Scott and White Department of Radiology
Breast Imaging Curriculum, Goals and Objectives
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Goals and Objectives
The residents will participate in the day-to-day interpretation of Diagnostic and Screening mammography, and problem solving involving Breast U/S, CAD, and breast MRI. The resident will become familiar with the fundamental of mammographic positioning, technique, and Quality Control, and will use MQSA-approved BIRADS lexicon in generating reports. We will give hand-on training on Breast U/S, and we expect that the resident will participate directly in scanning patients, as well as in interventional U/S procedures, including cyst aspiration, ultrasound guided core biopsies, stereotactic biopsies and needle localization guided by U/S or X-ray.

Residents are expected to participate in all the clinical activities of the Breast Imaging Service, including the real time monitoring of studies, and all interventional procedures. Attendance at the Weekly Breast Multi-disciplinary Conference is optional, since it often conflicts with the departmental conferences. The resident is encouraged to attend when possible.

Epidemiology
Risk factors and incidence
Staging and survival rates

Breast Anatomy, Pathology, and Physiology
Breast development
Normal breast anatomy and histology; alteration with the age, pregnancy, menstrual cycle, and hormonal effects
Pathological and mammographic appearance and clinical significance of benign breast conditions, such as fibroadenoma, cysts, papilloma, hamartoma, lipoma, ductal ectasia, radial scar, and fat necrosis
Atypical ductal hyperplasia, lobular neoplasia, and other histologic risk factors

Pathologic and mammographic appearance, clinical features' significance, and prognosis of ductal carcinoma in situ

Pathologic and mammographic appearance, critical features and prognosis of invasive carcinoma, including invasive ductal carcinoma not otherwise specified, mucinous, medullary, papillary, tubular subtypes, and invasive lobular carcinoma

Other manifestations of breast cancer, such as Paget's disease and inflammatory carcinoma

Histologic grading

Pathologic staging

Multi-focal and multicentral carcinoma

Margin analysis for specimens containing ductal carcinoma In Situ.

**Mammographic equipment and technique**

Features of mammographic equipment units including target, filtration, automatic exposure control, and grids

Equipment requirements for American College of Radiology accreditation and Mammography Quality Standards Act (MQSA) certification

Characteristics of mammographic film screen systems

Positioning technique for cranio-caudal and medio-lateral oblique views

View box criteria for assessment of positioning, compression, exposure, contrast, sharpness, and noise

Rationale for breast compression

Selection of technical factors, including effects of milliampere seconds (MAs), Kilovolt peak (kVp) and density settings on image quality

Film processing

Factors affecting exposure contrast, noise, and sharpness
Need for dedicated high intensity view boxes, view box masking, and magnifying glass for film review

Workstation attributes for digital, technical factors for digital acquisition and digital display considerations

Standardized labeling of images

**Mammography quality control**

Purpose and frequency of performance of those quality control tests performed by technologist including phantom images and processor sensitometry

Appearance and causes of artifacts, such as roller marks, grid lines, motion, sharpness, dust, poor screen-film contact, pickoff, and scratches

Requirements and standards for American College of Radiology Mammography Accreditation and the Food and Drug Administration MQSA certification

**Mammographic interpretation**

Normal mammographic anatomy and parenchymal patterns

Mammographic features of typically benign calcifications, such as those caused by adenosis, fibroadenoma, fat necrosis, secretory disease, milk of calcium, sutural calcification, dystrophic calcification, etc

Mammographic features of calcification of intermediate concern and those having a higher probability of malignancy

Significance of distribution of calcifications

Mammographic features of benign masses and densities, such as asymmetric breast tissue, radial scar, hematoma, abscess, cysts, fibroadenoma, intramammary lymph node, hormonal replacement therapy, phyllodes tumor, hamartoma, gynecomastia, lipoma, fat necrosis, intracystic papilloma

Mammographic appearance of malignant masses, densities and architectural distortion caused by In Situ and invasive ductal carcinoma, invasive lobular carcinoma, and metastases to the breast

Knowledge of the ACR BI-RADS – lexicon
Mammographic features of the altered breast: lumpectomy, reduction, reconstruction and augmentation

**Problem solving mammography**

ACR Practice standard for the performance of diagnostic mammography

Technique, value, and indications for supplementary mammographic views, such as tangential, 90 degree medio-lateral, spot compression-magnification, exaggerated cranio-caudal, cleavage

Technique for documentation of skin calcifications

Criteria and methods for distinguishing focal asymmetric densities, asymmetric breast tissue, and breast masses

Technique for evaluation of implants, breast parenchyma, and implant leakage

Masses: criteria and methods for assessment by mammography and sonography: likelihood of malignancy

Calcification: criteria for mammographic assessment

Magnification mammography: advantages and disadvantages, technique, does, and indications

Localization of lesions seen out only one view; triangulation

Criteria for biopsy and follow up of masses: calcifications, and soft tissue densities

Evaluation and management of a palpable mass with no mammographic findings

**Breast ultrasound**

Equipment and physical principles

Technique

Hands-on experience
Indications

Normal sonographic anatomy

Features of cysts

Differential features of benign and malignant solid masses

Limitations

Need for correlation with mammography

Interventional procedures

Principles, indications, and contra-indications, equipment, technique, advantages, disadvantages, accuracy, preparations, and follow up for the following:

Needle wire localization

Stereotactic core biopsy

Ultrasound guided core biopsy and FNA; importance of correlation of pathologic, mammographic, and sonographic findings and history in determining patient management

Sonographic guided cyst aspiration

Specimen radiography, including paraffin block radiography

ACR image guided breast biopsy accreditation program

Mammographic reporting and medical legal aspects of mammography

American college of radiology BI-RADS terms for the following:

Mass: shape, margins, and density

Typically benign, intermediate concern, and higher probability of malignancy calcifications

Distribution modifiers for calcification
Associated findings
Lesion location
Categorization of breast composition
Final assessment categories
Medical legal aspects of screening, problem solving mammography, and interventional procedures

**Screening mammography**

ACR practice standards for screening mammography
Knowledge of practical aspects of performance and interpretation of screening mammography
Mammographic audit
Cost effectiveness screening
Randomized clinical trials, case control studies, and follow-up studies: purpose, methods, and results
Controversies regarding screening women aged 40 to 49 years
Screening guidelines of the American College of Radiology, American Cancer Society, National Cancer Institute

**Breast MRI**

Indications
Technique
Characteristics of benign and malignant breast masses
Implant rupture

**Therapeutic considerations**

Role of breast imaging in selection and monitoring of breast cancer treatment and post - treatment follow up
Basic understanding of breast cancer treatment options

Patient management principles

Patient interaction and communication

Informed consent for invasive procedures

Follow up procedures for positive findings

Yearly educational objectives

In light of the six general core competencies, as outlined by the ACGME and developed in depth by the APDR Education Committee, the following yearly curricula, including skill, education, and assessment tools are described.

Patient Care Skills

Gather clinical and radiological data on patients with breast lesions

Develop diagnostic plan based on the clinical presentation and prior imaging

Oversee customized breast imaging workups

Counsel patients concerning exam preparations

Demonstrate basic knowledge of IDX-RAD and UHIS

Perform exams responsibly and safely, assuring that the correct exam is ordered and performed

Education

Active participation with faculty in patient workup
Participation in Journal Club

Preparation of cases for Multi-disciplinary Conference

Graduated responsibility in performing radiologic procedures

**Assessment**

Global ratings by faculty

Procedure Log

**Medical Knowledge**

**Skills**

Demonstrate sufficient knowledge of medicine and its proper application to generate meaningful differential diagnoses

Demonstrate progress during subsequent rotations

Demonstrate understanding of the principles of research project design and implementation

Demonstrate a clinically appropriate diagnostic treatment plan

Demonstrate the ability to use all relevant information resources to acquire evidence based data

Demonstrate the proper use of radiological equipment

**Education**

Suggested Reading:

Cardenosa, Breast Imaging

Tabar, Breast Pathology

Shaw DeParedes, Breast Imaging

Didactic lecture series

Participation in case conferences (noon)
Participation in the clinical activities of the Breast Imaging Section

**Assessment**

- Global ratings by faculty
- Written examination based on required reading and curriculum
- ACR in-training examination
- Written ABR exam
- Oral ABR exam
- Raphex physics exam

*Interpersonal and Communication Skills*

- Provide a clear report based on BIRADS lexicon
- Provide direct communication to referring physicians, and documenting communication in report
- Demonstrate skills in obtaining informed consent, including effective communication to patients of the procedure, alternatives, and possible complications
- Demonstrate the verbal and non-verbal skills necessary for face to face listening and speaking to physicians, families, and support personnel

**Education**

- Participation as an active member of the radiology team by communicating with clinicians face to face, providing consults, answering phones, problem solving and decision-making
- Act as contact person for technologists and nurses in managing patient and imaging issues
- Practical experience in constructing radiological reports
Assessment

Global ratings by faculty

ABR Oral exam

If needed, record review

Professionalism

Skills

Demonstrate altruism

 Demonstrate compassion (be understanding and respectful of patient, their families, and medical colleagues)

 Demonstrate excellence: perform responsibilities at the highest level and continue active learning throughout one’s career

 Demonstrate honesty with patients and staff

 Demonstrate honor and integrity: avoid conflict of interests when accepting gifts from patients and vendors

 Demonstrate sensitivity without prejudice on the basis of religious, ethnic, sexual or educational differences, and without employing sexual or other types of harassment

 Demonstrate knowledge of issues of impairment

 Demonstrate positive work habits, including punctuality and professional appearance

 Demonstrate the broad principles of biomedical ethics

 Demonstrate principles of confidentiality with all information transmitted during a patient encounter

Education
Discussion of above issues during daily clinical work

Training programs and/or videotapes on harassment and discrimination

Didactic presentations on “the impaired physician”

Participation in hospital based educational activities

**Assessment**

Global ratings by faculty

ABR written exam

*Practice Based Learning and Improvement Skills*

Analyze and develop improvement plans in the clinical practice, including knowledge, observation, and procedural skills

Demonstrate knowledge of and apply the principles of evidence-based medicine in practice

Demonstrate critical assessment of the scientific literature

Help teaching of medical students, peers and other health care professionals

**Education**

Participate in Journal club, clinical conferences, and independent learning

Active participation in MQSA directed mammographic audit and QC

**Assessment**

Global ratings by faculty

ACR in-service exam

ABR written exam
**Systems Based Practice**

**Skills**

- Demonstrate ability to design cost-effective care plans
- Demonstrate knowledge of reimbursement methods
- Demonstrate knowledge of the regulatory environment

**Education**

- Review of literature, including ACR Appropriateness Criteria
- Attendance and participation in multi-disciplinary conference
- Interaction with department administrators
- Membership and participation in local and national radiological societies

**Assessment**

- Global ratings by faculty
- ABR written exam
- ACR in-training exam
- Documented membership in societies
Body Imaging:  
Section of Breast Imaging  
Resident Rotations

General Information for all Rotations

1. **Two (2) teaching file cases MUST be submitted in order to complete the rotation.** These are to be submitted on CD to Dr. Monticciolo by the end of the 4th week. Both cases are to be presented at the technologist meeting on the 3rd or 4th Friday of the rotation; this will give you an opportunity to share your knowledge with the technologists, with whom you will be working closely with during the month.

   Plan each case presentation to be no more than 5 minutes

   Informal presentation

   Opening slide should present the clinical scenario (pt age, gender, c/o, other pertinent history)

   Digitized all pertinent images; ultrasound can be obtained from PACS

   Obtain appropriate pathology

   Last slides should give background info and summarize teaching points

2. Review procedures planned for that day EARLY (before the patient arrives) or the night before. Scout films for the 8:00 localization should be on the board by 8:00 am and the patient consented or ready for consent.

3. All films for the current interventional case should be reviewed with the attending radiologist for diagnostic mammography PRIOR to initiating the procedure, even if you are at a level of working somewhat independently.

4. No procedure patient should be left in the room unattended once the procedure has begun. No exceptions. If the technologist needs to leave (run films for a localization, for example), then another tech, a tech aid or you must stay with the patient. This is for her safety as well as yours.
Suggested Reading:


2. Breast Imaging Reporting and Data System, 3rd edition. ACR

3. ACR Syllabus, Breast Disease III, Volume 47.


5. Diagnosis of Diseases of the Breast. Bassett (also good reference)
Rotation One (1)

Knowledge Based Objectives
At the end of this rotation, the resident should be able to:

1. Identify normal structures on a mammogram.
2. Describe mammographic lesions using the Breast Imaging Lexicon.
3. Discuss the technical factors unique to the production of a mammogram.
4. Define and assign appropriate BIRADS category to each exam.
5. Understand and discuss the follow up protocol for probably benign lesions.
6. Understand the basics of a diagnostic work up including magnification views, additional views, etc. This includes the appropriate designation of the additional views obtained.
7. Select cases appropriate for ultrasound and interpret ultrasound examinations.
8. Select appropriate cases for and mode of image-guided biopsy.

Technical Skills
At the end of the rotation, the resident should be able to:

1. Read and dictate or Penrad mammograms and ultrasounds using the BIRADS Lexicon after review by the attending radiologist.
2. Assist with and perform needle localizations using the best imaging modality for the case (ultrasound or mammography).
3. Perform vacuum-assisted stereotactic biopsy and ultrasound guided needle biopsy, including aspirations. This includes knowledge of and performance of obtaining appropriate consent for the process and working understanding of after-care.
4. Perform directed ultrasound.
**Decision Making and Value Judgement Skills**
At the end of the rotation, the resident should be able to:

1. Recognize limitations in personal skill and knowledge, always making sure decisions, dictations or report, and consultations are checked by the radiologist in charge.

2. Make a preliminary review of the mammograms and advise the technologist on the need for additional films.

3. Communicate to referring physicians important findings, including information about the localization to the surgeon as needed.

4. Refer all cases of abnormal mammograms (BIRADS 0,4,5) to the nursing staff with appropriate and clear instructions for biopsy and/or follow up.

5. Communicate clearly to the technologists all information important for their work with regard to the patients.

6. Communicate effectively with the patients regarding recommendations and management plans, as appropriate.
Rotation Two (2)

Knowledge Based Objectives
At the end of this rotation, the resident should be able to:

1. Meet all expectations from Rotation One.

2. Discuss the significance of different breast pathology results obtained at breast biopsy including appropriate management, follow up and risks of malignancy.

3. Discuss evaluation of implants, including MRI. Discuss types, placement and clinical issues associated with implants.

4. Discuss evaluation, clinical issues, imaging and appropriate follow up for the post-surgical patient: lumpectomy, mastectomy, reconstruction, reduction, and post-biopsy.

5. Give indications, contraindications, and possible complications and their management for all image-guided biopsy techniques.

6. Discuss QA tests required for accreditation.

7. Basic knowledge of MQSA.

Technical Skills
At the end of the rotation, the resident should be able to:

1. Demonstrate increased efficiency and knowledge of biopsy and needle procedures.

2. Understand galactography.

Decision Making and Value Judgement Skills
At the end of the rotation, the resident should be able to:

1. Demonstrate an enhanced ability to perform decision making listed under the first rotation. This includes near-complete evaluation and appropriate recommendations for work up and management of breast lesions.
2. Manage biopsy planning and follow up. Communicate with the nursing and technical staff.

3. Assess film quality and take corrective action.

4. Recommend the appropriate breast imaging to clinicians given a particular clinical scenario.
Rotation Three (3)

Knowledge Based Objectives
At the end of this rotation, the resident should be able to:

1. Display proficiency in the requirements outlined for Rotations 1 & 2.
2. Understand and list the quality assurance activities required for accreditation.
3. Discuss follow up and management based on knowledge of lesion diagnosis.
4. Discuss the current use of adjunctive imaging: MRI, ultrasound.

Technical Skills
At the end of the rotation, the resident should be able to:

1. Demonstrate ability to protocol and interpret MRI examinations for implants and malignancy.
2. Demonstrate ability to perform all skills and procedures listed in Rotations 1 & 2 at the competence level associated with a beginning practicing radiologist.

Decision Making and Value Judgement Skills
At the end of the rotation, the resident should be able to:

1. Demonstrate decision making skills and value judgements at a competence level associated with a beginning practicing radiologist.
2. Display knowledge of the appropriate breast imaging studies to fit the clinical scenario.
3. Understand surgical options and treatment implications of imaging diagnoses.