BREAST IMAGING ROTATION: RESIDENT GUIDE

Rotation sessions minimum goal summary ..................................................................................... 1
Identifying your rotations .................................................................................................................. 2
General notes about the rotation ..................................................................................................... 2
2nd year residents .............................................................................................................................. 4
Breast Imaging Conferences ............................................................................................................. 6
EPIC Schedules ................................................................................................................................ 7
Performing Screening Mammography .............................................................................................. 7
Procedural tracking ............................................................................................................................ 9
Biopsy Movies .................................................................................................................................. 9
Biopsies: Preprocedural workup and Post procedural management ............................................. 10
Tumor boards .................................................................................................................................. 10
Clock Face localization of lesions ..................................................................................................... 12
Views for diagnostic mammography ............................................................................................... 12
Standard views for callbacks ............................................................................................................ 13
Triangulating lesions using the ML, MLO and CC ......................................................................... 13
Triangulating lesions from rolled views ........................................................................................... 14
Management of Nipple discharge ..................................................................................................... 15
Resident self-study assignments ........................................................................................................ 15
Breast biopsy-path conference - Resident instructions ................................................................. 18
Stereotactic biopsy instructions (PRONE UNIT) ......................................................................... 21
Stereotactic biopsy instructions (TOMO UNIT) ............................................................................. 28
Curriculum ....................................................................................................................................... 33
Goals and Objectives rotation 1 ...................................................................................................... 39
Goals and Objectives rotation 2 ...................................................................................................... 43
Goals and Objectives rotation 3 ...................................................................................................... 46

ROUATION SESSIONS MINIMUM GOAL SUMMARY

<table>
<thead>
<tr>
<th>Rotation</th>
<th>Screening sessions</th>
<th>MINIMUM Screening #s</th>
<th>Diagnostic sessions</th>
<th>Biopsy sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>12</td>
<td>240</td>
<td>19</td>
<td>8</td>
</tr>
<tr>
<td>Two</td>
<td>12</td>
<td>280</td>
<td>19</td>
<td>8</td>
</tr>
<tr>
<td>Three</td>
<td>12</td>
<td>320</td>
<td>19</td>
<td>8</td>
</tr>
</tbody>
</table>
IDENTIFYING YOUR ROTATIONS

All residents should identify on the sheets provided on the reading room corkboard if they are resident A or B.

<table>
<thead>
<tr>
<th>WEEK 1</th>
<th>RESIDENT A</th>
<th>RESIDENT B</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>SCR</td>
<td>BX</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>SCR</td>
</tr>
<tr>
<td>AM</td>
<td>BX</td>
<td>SCR</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>DX</td>
</tr>
<tr>
<td>AM</td>
<td>SCR</td>
<td>BX</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>DX</td>
</tr>
<tr>
<td>AM</td>
<td>BX</td>
<td>SCR</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>DX</td>
</tr>
<tr>
<td>AM</td>
<td>SCR</td>
<td>DX</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>DX</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEEK 2</th>
<th>RESIDENT A</th>
<th>RESIDENT B</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>BX</td>
<td>SCR</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>DX</td>
</tr>
<tr>
<td>AM</td>
<td>SCR</td>
<td>BX</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>DX</td>
</tr>
<tr>
<td>AM</td>
<td>BX</td>
<td>SCR</td>
</tr>
<tr>
<td>PM</td>
<td>SCR</td>
<td>DX</td>
</tr>
<tr>
<td>AM</td>
<td>SCR</td>
<td>BX</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>DX</td>
</tr>
<tr>
<td>AM</td>
<td>DX</td>
<td>SCR</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>DX</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEEK 3</th>
<th>RESIDENT A</th>
<th>RESIDENT B</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>SCR</td>
<td>BX</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>SCR</td>
</tr>
<tr>
<td>AM</td>
<td>BX</td>
<td>SCR</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>DX</td>
</tr>
<tr>
<td>AM</td>
<td>TUMOR BD</td>
<td>BX</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>DX</td>
</tr>
<tr>
<td>AM</td>
<td>BX</td>
<td>SCR</td>
</tr>
<tr>
<td>PM</td>
<td>SCR</td>
<td>DX</td>
</tr>
<tr>
<td>AM</td>
<td>SCR</td>
<td>DX</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>DX</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEEK 4</th>
<th>RESIDENT A</th>
<th>RESIDENT B</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>BX</td>
<td>SCR</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>DX</td>
</tr>
<tr>
<td>AM</td>
<td>SCR</td>
<td>BX</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>DX</td>
</tr>
<tr>
<td>AM</td>
<td>BX</td>
<td>TUMOR BD</td>
</tr>
<tr>
<td>PM</td>
<td>SCR</td>
<td>DX</td>
</tr>
<tr>
<td>AM</td>
<td>SCR</td>
<td>BX</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>SCR</td>
</tr>
<tr>
<td>AM</td>
<td>DX</td>
<td>SCR</td>
</tr>
<tr>
<td>PM</td>
<td>DX</td>
<td>DX</td>
</tr>
</tbody>
</table>

GENERAL NOTES ABOUT THE ROTATION

Welcome to Breast Imaging at DHMC

We want your time here to be powerfully instructive, challenging and stress free as possible. We know you are often pressed for time and pulled in many directions. We also know that these rotations are absolutely critical to passing boards and succeeding in the real world. Perfecting your skills in breast imaging interpretation and procedures will make you a marketable radiologist. More importantly you can increase a person’s time on earth and decrease disfigurement and stress. It is an incredibly rewarding field.

Helpful Advice:
PREPARE
- You are expected to have reviewed the breast imaging manual which provides guidance for both self-study and for clinical rotations.
- You have a schedule for success laid out for you by Dr. Lewis that gives rotation goals and a suggestion for dividing your time. Please schedule your month out according to the timeline and stay on top of where you need to be and when. Please don’t expect the attending to know what you need to do.
- Be ready to answer questions. The attendings on our service want to know you are reading!

DAILY
- Our day starts at 0730 hours. We use military time.
- Please hang your coats on the hooks behind each door and stow backpacks and other personal belongings in room 2 under the desk. Minimize clutter and maintain a professional environment.
- Please preview interventional cases and enter pre-procedure notes (see separate form) the evening before. Keep the Interventional Planning Sheets together and make sure the attending radiologist has reviewed the form prior to giving it to the technologist.
- Try and present cases at weekly Wednesday 1200 (noon) Multidisciplinary Tumor Board after you have seen one or two.
- “Mini-Tumor Boards” occur each Wed at 0900 and are high speed meetings with individual breast surgeons to discuss their cases. Generally, the time is too tight for you to present these cases but do know the cases and listen carefully to the discussions. These are valuable windows into patient and surgeon-focused care that will improve your appreciation of practical issues and hone your reporting.

COMPORTMENT
- Please wear a clean white coat when seeing patients. It identifies you as the “clinician” that you are.
- Let the patient see you sanitize your hands before shaking their hand.
- Enter the room in front of the attending if you are doing the procedure. Always introduce yourself as a physician, and as a resident.
- Respect a patient’s modesty at all times. Do not leave a door wide open. Use the privacy screen when exiting the room. Expose the breast as little as possible and do not leave the breast exposed unnecessarily.
- Please conduct procedures thoroughly, but without delay. Be efficient when opening gloves and equipment. Time is a valuable commodity. It also minimizes the stress time when a patient is having a procedure. In and out faster = less stress for her, more time for you.
- You have the benefit of training with some of the brightest and most accomplished breast imagers. We each may have different methods and techniques that may differ
from instructional videos. The goals are the same! Take in each technique or nuance and take home what works best for you and your patient.

- Clean up as you go! Whether you are in a procedure or the reading room- please keep the areas as clean and debris free as possible. You, the attending and the technologist are working in concert making sure all procedures are performed efficiently. Do not leave room clean-ups to technologists. We all work together.

REPORTING
- We use centimeters.
- We use complete sentences in the body of the report under Findings, not in the Impressions.
- Autotext “Start” is a macro that will get you started in proper report format as follows:
  - Study/Indication/Technique/Comparison/Findings/Impression (include recommendations here)/BIRADS Code
- Because of technical issues residents are discouraged from dictating “linked” examinations. They cause the computers to freeze.

PAPERWORK
- We don’t have a lot of papers. The ones we do have are particularly important. “Call Back” and “Interventional Planning” forms are never discarded.
- All relevant forms are in the desk drawer vertical file in the Nagy Reading Room. It has protocols, equipment and procedural instructions. Please help us keep the files organized.
- “Call Back” forms are prepared – at the direction of the attending radiologist - for Screening Mammogram call backs (including technical), Breast MRI requiring additional imaging, Outside Interpretations (formal second opinions) and Outside Reviews (informal reviews by our satellite colleagues) requiring additional imaging.
- Do not leave papers lying around. If you have a question about what to do with a requisition or form please ask. We encourage Post-it notes – not paperclips - for communication.
- Be honest if you are uncomfortable or need help or further instruction in any aspect. We want you to learn without negative consequences to you or your patients. Finally, thanks for your help. You will be a valued member of a team and we appreciate the work you do.

Welcome!
Rebecca A. Zuurbier, M.D., Director of Breast Imaging

2ND YEAR RESIDENTS
BEFORE starting their first rotations, all second year should read the breast imaging chapter in the Lewis and McNulty Oxford Handbook and watch this movie. A specific introductory section for 2nd year residents is on the website and at the end of this document.
<table>
<thead>
<tr>
<th>Topic</th>
<th>Lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board Review mammo and mri</td>
<td>PJL</td>
</tr>
<tr>
<td>Board Review mammo and US</td>
<td>TR</td>
</tr>
<tr>
<td>Breast US</td>
<td>TR</td>
</tr>
<tr>
<td>MRI –cases</td>
<td>TR</td>
</tr>
<tr>
<td>Intro to Mammo</td>
<td>RZ</td>
</tr>
<tr>
<td>Arch Dist/ Asym</td>
<td>RZ</td>
</tr>
<tr>
<td>Mammo-Screening</td>
<td>RZ</td>
</tr>
<tr>
<td>Breast Intervention–Ubx workshop</td>
<td>PJL</td>
</tr>
<tr>
<td>Breast Intervention–MRBx</td>
<td>PJL</td>
</tr>
<tr>
<td>Breast Disease–SurgicalOnc</td>
<td>Rosenkranz</td>
</tr>
<tr>
<td>Male Breast</td>
<td>RZ</td>
</tr>
<tr>
<td>Breast Intervention–SBx</td>
<td>TR</td>
</tr>
<tr>
<td>Breast MRI – 1</td>
<td>PJL</td>
</tr>
<tr>
<td>Breast MRI – 1</td>
<td>PJL</td>
</tr>
<tr>
<td>Calcification –cases</td>
<td>RZ</td>
</tr>
<tr>
<td>Calcifications</td>
<td>RZ</td>
</tr>
<tr>
<td>Masses</td>
<td>TR</td>
</tr>
<tr>
<td>BIRADS and PBF</td>
<td>PJL</td>
</tr>
<tr>
<td>Breast Masses</td>
<td>RZ</td>
</tr>
<tr>
<td>Mammo-Diagnostic</td>
<td>RZ</td>
</tr>
<tr>
<td>Post Op Breast</td>
<td>RZ</td>
</tr>
<tr>
<td>Breast Tomosynthesis</td>
<td>TR</td>
</tr>
<tr>
<td>MQSA and image quality</td>
<td>PJL</td>
</tr>
<tr>
<td>Breast Pathology</td>
<td>Marotti</td>
</tr>
<tr>
<td>Breast Disease–Medical Oncology</td>
<td>Swartz</td>
</tr>
<tr>
<td>Case Conf</td>
<td>PJL</td>
</tr>
<tr>
<td>Case Conf</td>
<td>TR</td>
</tr>
</tbody>
</table>
EPIC SCHEDULES

Add the following rooms to your schedules on EPIC to identify patients
MHMH DB MAM ROOM 2 and ROOM 4 – screening
MHMH MAM ROOM 1, 2, 3, 7 - diagnostic

PERFORMING SCREENING MAMMOGRAPHY

The Accreditation Council for Graduate Medical Education (ACGME) Residence Review Committee (RRC) for diagnostic radiology requires three months of breast imaging. The latest RRC regulations state: “Each resident should have documentation of the interpretation/multireading of at least 240 mammograms within a six-month period within the last two years of the residency program.” This will also fulfill MQSA requirements.

Note: YOU are responsible for getting the callback sheets signed by staff and handed into Lisa. If she does not get a signed sheet, those studies will not count towards your totals.

SCREENING GOALS

<table>
<thead>
<tr>
<th>Rotation</th>
<th>Screening sessions</th>
<th>MINIMUM Screening #s</th>
<th>Callback rates relative to staff %</th>
<th>Concordance with staff CBs %</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>12</td>
<td>240</td>
<td>100-300</td>
<td>&gt;70</td>
</tr>
<tr>
<td>Two</td>
<td>12</td>
<td>280</td>
<td>100-250</td>
<td>&gt;80</td>
</tr>
<tr>
<td>Three</td>
<td>12</td>
<td>320</td>
<td>100-200</td>
<td>&gt;90</td>
</tr>
</tbody>
</table>

SCREENING PROTOCOL

- On mornings screening rotations, read on the back workstation (left hand room) using the Hologic worklist sorted by date. Read the prior afternoons and the current morning screening studies.
- Use the screening documentation forms found near the workstation.
- If the screening exams are not clearly identified as such, use EPIC (see above) to find the screening worklists from the prior/current day.
- Write down the name, first initial of all screening studies you review, as well as if you CB the patient.
- Include TECHNICAL callbacks.
- Before noon, go through both your and the staff callbacks and indicate on the screening worklist sheet. The’ breast 24 hour’ and ‘breast 48 hour’ PACS lists may be helpful.
- If you screen in the afternoon, read that day’s studies, continue the reading the next morning and go through all studies you called back with the staff. There is a folder with
the copies of the call back sheets that you can use to check if any others were called back the prior day.

- IT IS VITAL THAT YOU REVIEW ALL DISCORDANCIES. This is where the learning happens.
- Give sheets to Lisa in the business office next door as soon as complete.

---

You will be sent a screening report biweekly that looks something like below, and will update as you pass through the rotation

### Resident Mammography Screening Record

<table>
<thead>
<tr>
<th>Resident</th>
<th>Jones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates of screening</td>
<td>7/1/2013 to 7/28/2013</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rotation Screening totals</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Volume</td>
<td>50</td>
</tr>
<tr>
<td>Total Tomos</td>
<td>0</td>
</tr>
<tr>
<td>Total concordant Staff CB/Resident CB</td>
<td>4</td>
</tr>
<tr>
<td>Total concordant Staff NCB/Resident NCB</td>
<td>41</td>
</tr>
<tr>
<td>Total discordant Staff CB/Resident NCB</td>
<td>2</td>
</tr>
<tr>
<td>Total discordant Staff NCB/Resident CB</td>
<td>3</td>
</tr>
<tr>
<td>Staff CB rate</td>
<td>12%</td>
</tr>
<tr>
<td>Resident CB rate</td>
<td>14%</td>
</tr>
<tr>
<td>Resident concordance rate</td>
<td>90%</td>
</tr>
<tr>
<td>Resident discordance rate</td>
<td>10%</td>
</tr>
</tbody>
</table>
PROCEDURAL TRACKING

All residents should enter their breast procedures (observed and operator) as they rotate through mammography, this tracks their procedures between faculty and rotations. The expectations are that the relevant movies are viewed prior to you doing procedures as well as observing as below. Our MINIMUM targets for residency are as follows:

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Movies?</th>
<th># to observe</th>
<th># to perform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital NLOC</td>
<td>Yes</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>US NLOC</td>
<td>Yes</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>US core biopsy</td>
<td>Yes</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>US vacuum biopsy</td>
<td>Yes</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Stereo biopsy</td>
<td>Yes</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>MRI guided biopsy</td>
<td>Yes</td>
<td>3</td>
<td>2 (optional)</td>
</tr>
<tr>
<td>Sentinel node injections</td>
<td>No</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Cyst/abscess aspiration</td>
<td>No</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

BIOPSY MOVIES

The following movies should be watched prior to doing procedures and reviewed as necessary on subsequent rotations. These movies were made by colleagues at Beth Israel, Northwell Health and University Maryland as well as Dartmouth. The written instructions for the stereo units are also at the end of this guide.

Stereo biopsies
- Basic Stereo Instructions
- Tomo breast biopsy instructional video

Ultrasound biopsy movies:
- Positioning
- Preparation
- Basic Core Biopsy Technique
- Tips and Tricks 1
- Tips and Tricks 2
- Tips and Tricks 3
- Vacuum Needle Techniques

Needle localizations
- Digital NLOC
- US NLOC
MRI guided biopsy

General Concepts

Basic Biopsy Technique

Tips and Tricks on Preparation to MRI Biopsy

Tips and Tricks on Equipment for MRI biopsy

Tips and Tricks on Targeting During MRI guided Biopsy

BIOPSIES: PREPROCEDURAL WORKUP AND POST PROCEDURAL MANAGEMENT

Pre-procedure

If residents are going to be present on a biopsy session, it is expected that they will work up the patients the previous day. Review the imaging and clinical history as appropriate.

1. Complete the middle section of the biopsy worksheet, selecting the imaging type, approach and needle.
2. Fill in the differential diagnosis
3. Go into EDH and put in a preprocedure note for each patient (use .mammopl template). Review with the biopsying staff.

See here for biopsy techniques.

Post-procedure

You may be asked to contact the patient with results after they become available (usually within 36 hours). Result notification will be emailed to you.

1. Check with the attending if you are to contact the results, or under what situation (e.g. if only benign) at the time of the study.
2. Review results with attending before contacting patient and clarify concordance and follow up.
3. Phone patient.

These patients are very anxious and should be contacted asap.

TUMOR BOARDS

During each rotation you will do tumor board twice (wed am). There are two tumor boards, mini tumor board when we meet with the surgeons before they see new patients (combined
clinic 9am) and the full tumor board when we present selected case imaging findings (Aud F 12p).

If you are scheduled for tumor board:
1. Ask for the assigned staff to give you the patient lists on Monday
2. Review all cases and take notes including all outside imaging and scanned reports in EDH BEFORE WED
3. Go through the cases with the assigned staff on Wed am.
4. 3rd and 4th year residents should present the cases in minitumor board with staff facilitation
5. 4th year residents should present the cases at noon tumor board additionally
6. 3rd and 4th year residents should attend noon tumor board at least once in addition to the session they present as a 4th year.
Imagine the breasts are a pair of clocks looked at from the front. Use the clock face position and the distance (on CC or radially on US) from the nipple to localize lesions.

**VIEWS FOR DIAGNOSTIC MAMMOGRAPHY**

Other views are used to evaluate abnormalities or possible abnormalities seen on mammograms.

**Other angles of rotation** from 0 degrees (CC) to 90 degrees (ML or LM)

**Mediolateral (ML) and Lateromedial (LM):** lesion is best seen when closer to receptor plate, and ML versus LM is chosen accordingly

**Magnification views (Mag):** small area or whole breast. Increases fine detail but is more susceptible to motion. Obtained by increasing distance from breast to receptor plate. Use for visualizing calcifications and margins of small masses.

**Focal (cone) compression:** small paddle used to compress overlying tissue away from area of interest

**Rolled views:** the top of the breast is rolled relative to the bottom to spread out the tissues and provide localization for images only seen in one plane.

**Extended CC view (XCC):** to see axillary or far lateral tissue

**Tangential views:** put the skin or an abnormality in tangential to the xray beam to aid localization – e.g. of skin calcifications

**Cleavage views:** used for assessing medial abnormalities
STANDARD VIEWS FOR CALLBACKS

<table>
<thead>
<tr>
<th>If call back is for:</th>
<th>Obtain these views</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcifications</td>
<td>Mag CC</td>
</tr>
<tr>
<td></td>
<td>Mag TL</td>
</tr>
<tr>
<td></td>
<td>TL</td>
</tr>
<tr>
<td>Mass or lymph node</td>
<td>Mag cone compression in view best seen TL</td>
</tr>
<tr>
<td>Mass – high probability of cyst</td>
<td>US first</td>
</tr>
<tr>
<td>Architectural distortion</td>
<td>Repeat view</td>
</tr>
<tr>
<td></td>
<td>Cone Mag or cone compression TL</td>
</tr>
<tr>
<td>Superimposition (questionable lesion)</td>
<td>Repeat view</td>
</tr>
<tr>
<td></td>
<td>Cone compression in view best seen TL</td>
</tr>
</tbody>
</table>

TRIANGULATING LESIONS USING THE ML, MLO AND CC

Where lesions will move between the ML and MLO dependent on if they are medial or lateral.

- In general, lateral lesions will move DOWN on the ML relative to the MLO
- In general, medial lesions will move up on the ML relative to the MLO
- Line the nipples up with the images in the following order to project where you would expect to see a lesion on a projection
TRIANGULATING LESIONS FROM ROLLED VIEWS

Rolled views can be used to see if a lesion is superimposition or a true lesion (disappears/less apparent if former), but they can also be used to localize a lesion only seen in one view.

- Rolled views are named by the direction the top half of the breast is ‘rolled’.

If only seen in CC projection, do CC rolled views:

- A lesion in the top half of the breast will move in the same direction as the roll
- A lesion in the bottom half of the breast will move in the opposite direction to the roll
- Central lesions do not move (relative to nipple) between rolls.

So on the CC views, this is what you will see:
MANAGEMENT OF NIPPLE DISCHARGE

New and spontaneous (all colors) or bloody:
Views to obtain:
- CC, MLO
- Large mag view CC and ML (all areas of discharge)
- Retroareolar US for bloody discharge
- Refer to surgery if negative and not already referred
- Consider MRI if negative (but leave to surgery to order)

RESIDENT SELF-STUDY ASSIGNMENTS

All articles are in the zip file

-----------

WEEK 1

BEFORE starting their first rotations, all second year should read the breast imaging chapter in the Lewis and McNulty Oxford Handbook and watch this movie.
**WEEK 2**

**Book/Chapters**
- Chapters 4, 5 of Cardenosa

**PACS teaching files**
Start on the divisional Mammo basics PACS file (in development)

**WEEK 3**

**Online resources**
ACR Appropriateness Criteria for Breast Imaging: Screening, Palpable masses,

**PACS teaching files**
Continue going through the divisional Mammo basics PACS file (in development)

**WEEK 4**

**Book/Chapters**
- Chapters 9, 10, 11, 12, 13, 14 of Cardenosa

**Articles**

**Online resources**
AIRP Breast syllabus: Interpretation of breast MRI
**PACS teaching files**
Continue going through the divisional Mammo basics PACS file (in development)

---

**ROTATION 2**

**Book/Chapters**
- Chapters 18 of Cardenosa
- Chapters 3,4,5,6,10,12,13,14,15 of Stavros Breast Ultrasound
- Chapters 2, 4, 8 of Liberman Breast MRI

**Articles**

**Online resources**
1. AIRP Breast syllabus: Unusual breast cancers, breast disease in men and young women, Classic Breast Lesions, Pathologic Basis of Breast imaging
2. ACR Appropriateness Criteria for Breast Imaging : Non palpable mammographic findings, Micro Calcifications

---

**PACS teaching files**
General mammo and breast MRI PACS teaching files

---

**ROTATION 3**

**Book/Chapters**
• Chapters 2, 3, 19 of Cardenosa
• Chapters 8, 19, 21 of Stavros Breast Ultrasound (in dept)
• Chapters 9-15, 19,20 and the atlas section of Liberman Breast MRI (in dept)

Articles

Online resources
ACR Appropriateness Criteria for Breast Imaging: Stage 1 breast cancer

PACS teaching files
General mammography and breast MRI PACS teaching files

__________________________
BREAST BIOPSY-PATH CONFERENCED - RESIDENT INSTRUCTIONS
This conference takes place at 7am on the first Thursday of the month on 4th floor Borwell – your badge is needed for entry, go through doors, turn left, you will see the multiheaded scope on left past anatomic pathology.

GOALS

1. To increase your exposure to both benign and particularly malignant breast imaging by reviewing the key biopsy cases from the previous month
2. To provide radiological-pathological correlation in a clinical and teaching arena
3. To facilitate rapid image review for rad-path correlation

CASES TO BE PUT ON THE CONFERENCE LIST

Time constraints limit how many biopsies that can be reviewed during this conference, so these are identified on the biopsy record sheet, or occasionally after the results become available. Typically studies that are NOT reviewed are:

- Classic cancers (e.g. obvious spiculated masses)
- Fibroadenomas unless atypical
- Calcifications where sampling is good
- Cysts

Any study where there is a question of rad-path correlation MUST be reviewed, at this point we are also reviewing all MRI guided biopsies

REVIEWING STUDIES FOR STEREO/US PATH CONFERENCE

- The list of cases for the conference is usually circulated at the beginning of the week by Brit Kvinlaug or one of the other administrative assistants.
- If 2 residents are on the service, you can divide the studies between you, however the teaching element will be enhanced if you both review all studies prior to the conference
- The cases that will be reviewed at the conference will be identified on the document circulated (in white), your learning will be markedly enhanced however by reviewing all biopsies.
- For each case that will be seen at conference, you should review the studies on the PACS workstation and identify the images of interest as recommended below.
  - Identifying the key images is a central learning point
  - Look up key information in CIS - find out the patient’s story and the images most relevant to it (e.g. subtle finding on screening mammogram)
  - Have the list of patients ready in a public folder under Breast (date) in Imagecast for viewing in pathology
  - Go through the study, correlating with the pathology and identify which images are the key ones to be shown at conference (annotate)
  - We recommend keeping a list, write down the key studies (e.g. "LCC and LCC mag from 1/20, specimen from 1/28" and any clinical details)
At conference be prepared to call up these images for viewing and others if we request them

If you have any questions, after you have reviewed the cases, please ask one of us (preferably the one who did the biopsy)

---

**KEY IMAGES**

- These are the films that you should have reviewed (as a minimum) and have ready to show
  - For stereos of microcalcifications:
    - Regular view mammo that shows the calcs best
    - Mag view
    - Comparison only if important
    - Specimen film stereo bxs
  - For stereos of masses and asymmetric densities
    - Regular view mammo that shows mass best
    - Compression view
    - Comparison if important (e.g. lesion showed slow growth with time)
    - Specimen film if taken
  - For ultrasound guided biopsies of masses
    - Regular view mammo
    - Compression view if present
    - Ultrasound of mass (pre biopsy)
    - Specimen film if taken

For abnormalities much better or only visualized on DBT, please download AVI from Hologic workstation and capture in thumb drive to upload during conference.

1. For MRI guided biopsies
   - Identify the key sequence (usually G+ or subtraction) and image(s) on the breast MRI
   - Original G+ and subtraction images that provoked the biopsy
   - Biopsy images (usually axial) of G+ pre and post needle placement, biopsy cavity
   - Make sure you know what was the index lesion and reason for performing the study.
   - Keep a list, write down the key studies (e.g. "series 7, images 24 and 65")
   - At conference be prepared to call up these images for viewing and others if we request them
See also the Hologic stereo manual HERE

1. Review images to determine approach (CC, from below, Medial, lateral); considerations: depth from skin, breast thickness (?<3cm or deep lesions may need standoff pad), relationship to areola, visibility, configuration, multiple lesions (check correct lesion) and confirm modality, approach and needle type with breast interventional staff.

2. Select needle—regular 9G (2cm chamber), versus petit 9G (1cm chamber) for breasts under 3cm thick.

3. Check prebiopsy film w/ BB over area of interest (if obtained)

4. Consent and place green circle on breast (anticipating location of lesion and approach)

5. Tech will set room up. Has biopsy chamber been tested?

6. Tech will position patient w/ BB marker in field of view and they will obtain scout film (directly down FOV) and a stereotactic pair (30 degrees apart).

7. Compare scout film and stereo pair to pre-procedure films to ensure accuracy of target. This is especially critical if multiple lesions (e.g. groups of calcs) are present.

8. **Ensure reference markers are correct, i.e. crosses are in holes at top of stereo pair images – if not, click incorrect and go through process (i.e.click in the holes, left then right) to confirm correct reference plate.**

9. Click on target in both pair windows to obtain coordinates; in general it is best to aim for the bottom (nipple side) of smaller lesions to maintain visibility of needle to target on pre and post biopsy imaging pairs.

10. Double check stroke margin (compression - Z must equal >7mm for the regular needle, and >2mm for the petit). If <7mm may need standoff pad or different approach
11. Send coordinates and have tech read off machine to confirm

12. **PERFORM TIME OUT**

13. Prep breast with chlorhexadine

14. Tech will place needle on needle holder

15. Set Z=0. Hold together motor enable and Z position until needle moves up to top and machine beeps. Dial needle forward until the tip just crosses plane of the reference plate (i.e. is immediately in front of the small vertical metal bar when viewed in profile through the gap in the compression paddle.

16. Retract needle back approx 1cm to avoid scratching breast when moving to target.

17. Move needle to X & Y coordinates Hold together motor enable and go to target until needle moves up to top and machine beeps

18. Advance needle close to skin surface

19. Intradermal bleb using **1% plain** lidocaine and deep anesthesia (with lido w/o and then w/ epi) to estimated Z depth(<3cc)

20. Skin incision with scalpel deep enough get to the green plastic on scalpel
21. Blunt dissection w/ mosquito clamp (deeper tissues not skin)
22. Advance needle through insertion site to Z depth using rear dial (Z-differential=0);
23. If machine beeps as stroke margin is small, reassure patient (but must have stroke margin >0.5mm prior to firing)
24. Obtain stereo pair
25. Check needle tip position relative to target

![Figure 25: Pre-Fire Needle Placement](image)

26. Adjust as necessary using x,y,z dials; reimage if necessary. See [common positioning errors](#).
27. Additional deep anesthesia w/ lido + epi (approx 5cc) running needle along hub at 4 quadrants
28. Dial needle back to -5mm z depth for regular needle and -1mm for petite needle.
29. Lock needle travel and push needle guide to skin
30. Warn patient about upcoming popping noise
31. Deploy needle with plunger
32. Obtain stereo pair
33. Check target relative to chamber; adjust as necessary (ideal position is target immediately above chamber). Be aware of foreshortening effect.

34. Deep anesthetic w/ lido + epi through back of chamber using adapter. Inject 2cc to fill dead space then inject another 4-6cc while needle turns 360 degrees.

35. Warn patient of biopsy noise then put foot on pedal. Each time the machine beeps turn needle (12, 2, 4, 6, 8, 10 O’clock positions).

36. Obtain 6 core biopsies.

37. Select lavage on the Atec machine (or ask tech to). Rotate needle until clear fluid and all biopsies in chamber.

38. Select biopsy on Atec machine.

39. Remove specimen container and lay out specimens on wet filter paper.

40. X-ray specimen to document presence/absence of calcs.

41. If biopsies inadequate, retract needle several mm but keep in skin.

42. Redo stereo pair and retarget.

43. Dial to X and Y targets manually then reinsert to new Z-5mm and rebiopsy.

44. If biopsy satisfactory then remove needle (clips off at back), leave sheath in.

45. Insert clip and deploy, image to confirm.

46. Remove sheath by dialing back on Z. Hold compression and remove patient from hole.

47. Clean skin with peroxide, apply 3x stereo strips after benzoin.
48. Give patient instructions – no showers for 24 hrs. No tub baths, hot tubs or swimming for 5 days. No lifting > 10 lbs, exercise that involves jumping up and down or contracting pectorals for 3 days. Remove steristrips after a week.

49. Patient will then go to mammo for a check clip film.

50. Review clip position with original prebiopsy films.

51. Confirm if biopsy needs to be reviewed with in path conference. Time constraints limit how many biopsies that can be reviewed during this conference, so these are identified on the biopsy record sheet, or occasionally after the results become available.

Typically studies that are NOT reviewed are:
- Classic cancers (e.g. obvious spiculated masses)
- Fibroadenomas unless atypical
- Calcifications where sampling is good
- Cysts

Any study where there is a question of rad-path correlation MUST be reviewed, at this point we are also reviewing all MRI guided biopsies.

52. Complete the back side of the biopsy sheet and get staff to review and sign.

---

COMMON NEEDLE POSITIONING ERRORS

---

**X EROOF**
Y ERROR

*Figure 82: +Y Pre-Fire Needle Placement Error*

Needle tip is lower than the center of ROI on both (-) and (+) 15° stereo images. 
*Look for symmetry.*

*Figure 83: -Y Pre-Fire Needle Placement Error*

Needle tip is higher than the center of ROI on both (-) and (+) 15° stereo images.
Z ERROR

Figure 84: +Z Pre-Fire Needle Placement Error

Needle tip is beyond the center of ROI on both (-) and (+) 15° stereo images. Look for symmetry.

Figure 85: -Z Pre-Fire Needle Placement Error

Needle tip is short of the center of ROI on both (-) and (+) 15° stereo images. Look for symmetry.

COMBINED X AND Z ERROR

Figure 86: +X and -Z Pre-Fire Needle Placement Error

Needle tip is to the right of center on the +15 image and short of center on the -15 image. Look for asymmetry first, which is X.

Figure 87: -X and +Z Pre-Fire Needle Placement Error

Needle tip is to the left of center on the -15 image and beyond the center on the +15 image. Look for asymmetry first, which is X.
STEREOTACTIC BIOPSY INSTRUCTIONS (TOMO UNIT)

See also the Hologic Affirm manual

1. Identical to prone unit. Review images to determine approach (CC, from below, Medial, lateral); considerations: depth from skin, breast thickness (?<3cm or deep lesions may need standoff pad), relationship to areola, visibility, configuration, multiple lesions (check correct lesion) and confirm modality, approach and needle type with breast interventional staff.

2. Select needle – regular 9G (2cm chamber), versus petit 9G (1cm chamber) for breasts under 3cm thick.

3. Check prebiopsy tomographic images to determine morphology and orientation of calcifications (if obtained)

4. Consent and place green circle on breast (anticipating location of lesion and approach)

5. Tech will set room up. Has biopsy chamber been tested?

6. **PERFORM TIME OUT**

7. Tech will position patient and they will obtain scout tomographic image.
8. Compare scout film to pre-procedure films to ensure accuracy of target. This is especially critical if multiple lesions (e.g. groups of calcs) are present.

9. You will see the home screen above for the selected patient on the touchscreen input.

10. The tech will have already added the appropriate imaging pair and the Biopsy tab will be selected on the tomo unit touchscreen display.

11. Check to see the appropriate needle has been selected under the Device category.

12. The grayed out target with the check adjacent to the Device header will illuminate allowing for you to click the biopsy location on the tomographic image.
13. The target location (10) will correspond to the area identified on the tomo image in a X, Y, Z plane. Tap the illuminated target checkbox (1) to transmit the target coordinate to the biopsy module unit.

14. The Target Guidance Screen as shown below will be displayed on the Biopsy Control Module. The tech will read the desired target from the touchscreen display and you will need to compare it with the BCM screen.

15. Prep breast with chlorhexadine

16. Tech will place needle on needle holder
17. Retract needle back approx 1cm to avoid scratching breast when moving to target.

18. Press needle to target buttons (squeeze top corner of LCD unit back and front). This will move needle to X coordinate target. Both the Y and Z coordinates will not be at target at this point.

19. Advance needle close to skin surface

20. Intradermal bleb using 1% plain lidocaine and deep anesthesia (with lido w/o and then w/ epi) to estimated Z depth(<3cc)

21. Skin incision with scalpel deep enough get to the green plastic on scalpel

22. Blunt dissection w/ mosquito clamp (deeper tissues not skin)

23. Advance needle through insertion site to Y and Z target locations by advancing needle using the rear dial. The X,Y and Z will now be green. Note, a positive co’ordinate in the Z direction means not far enough advanced (in contrast to the prone unit where it means too far advanced).

24. Additional deep anesthesia w/ lido + epi (approx 5cc) running needle along hub at 4 quadrants

25. Push needle guide to skin

26. Deploy the needle after warning patient of ‘pop’ (count to 3 and deploy on 2.5)

27. Deep anesthetic w/ lido + epi through back of chamber using adapter. Inject 2cc to fill dead space then inject another 4-6cc while needle turns 360 degrees

28. Warn patient of biopsy noise then put foot on pedal. Each time the machine beeps turn needle (12,2,4,6,8,10 O’clock postions)

29. Obtain 6 core biopsies

30. Select lavage on the Atec machine (or ask tech to). Rotate needle until clear fluid and all biopsies in chamber. Undo gold flush connection to vac dry.

31. Select biopsy on Atec machine

32. Remove specimen container and lay out specimens on wet filter paper.

33. X-ray specimen to document presence/absence of calcs if calcs.

34. If no calcs, or biopsying for architectural distortion or mass, remove needle (clips off back), leave sheath in.

35. Redo tomographic image and re-check co’ordinates of biopsy cavity to check adequacy. Retarget and send if necessary for more biopsies (go to new target, repeat biopsies).

36. If biopsy satisfactory then remove needle (clips off at back), leave sheath in.

37. Insert clip and deploy, tomo image to confirm

38. Remove sheath by dialing back on Y and Z. Hold compression.

39. Clean skin with peroxide, apply 3 x stereo strips after benzoin.
40. Give patient instructions – no showers for 24 hrs. No tub baths, hot tubs or swimming for 5 days. No lifting > 10 lbs, exercise that involves jumping up and down or contracting pectorals for 3 days. Remove steristrips after a week.

41. Patient will then go to mammo for a check clip film.

42. Review clip position with original prebiopsy films.

43. Confirm if biopsy needs to be reviewed with in path conference. Time constraints limit how many biopsies that can be reviewed during this conference, so these are identified on the biopsy record sheet, or occasionally after the results become available.

Typically studies that are NOT reviewed are:
   ○ Classic cancers (e.g. obvious spiculated masses)
   ○ Fibroadenomas unless atypical
   ○ Calcifications where sampling is good
   ○ Cysts

Any study where there is a question of rad-path correlation MUST be reviewed, at this point we are also reviewing all MRI guided biopsies

44. Complete the back side of the biopsy sheet and get staff to review and sign.
Adapted from:  
*American College of Radiology/Society of Breast Imaging Curriculum for Resident and Fellow Education in Breast Imaging* (Sickles et al)

The goal of residency training in breast imaging is for residents to be fully prepared to become the interpreting physician in any breast imaging facility, without the need for additional training.

Residency training must involve a minimum of 12 full-time-equivalent weeks of clinical training in breast imaging during the entire 4-year residency. The initial month of breast imaging training is in the second year of residency. The last month of breast imaging training is given in the last 6 months of residency, to meet the MQSA initial-experience requirement for the direct supervision of at least 240 mammography interpretations within 6 months of beginning independent interpretation of mammography examinations.

By means of lectures, conferences, textbooks, syllabi, journal reprints, videotapes, teaching files, and other teaching materials, a resident will become familiar with and understand the following topics in breast disease:

### 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, atypical lobular hyperplasia, lobular carcinoma in situ, and other histologic risk factors
  - Ductal carcinoma in situ, including its histologic subtypes
  - Invasive ductal carcinoma not otherwise specified; 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, leukemia, 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

• Screen-film, full-field digital mammography and digital breast tomosynthesis
• Features of dedicated mammographic units, including target, filtration, automatic exposure control, and grids
• Factors affecting optical density, contrast, sharpness, and noise
• Selection of technique factors, including effects of milliampere-seconds, kilovolt peak, target and filter material choice, and density settings on image quality and radiation dose
• Rationale for breast compression
• Clinical image assessment for proper breast positioning, compression, exposure, contrast, sharpness, and noise
• Screen-film mammography
  o Characteristics of mammographic screen-film systems
  o Film processing
  o Effect of screen-film speed, optical density, and film processing on radiation dose
  o High-intensity view boxes, view box masking
• Full-field digital mammography
  o Characteristics of full-field digital mammographic systems, including advantages and limitations
  o Effects of post-processing on the digital mammographic image
  o Effect of signal-to-noise ratio on radiation dose
  o Dedicated high-luminance, high-resolution viewing monitors
  o ACR Practice Guideline for the Performance of Whole Breast Digital Mammography [3]

MAMMOGRAPHY QUALITY ASSURANCE

• Digital Breast Tomosynthesis
  o Characteristics of DBT systems, including advantages and limitations
  o Advantages and disadvantages of different DBT systems
  o Awareness of sweep angle, source exposures, reconstruction algorithms of different DBT platforms.
  o Radiation dose considerations specific to DBT.
• Familiarity with content in the ACR Mammography Quality Control Manual [4]
• 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 DBT
• Regulation
  o Equipment, quality control, and personnel (radiologist, technologist, physicist) requirements for ACR accreditation and MQSA certification
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 [5, 6, 7]
  - Auditing requirements for MQSA certification

MAMMOGRAPHIC INTERPRETATION

- Optimal viewing conditions, including a 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 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 vs 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-positive results
- Cost-effectiveness
- Controversies regarding
  - Screening of any age range
  - Screening women aged 40 to 49 years;
  - Screening women aged >70 years
  - Periodicity (frequency) of screening: yearly vs. biennial
  - Screening guidelines of the ACR, the American Cancer Society, the National Cancer Institute, the US Preventive Services Task Force, and others
- Logistics and throughput issues in the performance and interpretation of screening mammography examinations
Diagnostic (Problem-Solving) Mammography

- Techniques and indications for and value of supplementary mammographic views
- Demonstrate proficiency in
  - Performing the workup of lesions seen on only 1 standard (mediolateral oblique or craniocaudal) 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 known-malignant lesions

Breast Ultrasound

- Equipment and physical principles
- Techniques
- Indications
- Demonstrate proficiency in
  - Scanning the breast, including breast positioning, image depth and gray scale.
  - 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 and including Automated Whole Breast US (ABUS)
- ACR Practice Guideline for the Performance of a Breast Ultrasound Examination [3]
- ACR Breast Ultrasound Accreditation Program

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 [3]

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®, MQSA regulatory requirements)
  - Management recommendations
  - Concordance between lesion descriptors and assessment categories
  - Concordance between assessment categories and management recommendation
- MQSA regulatory requirements for reporting mammography results to referring clinician and patient
- 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, if available)
  - Stereotactically guided core biopsy (also fine-needle aspiration, if available)
  - Ultrasound-guided cyst aspiration
  - Second-look 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
- Assessment of imaging-pathologic concordance
- Postprocedure follow-up imaging
• ACR Practice Guideline for the Performance of Stereotactically Guided Breast Interventional Procedures [3]
• 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 posttreatment follow-up
• ACR Practice Guideline for the Management of Ductal Carcinoma In-Situ of the Breast [3]
• ACR Practice Guideline for Breast Conservation Therapy in the Management of Invasive Breast Carcinoma [3]
• ACR Appropriateness Criteria™ for breast microcalcifications, nonpalpable breast masses, palpable breast masses, stage I breast carcinoma [8]

ECONOMICS OF BREAST IMAGING PRACTICE

• Basic understanding of coding and billing
• Revenue positive, revenue neutral, and revenue negative breast imaging examinations
• Strategies to improve the profitability of a breast imaging practice

OTHER RECOMMENDATIONS

• Minimum of 12 full-time-equivalent weeks of clinical training in breast imaging during 4-year residency; it is recommended that the initial month of breast imaging training be given in the first or second year of residency, to expose residents to the practice of breast imaging before they are expected to make subspecialty career choices
• Active participation in screening and diagnostic mammography interpretation
• Hands-on performance of breast ultrasound examinations
• Hands-on performance of all interventional breast imaging procedures, especially needle-wire localization and ultrasound-guided core biopsy
• Active participation in breast MRI interpretation
• Formal teaching conferences (lectures, case presentations)
• Imaging-pathologic correlation conferences; also multidisciplinary breast cancer case conferences, if practical
• Direct observation or videotape of mammographic positioning for routine and supplementary views
• Review of teaching file materials (film or digital images), especially using computer-based interactive formats
• Breast imaging textbooks available in department or breast imaging section library
• Reprint file or reference library including breast imaging materials
• Log of numbers of mammograms and sonograms interpreted and of procedures performed by each resident

GOALS AND OBJECTIVES ROTATION 1

All mornings start at 7:30am. On Monday of each week review planned schedule (screening/biopsy/diagnostic sessions) with staff according to the rotation goals and your anticipated time off service. Update staff on a daily basis with plan. Monday-Thurs mornings are biopsy sessions. Wed morning is a joint clinic-MRI/biopsy session (2 staff). Afternoons are diagnostic. Staff interpret screenings in 5L all mornings.

MEDICAL KNOWLEDGE

• Learn/review physics specific to mammography.
• Develop understanding of basic benign and malignant breast pathology.

Technical aspects

• Learn technical aspects of mammography exam acquisition from mammography technologists, including screening, diagnostic, and stereotactic positioning.
• Spend 1 hour on morning 1 with technologist in screening area
• Spend the afternoon of day 1 with technologist in diagnostic area
• Supplement positioning training with video resources.

Screening goals: See screening protocol.

Diagnostic goals: 12 sessions (including one with clinic rad)

• Learn specific work-up evaluations for each abnormal finding.
• Perform diagnostic evaluations with supervision.
• Learn set-up and basic technique of breast US.
• Perform breast ultrasonography with supervision initially, then independently.
• Attend Breast Tumor Board on day that shadow clinic rad.

ASSESSMENT

• Global ratings by faculty
• Screening log and callback assessment
• ACR In-service examination
• Learning Portfolio
PATIENT CARE

- Learn screening guideline recommendations of the American Cancer Society and ACR
- Communicate effectively and demonstrate caring and respectful behaviors when interacting with patients and their families
- Gather essential and accurate medical and radiologic history pertinent to the procedure for which the patient is scheduled or for the examination that the patient has had
- Work with health care professionals, including those from other disciplines to provide patient focused care
- Keep breast procedure logs and competency check lists
- Learn basic clinical management of DCIS, Stage I/II Invasive Breast Cancer.

Biopsy goals: 8 sessions

- The day before biopsies mornings that you will be attending:
  - Review all cases—imagecast, EDH.
  - Consider modality, approach, needle type, risks, challenges
  - Discuss any questions with staff who will be performing the biopsy
- Observe breast interventional procedures (wire locs, SN injection, core biopsy).
- Learn and perform mammographically guided wire localizations.
- Learn to perform straightforward stereotactic biopsies
- Develop skills in simple US guided procedures such as injected local anesthetic and cyst aspirations

ASSESSMENT

- Global ratings by faculty
- Document the number of readings and procedures in your department portfolio

PRACTICE BASED LEARNING AND IMPROVEMENT

See Rotation 1 self study assignments

- Prepare cases for Pathology-Core Conf. (first Thursday of the month) during 1 or 2 sessions on the days preceding the conference and attend. See instructions
- Use information technology to manage information, access on-line medical information and teaching files, and support own education
- Utilize the available texts and journals to build knowledge base
- Review journal articles dedicated to breast imaging
- Maintain a log of interesting and unknown cases, and obtain follow-up clinical and imaging information and pathologic diagnoses
- Start to learn about Quality Assurance/Medical Outcomes as it particularly relates to breast imaging
- Attend conferences, including all staff to resident lectures, path-core conf (1 per month), Breast tumor board ≥ 1 per month.
- Participate in Journal Club related to breast imaging

**ASSESSMENT**

- Global ratings by faculty
- Conference attendance and participation
- Learning Portfolio

**PROFESSIONALISM**

- Demonstrate respect, compassion and integrity
- Maintain appropriate professional demeanor (including grooming and dress) and bearing
- Demonstrate a commitment to excellence and on-going educational and professional development
- Demonstrate a commitment to ethical principles pertaining to provision or withholding of clinical care, confidentiality of patient information
- Demonstrate sensitivity and responsiveness to patients' culture, age, gender and disabilities
- Be conscious of being a role model for fellow residents and medical students
  - Arrive on time at beginning of work day and display a professional work ethic
  - Understand the ethical issues as related to breast imaging including patient confidentiality in giving results of study, informed consent, HIPPA regulations
  - Demonstrate professional values and ethical behavior including professional integrity, honesty, empathy and compassion

**ASSESSMENT**

- Global ratings by faculty
- ACR In Service Exam
- Medical Student Evaluations

**INTERPERSONAL AND COMMUNICATION SKILLS**

- Directly observe attending communication of significant results to patient
- Learn to communicate normal results directly to patient
- Obtain informed consent after explaining risks, benefits, and alternative procedures to patient
- Learn quality mammography reporting
- Start to learn the ACR practice guidelines for communication.
- Provide direct communication of significant or unexpected findings to the referring physician
• Demonstrate ability to communicate effectively and professionally with other health care professionals, including nurses, technical and non-technical staff

**ASSESSMENT**

• Global ratings by faculty
• Medical Student Evaluation
• ACR In-Service Exam

---

**SYSTEM BASED PRACTICE**

• Understand how their professional practice affects other health care professionals, the health care organization and the larger society, and understand how these elements affect their own practice.
• Be prepared to evaluate the request for imaging as regards cost, effectiveness, and appropriateness, and to facilitate performance of an alternative study if indicated
• Begin to become familiar with the ACR Appropriateness Criteria
• Begin to understand screening costs and how it relates to national health care goals

**ASSESSMENT**

• Global ratings by faculty
• ACR In-service Exam
GOALS AND OBJECTIVES ROTATION 2

All mornings start at 7:30am. On Monday of each week review planned schedule (screening/biopsy/diagnostic sessions) with staff according to the rotation goals and your anticipated time off service. Update staff on a daily basis with plan.

Monday-Thurs mornings are biopsy sessions.
Wed morning is a joint clinic-MRI/biopsy session (2 staff).
Afternoons are diagnostic.
Staff interpret screenings in 5L all mornings

MEDICAL KNOWLEDGE

- Review physics specific to mammography (FS, FFDM and DBT).
- Learn MQSA regulations: routine QA, interpretive audit, etc.

Screening goals: See screening protocol.

Diagnostic goals: 12 sessions (including two with clinic rad)

- Review specific work-up evaluations for clinical and abnormal mammographic findings.
- Perform diagnostic evaluations with supervision initially, becoming independent by last week.
- Perform breast ultrasonography with supervision initially (week 1), then independently.
- Develop detailed understanding of benign and malignant breast pathology including less common entities.
- Attend Breast Tumor Board on at least one day that shadow clinic rad.

ASSESSMENT

- Global ratings by faculty
- ACR In-service examination
- Learning Portfolio
- Screening log and callback assessment

PATIENT CARE

- Communicate effectively and demonstrate caring and respectful behaviors when interacting with patients and their families
- Gather essential and accurate medical and imaging history pertinent to the procedure for which the patient is scheduled or for the examination that the patient has had
- Learn to optimize the study, including radiation exposure for patient safety
- Work with healthcare professionals to provide patient focused care
• Review with attending requests for diagnostic mammography studies
• Understand risk/benefit criteria for screening and diagnostic mammography and how this will vary depending on clinical circumstances
• Demonstrate competency in obtaining informed consent prior to interventional procedure.
• Keep breast procedure logs and competency checklists

**Biopsy goals:** 10 sessions

• The day before biopsies mornings that you will be attending:
  - Review all cases – imagecast, EDH (and insert pre-procedure note in EDH for staff to cosign).
  - Consider modality, approach, needle type, risks, challenges and complete procedure sheet
  - Discuss any questions with staff who will be performing the biopsy and confirm modality/approach/needle on procedure sheet with staff

• Perform breast interventional procedures
  - Wire locs with supervision (first week) then independently
  - Stereo Bx. with supervision (first week)
  - US spring loaded Bx with supervision (first 2 weeks) then independently for simple cases
  - US vacuum assist Bx with supervision.

**ASSESSMENT**

• Global ratings by faculty
• Learning Portfolio
• Procedure competency check lists

---

**PRACTICE BASED LEARNING AND IMPROVEMENT**

See [Rotation 2 self study assignments](#)

• Prepare cases for Pathology-Core Conf. (first Thursday of the month) during 1 or 2 sessions on the days preceding the conference and attend. See [instructions](#)
• Use information technology to manage information, access on-line medical information and teaching files, and support own education
• Utilize the available texts and journals to build knowledge base
• Review journal articles dedicated to breast imaging
• Maintain a log of interesting and unknown cases, and obtain follow-up clinical and imaging information and pathologic diagnoses
• Start to learn about Quality Assurance/ Medical Outcomes as it particularly relates to breast imaging
- Attend conferences, including all staff to resident lectures, path-core conf (1 per month), Breast tumor board ≥ 1 per month (attending one and presenting second)
- Participate in Journal Club related to breast imaging
- Apply knowledge of study designs and statistical methods to the appraisal of clinical studies and other information on the diagnostic effectiveness of breast imaging and its role in the clinical care of the patient
- Use information technology to manage information, access on-line medical information; and support their own education
- Facilitate the learning of students and other health care professionals.
- Demonstrate knowledge and use of medical informatics in patient care and education
- Start learning about Quality Assurance/ Medical Outcomes as it relates to breast imaging
- Attend conferences
  - Participate in Journal Club

**ASSESSMENT**

- Faculty evaluation
- Medical Student evaluation
- ACR In-Service Exam
- Procedure Log
- Learning Portfolio

**PROFESSIONALISM**

- Demonstrate respect, compassion and integrity
- Maintain an appropriate professional demeanor, including grooming and dress habits, and bearing
- Demonstrate a commitment to excellence and on-going educational and professional development
- Demonstrate a commitment to ethical principles pertaining to provision or withholding of clinical care, confidentiality of patient information, informed consent, documentation and business practices
- Demonstrate sensitivity and responsiveness to patients’ culture, age, gender and disabilities
- Demonstrate a professional work ethic with on time arrival and prioritization of patient needs and concerns

**ASSESSMENT**

- Faculty Evaluation
- Medical Student Evaluation
- Learning Portfolio
INTERPERSONAL AND COMMUNICATION SKILLS

- Work professionally and effectively with other health care professionals, including technologists, secretaries, schedulers, speech pathologists, nurses, students, residents and physicians
- Interact effectively and sensitively with patients, and with family members of patients, by greeting them appropriately, introducing yourself and your role, explaining the procedure to be performed, allowing them an opportunity to ask questions, obtaining informed consent when indicated, and discussing results as indicated
- Produce a concise but thorough dictated report
- Communicate the need for a biopsy or an abnormal finding under direct supervision
- Communicate findings effectively with the referring clinicians
- Communicate and document the communication of critical findings with the appropriate medical personnel in a timely fashion

ASSESSMENT

- Global ratings by faculty
- ACR In-service examination
- Dictation evaluation
- Learning Portfolio

SYSTEM BASED PRACTICE

- Understand how their professional practice affects other health care professionals, the health care organization and the larger society
- Learn how these elements affect their own practice
- Assist referring clinicians in providing cost effective healthcare
- Practice cost effective health care and resource allocation that does not compromise quality of care
- Be prepared to evaluate the request for imaging as regards cost, effectiveness, and appropriateness, and to facilitate performance of an alternative study if indicated
- Demonstrate knowledge of the ACR Appropriateness Criteria

ASSESSMENT

- Global ratings by faculty
- ACR In-service examination
- Evidence of accomplishments in the learning portfolio

GOALS AND OBJECTIVES ROTATION 3
All mornings start at 7:30am. On Monday of each week review planned schedule (screening/biopsy/diagnostic sessions) with staff according to the rotation goals and your anticipated time off service. Update staff on a daily basis with plan. Monday-Thurs mornings are biopsy sessions. Wed morning is a joint clinic-MRI/biopsy session (2 staff). Afternoons are diagnostic. Staff interpret screenings in 5L all mornings.

MEDICAL KNOWLEDGE

- Review physics specific to mammography.

Screening goals: See screening protocol.

Diagnostic goals: 14 sessions (including two with clinic rad)

- Review specific work-up evaluations for clinical and abnormal mammo findings.
- Perform diagnostic evaluations with Supervision initially week 1, independently weeks 2-4.
- Perform breast ultrasonography with supervision initially (first days of week 1), then independently.
- Review breast MR cases.
- Develop detailed understanding of benign and malignant breast pathology including less common entities.
- Review MQSA regulations: routine QA, interpretive audit, etc.
- By the end of this rotation we expect that you will be able to "run" a breast imaging center.

ASSESSMENT

- Global ratings by faculty
- Screening log and callback assessment
- Boards review sessions
- ACR In-service examination
- ABR Written exam
- Learning Portfolio

PATIENT CARE

- Communicate effectively and demonstrate caring and respectful behaviors when interacting with patients and their families
- Gather essential, accurate and pertinent medical and radiologic history
• Perform tailored exams and procedures
• Work with health care professionals, including those from other disciplines to provide patient focused care

**Biopsy goals:** 12 sessions

• The day before biopsies mornings that you will be attending:
  - Review all cases – imagecast, EDH (and insert pre-procedure note in EDH for staff to cosign).
  - Consider modality, approach, needle type, risks, challenges
  - Discuss any questions with staff who will be performing the biopsy
• Review and perform breast interventional procedures
  - Wire locs with supervision (first days) then independently
  - Stereo Bx. with supervision (first days) then independently
  - US spring loaded Bx and SN injections with supervision (week 1) then independently
  - US vacuum assist Bx with supervision.
  - MRI guided Bx with supervision for any resident considering sub-specialty training in Breast.

**ASSESSMENT**

• Global ratings by faculty
• ACR In-service examination
• ABR Written exam
• Learning portfolio
• Procedure competency log

**PRACTICE BASED LEARNING AND IMPROVEMENT**

See Rotation 3 self study assignments
• Prepare and present cases for Pathology-Core Conf. (first Thursday of the month) during 1 or 2 sessions on the days preceding the conference and attend. See instructions
• Understand risk/benefit criteria for screening and diagnostic mammography and how this will vary
• Apply knowledge of study designs and statistical methods to the appraisal of clinical studies and other information on the diagnostic effectiveness breast imaging
• Use information technology to manage information, access on-line medical information; and support their own education
• Facilitate the learning of students and other health care professionals.
• Maintain a personal procedure log
• Demonstrate knowledge and use of medical informatics in patient care and education
• Attend all staff to resident conferences, attend (x1) and present path-core conf (x3 per month), present Breast tumor board 2 per month

ASSESSMENT

• Global ratings by faculty
• 360 degree evaluation
• ACR In-service examination
• ABR Written exam
• Medical Student evaluations
• Evidence of accomplishments in the learning portfolio

PROFESSIONALISM

• Demonstrate respect, compassion and integrity
• Maintain an appropriate professional demeanor, including grooming and dress habits, and bearing
• Demonstrate a commitment to excellence and on-going educational and professional development
• Demonstrate a commitment to ethical principles pertaining to provision or withholding of clinical care, confidentiality of patient information, and business practices
• Demonstrate sensitivity and responsiveness to patients’ culture, age, gender and disabilities

ASSESSMENT

• Global ratings by faculty
• ACR In-service examination
• ABR Written exam
• Evidence of accomplishments in the learning portfolio

INTERPERSONAL AND COMMUNICATION SKILLS

• Work professionally and effectively with all other health care professionals
• Interact effectively and sensitively with patients, and with family members of patients, by greeting them appropriately, introducing yourself and your role, explaining the procedure to be performed, allowing them an opportunity to ask questions, obtaining informed consent when indicated, and discussing results as indicated
• Communicate the need for a biopsy or other abnormal results to patients with indirect supervision
• Produce an accurate, concise dictated report
- Communicate findings effectively with the referring clinicians
- Communicate and document the communication of critical findings with the appropriate medical personnel in a timely fashion

**ASSESSMENT**

- Global ratings by faculty
- ACR In-service examination
- ABR Written exam
- Mock Boards
- Evidence of accomplishments in the learning portfolio

---

**SYSTEM BASED PRACTICE**

- Review (week 1) / Present (weeks 2-4) cases for Breast Tumor Board (Wednesdays 12-1).
- Review MQSA regulations, and understand routine QA, interpretive audit
- Understand how their professional practice affects other health care professionals, the health care organization and the larger society
- Know how these elements affect their own practice
- Assist referring clinicians in providing cost effective healthcare
- Practice cost effective health care and resource allocation that does not compromise quality of care
- Evaluate requests for imaging as regards cost, effectiveness, and appropriateness, and to facilitate performance of an alternative study if indicated
- Understand the ACR Appropriateness Criteria

**ASSESSMENT**

- Global ratings by faculty
- ACR In-service examination
- ABR Written exam
- Evidence of accomplishments in the learning portfolio
Breast Imaging Rotation Orientation for 2nd year Residents

To be adjusted in cases of vacation, precall etc.

Before rotation

1. Read the Breast Imaging Guide
2. Review the Introduction to Mammography video
3. Read Chapter 11 of the Lewis and McNulty Handbook of Radiology

Week 1

Day 1
Morning:
- Learn how to logon and use the Soft Copy (mammo) workstation for 2D and 3D mammograms
- Identify the appropriate Powerscribe breast templates for common breast exams. Learn about issues of associating exams.
- Go through the process for interpreting screening mammograms as described in the guide with an attending.
- Review the weekly schedule in the handbook and identify if you will be resident A or B after consultation with your fellow resident (if one) and Dr. Lewis, Rooney or Zuurbier
- Introduce yourself to key mammo staff including technologists, Lisa Wallace, Brit Kvinlaug (both in business office next door) and Valerie Michaud (co’ordinator).

Afternoon:
- Spend one diagnostic session following the technologists to see how they do diagnostic mammographic views and breast ultrasound.
- Go through the process for working up the biopsies for the next day including completing the biopsy approach, technique and imaging dxas well as the preprocedure notes in EDH
- Add the mammo room schedules to EDH
- Add the MAMPL template to EDH for preprocedure notes

Homework: Complete any of the prelearning that you did not previously

Day 2
Morning:
- Spend 1-2 hours in the screening reading room reading with the attending. See guide for instructions.
- Learn how to complete the screening worksheets.
- Observe the workflow of reading screening mammograms
- Discuss appropriate search systems
- Learn how to annotate the images
- Discuss about reviewing discordances, getting your sheets signed and handed into Lisa Wallace
• Spend an hour with the technologists in screening observing the positioning and challenges of performing screening mammography

Afternoon:
• Review the screening mammograms that you did not see in the morning
• Work up biopsies for the next day (in association with colleague if present)

Homework
• Review the stereotactic biopsy videos.

Day 3
Morning
• Observe biopsy procedures (document in database!)
• Observe the consent procedure
• Practice with the breast phantom and needles doing needle locs
• Play with the spare needle ‘toy box’ (in prone stereo room locked cupboard)
• Learn how to protocol Breast MRIs

Afternoon:
• In diagnostic mammography, dictate some studies, scan patients
• Work up patients for next day biopsies (in association with colleague if present)

Homework:
• Review the ultrasound procedure movies

Day 4
Morning
• Screening mammography alone

Afternoon:
Learn a structure for reviewing breast MRIs

Homework:
• BIRADS 4th Edition Atlas (in department)

Day 5
Morning
• Observe NLOC procedures (staff sign off on passport)
• Diagnostic mammography

Afternoon:
• Diagnostic mammography

Homework:
• Chapters 4, 5 of Cardenosa
Week 2-4

- See the Breast Guide for the reading requirements.
- Aim for a MINIMUM of 240 total screening exams during your first rotation.
- Follow the Breast Procedure Passport for a graduated introduction to performing breast procedures, get staff to sign off.
- When downtime, review the PACS teaching files (all Breast...)
- Learn how to work up patients for the stereo path conference (1st Thursday at 7a in pathology)
- Do tumor board one Wednesday with staff, working up the patients the day before.
- Observe staff giving ‘bad news’ to patients including need for biopsies and biopsy results

Drs. Lewis, Zuurbier and Rooney

February 15, 2016