidate
2. Educational qualification /Professional data
3. Record of case histories
4. Procedures learnt
5. Record of case Demonstration/ Presentations
6. Every candidate, at the time of practical examination, will be required to produce performance record (log book) containing details of the work done by him/her during the entire period of training as per requirements of the log book. It should be duly certified by the supervisor as work done by the candidate and countersigned by the administrative Head of the Institution.
7. In the absence of production of log book, the result will not be declared.

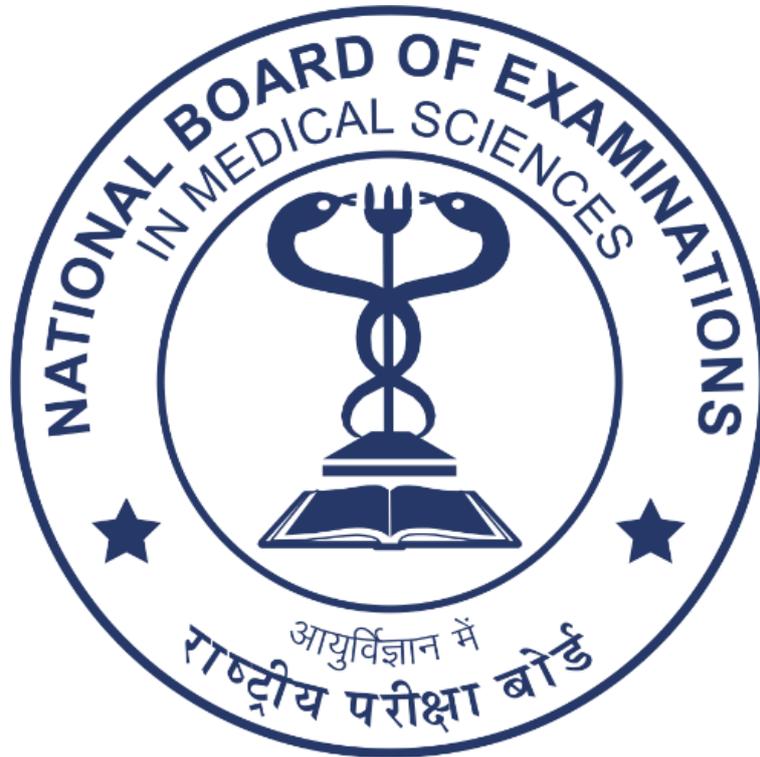
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## VII. RECOMMENDED BOOKS

1. Diagnostic Ultrasound, Rumack
2. Breast Ultrasound, A.Thomas Stavros
3. Breast Imaging, Daniel.B.Kopens
4. Vascular and Interventional Radiology, Karim Valji
5. Teaching Atlas of Mammography, Laszlo Tabar
6. Diagnosis of Diseases of the Breast, Bassett, Lawrence W
7. Breast Imaging Companion, Cardenosa, Gilda
8. Breast Imaging: The Requisites, Ikeda, Debra M
9. Breast Imaging: Case Review, Conant, Emily

## JOURNALS

1. American Journal of Roentgen ology
2. Radiographic
3. The Breast Journal
4. Radiology
5. Journal of Magnetic Resonance Imaging
6. Applied Radiology
7. Indian Journal of Radiology and Imaging
8. Radiology Clinics of North America
9. British Journal of Radiology
10. European Journal of Radiology
11. Diagnostic and Interventional Radiology
12. Investigative Radiology
13. American Journal of Obstetrics and Gynaecology
14. American Institute of Ultrasound in Medicine
15. Seminars in ultrasound, CT and MRI



आयुर्विज्ञान में राष्ट्रीय परीक्षा बोर्ड  
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