Breast Imaging Rotation: Resident Guide

If there are two residents on the rotation, decide if you are A or B. The following is a guide, but depending on your screening speed you may need more or less screening sessions. It is up to the residents to discuss who will do what rotation on a daily basis depending on their screening and biopsy numbers.

WEEK 1	RESIDENT A	RESIDENT B
Mon AM	SCR	DxDX
Mon PM	DX	SCR
Tues AM	DX	SCR
Tues PM	DX	DX
Wed AM	SCR/Tumor board	DX
Wed PM	DX	DX
Thu AM	DX	SCR
Thu PM	DX	DX
Fri AM	SCR	DX
Fri PM	DX	DX

WEEK 2	RESIDENT A	RESIDENT B
Mon AM	DX	SCR
Mon PM	DX	DX
Tues AM	SCR	DX
Tues PM	DX	DX
Wed AM	DX	SCR/Tumor board
Wed PM	SCR	DX
Thu AM	SCR	DX
Thu PM	DX	DX
Fri AM	DX	SCR
Fri PM	DX	DX

WEEK 3	RESIDENT A	RESIDENT B
Mon AM	SCR	DX
Mon PM	DX	SCR
Tues AM	DX	SCR
Tues PM	DX	DX
Wed AM	SCR/Tumor board	DX
Wed PM	DX	DX
Thu AM	DX	SCR
Thu PM	SCR	DX
Fri AM	SCR	DX
Fri PM	DX	DX

WEEK 4	RESIDENT A	RESIDENT B
Mon AM	DX	SCR
Mon PM	DX	DX
Tues AM	SCR	DX
Tues PM	DX	DX
Wed AM	DX	SCR/Tumor board
Wed PM	SCR	DX
Thu AM	SCR	DX
Thu PM	DX	SCR
Fri AM	DX	SCR
Fri PM	DX	DX

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. Please ensure that you understand how to record your screening mammograms and the expected screening goals. If not, ask us.
- 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. Tracking is automatic via Knack.
- Be ready to answer questions. The attendings on our service want to know you are reading!

DAILY

- Our day starts at 7:30 unless you have a 7am conference.
- Breast imaging includes mammographic screening, diagnostic mammography, breast MRI and breast procedures including ultrasound guided, tomographic guided and MRI guided biopsies as well as needle localizations (ultrasound and digital). One breast imager is allocated to screening am, and one to diagnostic/biopsies (am and pm). Very occasionally there is a pm screener. Needle localizations are usually done in the mornings. Biopsies may be any time of day, some are prescheduled, others added on. MRI guided biopsies are always late morning.
- Screening can be done by residents on the far workstation, in the screening rom. The workstation to the left in the diagnostic room does not have a Hologic workstation but is best for reviewing MRI scans (to be upgraded soon).
- If you are doing screenings, consider earplugs/music to cut out background noise.
- Please preview interventional cases and enter pre-procedure notes (see manual) 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. <u>These forms are found in Val's office the day before, and on the top tray the biopsy day</u>
- In your 2nd and 3rd rotations we would like you to present cases at weekly Wednesday 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. If no radiologist is assigned to 'clinic' then the screening radiologist is in charge of these. Residents are expected to run these sessions after they have observed a couple. The list is sent out on Monday, cases should

be reviewed and then discussed with the appropriate radiologist Tues pm or early Wed am. These are valuable windows into patient and surgeon-focused care that will improve your appreciation of practical issues and hone your reporting.

COMPORTMENT

- 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 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.
- Male residents must always have a female staff, tech or coordinator with them before examining or scanning a female patient's breasts.
- 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.
- Please review the procedural videos online (see manual) before your first rotation, and for a refresher if you have been away from the section for some time. 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

- All studies are interpreted using the ACR BI-RADS lexicon. 'Cheat sheets' are available in the reading room.
- We use centimeters.
- All mammos must include views used and breast density.
- All non-biopsy reports (all modalities) need a BI-RADS category in the impression.
- 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

- Ensure that all BI-RADS 0,3,4,5, and 6 lesions for both diagnostic and biopsy reports include the following (available in Dr. Lewis' autotext as 'breast lesion'):

Side/Lesion #/Size/Lesion type/radian/cm from nipple

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.

GENERAL

- **Please be proactive – look for breast MR and outside interpretations/reviews that need doing, review cases for the day. Don't wait for us to direct you.**
- Communication skills are very important in breast imaging, and we will be working with you to help you develop these.
- 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.
- Multiple short breast WIRED modules are available HERE (and via Knack Resident Database)

2ND YEAR RESIDENTS

Before rotation

1. Read this guide!
2. Review the Introduction to Mammography video
3. Review the Screening Workflow video
4. 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 – any issues see Dr.Lewis.
- 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 or Zuurbier
- Introduce yourself to key mammo staff including technologists and Valerie Michaud (co'ordinator).

Afternoon:

- S**pend 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 ddx as well as the pre-procedure notes in EDH
- Add the mammo room schedules to EDH
- Add the MAMPL template to EDH for pre-procedure notes

Homework:

- Complete any of the prelearning that you did not previously
- Review the following:
- Short video (5 min) that discusses how to approach screening.
- Nice module that goes into screening in more detail (highly recommended). May need IE to open.

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
- **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. Basic concepts and Prone biopsy and Tomo guided biopsy

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)
- There is a breast phantom in the screening room that you can practice biopsies on.
- Learn how to protocol Breast MRIs

Afternoon:

- In diagnostic mammography, dictate some studies, scan patients
- Learn how to sign into Dynacad for breast MRI biopsies
- 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.
- Record all your breast procedures in Knack as soon as done.
- When downtime, review the PACS teaching files (all Public Folders/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

QuizTime

R2 residents will receive daily questions on your phone or email from QuizTime. These are for self-learning of key topics and we highly recommend that you complete them. If any R3,4 residents also wish to get them please ask Matt Henry.

Breast Imaging Conferences

Lecture title	**Faculty**
Architectural Distortion/Asymmetry	Zuurbier, Rebecca
Breast Disease - Medical Oncology	Mary Chamberlain
Breast Disease - Surgical Oncology	Kari Rosenkranz
Breast masses 1	TBD
Breast masses 2	TBD
Breast MR 1 - Technique, BiRADS, normal	Lewis, Petra
Breast MRI 3 - Indications, cases	Lewis, Petra
Breast MRI biopsy workshop	Lewis, Petra
Breast Pathology	Jonathan Mariotti
Breast U/S Biopsy Workshop	All faculty
Breast U/S Biopsy Workshop	All faculty
Breast U/S technique and indications	TBD
Calcifications	Zuurbier, Rebecca
Case Conference	Zuurbier, Rebecca
Case conference	Diflorio, Roberta
Case Conference	TBD
Case conference	Lewis, Petra
Diagnostic mammography, problems and protocols	Zuurbier, Rebecca
Implants	Zuurbier, Rebecca

Intro to Mammo	TBD
Male breast and axilla	Zuurbier, Rebecca
MQSA and Image Quality	Lewis, Petra
Post Op Breast	Zuurbier, Rebecca
Screening mammography	Zuurbier, Rebecca
Tomosynthesis	Zuurbier, Rebecca
Breast Biopsy workshop	All faculty

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, 3, 4, 5, 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.

It is up to you to ensure that you complete the goals below. We expect you to be honest with your numbers interpreted and the concordance with the interpreting faculty. Not being honest with this will be considered a significant professionalism issue at the time of evaluation.

Screening goals

Rotation	MINIMUM Screening #s	Callback rate relative to staff	Concordance rate	Weighted mammo scores
One	60/week	100-350%	>70%	>1.4
Two	70/week	100-250%	>80%	>1.5
Three	80/week	75-200%	>90%	>1.6

Note that these are MINIMUM numbers, the more mammograms you review, the better you will be at breast imaging. If you reach your goal and have more time left, keep going! For the 4th year residents, it is worth considering that in private practice you may be expected to read 50-70 mammograms/half day, or 20+ while doing other work.

Screening resources

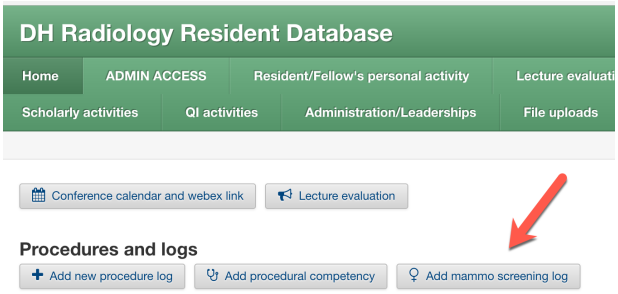
Short video (5 min) that discusses how to approach screening.

Screening mammo workflow – must review this

Nice module that goes into screening in more detail (highly recommended). May need IE to open.

Screening protocol

All mammo screenings are recorded via Knack on the Resident Database



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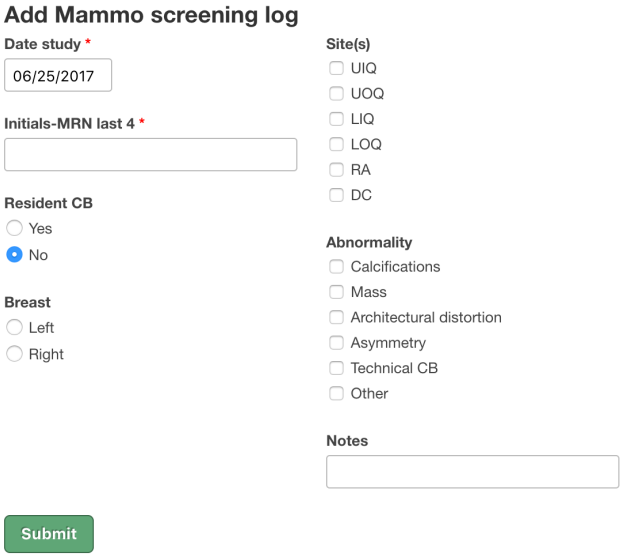
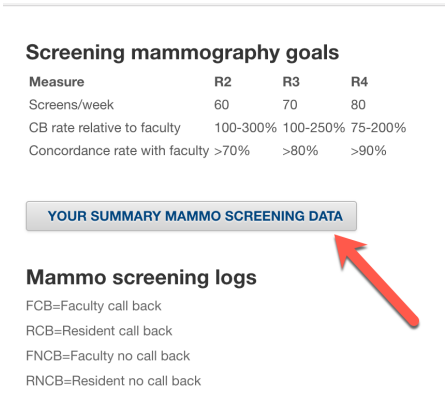
1. Use EPIC (see above) to find the screening worklists from the prior day, and the relevant patient on Hologic.
2. Complete the mammo form on Knack, use patient initials and last 4 of the MRN for identification
3. Include TECHNICAL callbacks



4. For no callback you just need to add date, identifier and then click 'submit'
5. A section has been added for you to put in your anticipated BiRADS. Use this for follow up tracking
6. Your studies will appear in the table below the form
7. When complete, go through both your and the staff callbacks from the EPIC reports (see below) and indicate on the table which staff called back.
8. For all discordant studies (that appear in red on the table), you need to review the study, then mark this as 'reviewed'

Number	Initials-MRN last 4	Date study	Resident CB	Faculty CB	Breast	Site(s)	Abnormality	Concordance	Reviewed?	Notes	Study read
1	2345	06/14/2017	Yes	Yes	Left	LIQ	Calcifications	FCB/RCB	No		06/14/2017
1	gh38738	06/14/2017	Yes	No	Right	LOQ	Mass	FNCB/RCB	No	tiny mass	06/14/2017
1	pl3567	06/14/2017	No	No				FNCB/RNCB	No		06/14/2017
1	1234	06/14/2017	No	Yes				FCB/RNCB	No		06/13/2017
1	TR-63773	06/14/2017	No	No				FNCB/RNCB	No		06/12/2017
1	yh-577o	06/14/2017	Yes	Yes	Left	LOQ	Asymmetry	FCB/RCB	No		06/12/2017
6											

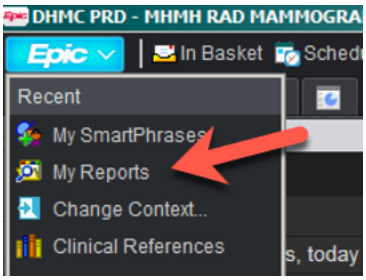
9. IT IS VITAL THAT YOU REVIEW ALL DISCORDANCIES. This is where the learning happens.
10. Your screening summary appears as a link above the logs for you to track progress



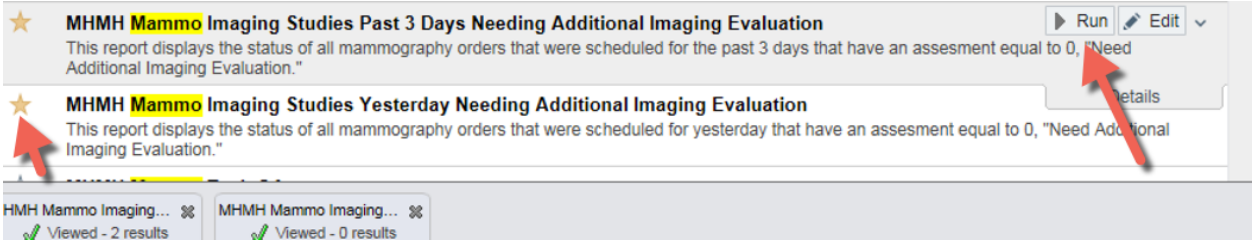
Finding the EPIC BiRADS zero lists

There are two reports that list the callbacks from patients from the prior day or for the last 3 days (for Monday screening – they are listed by date mammo was performed).

1. Click EPIC..My reports



2. Click Library…type Mammo into the search box and add both of these reports to favorites by selecting the star
3. Run report by clicking run (top right of report name). The list of patients will come up



Procedural tracking

All residents should enter their breast procedures (observed and operator) into Knack 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:

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

Spare needles and wires are present in the locked cabinet in the tech area (ask techs for key). We recommend that you review these to understand how to use them and you can use them to practice NLOC technique on the 'breast loaf' ballistic gel model (in screening room).

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 unit are also at the end of this guide.

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

Positioning
Preparation
Basic Core Biopsy Technique
Tips and Tricks 1
Tips and Tricks 2
Tips and Tricks 3
Vacuum Needle Techniques

MRI guided breast biopsies

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

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

Breast MRI interpretation

Breast MRIs can be read via PACS or better using Dynacad. The link is on the desktop of all mammo workstations.

1. Use DHMC/DHMC to login.
2. Select 'Hangings'….PJL hanging
3. Click link to link all series
4. The CAD can be selected for any series and the threshold changed.
5. Right click to select a different series.
6. The system can auto delineate, measure and position lesions.
7. Reports can be exported to PACS
8. Ask Dr. Lewis to demo the main features.

- Powerscribe templates for both normal and abnormal breast MRIs can be found under Powerscribe/autotext/breast.
- Several MR videos to aid in interpretation can be found here.

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. Worksheets are found in Val's office on the shelf.

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 pre-procedure note for each patient (use .mampl 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.
4. Document results, concordance and management including your phone call in the patient's biopsy report.
5. If a surgical apt is needed, use eDH to send a message to the Comprehensive Breast Program asking them to set up a surgical apt +/- breast MRI for that patient.

These patients are very anxious and should be contacted asap.

Tumor boards

During each rotation you will do tumor board at least twice (wed am). There are two tumor boards, mini tumor board when we meet with the surgeons before they see new patients (combined clinic NCCC 9am) and the full tumor board when we present selected case imaging findings (Aud F 12p or Webex). It is important that you observe 1-2 of these tumor boards before presenting.

Review this movie which will help you identify the important elements to present.

If you are scheduled for either 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.

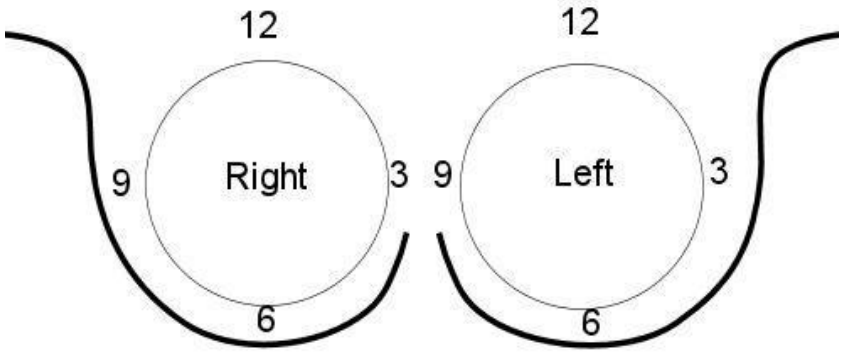
4. The key to the interpretation room is in the drawer in the mammo dx room.
5. 3rd and 4th year residents should present the cases in mini tumor board with staff facilitation after they have attended at least 2 mini tumor boards,
6. 3rd and 4th year residents should present the cases at noon tumor board additionally
7. 3rd and 4th year residents should attend noon tumor board at least once in addition to the session they present as a 4th year.

Breast PACS files

Under the Public Folders/Breast, there are a large number of teaching files that are of high yield for teaching. Please review as many as possible, during your first rotation you should ensure that you review the Breast Imaging Basics folder.

Clock Face localization of lesions

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. Review this very short video (no sound) then do this module on lesion localization.

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

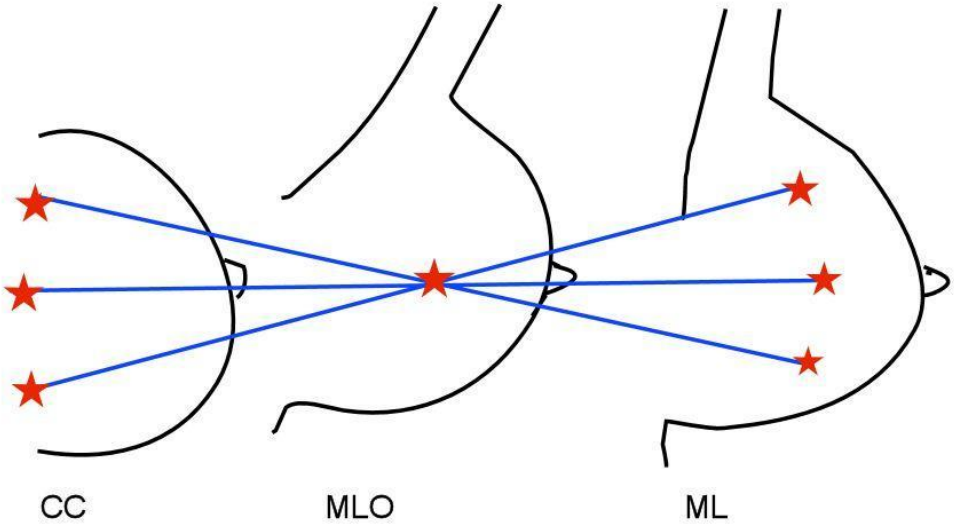
Standard views for callbacks

If call back is for:	**Obtain these views**
Calcifications	Mag CC Mag TL TL
Mass or lymph node	Mag cone compression in view best seen 3D TL 3D
Mass – high probability of cyst	US first
Architectural distortion	Repeat view Cone Mag or cone compression 3D TL 3D
Superimposition (questionable lesion)	Repeat view Cone compression in view best seen 3D TL 3D

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
- Also see here.



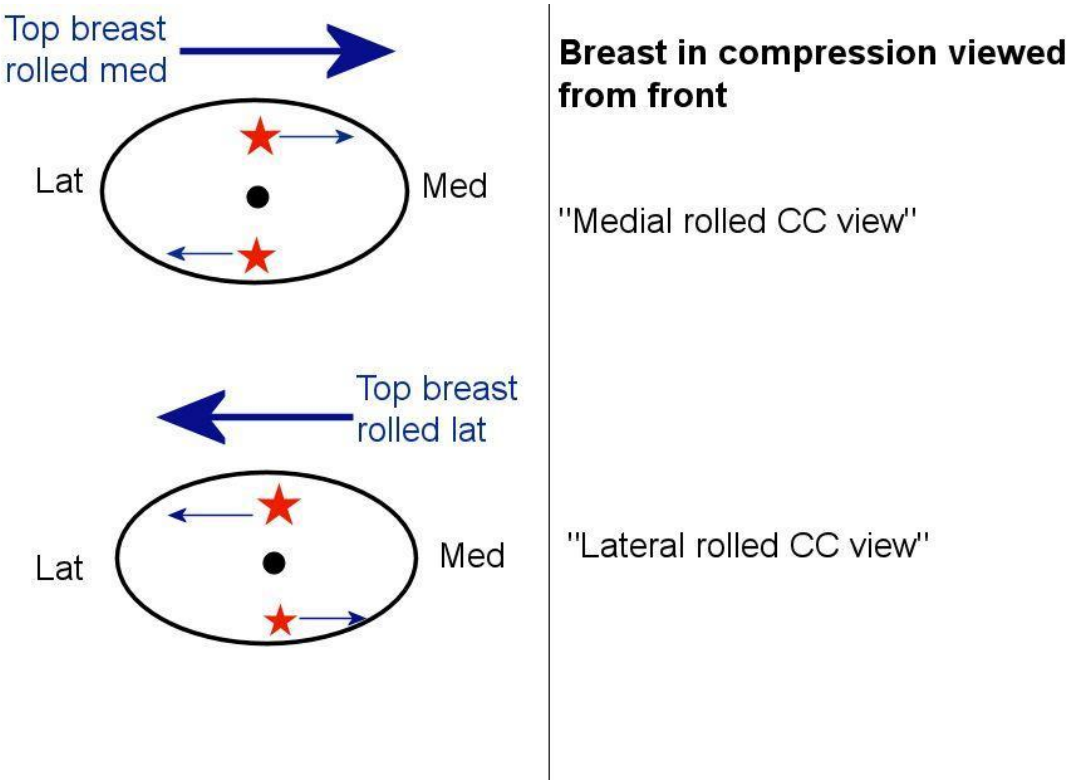
Triangulating lesions from rolled views

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.

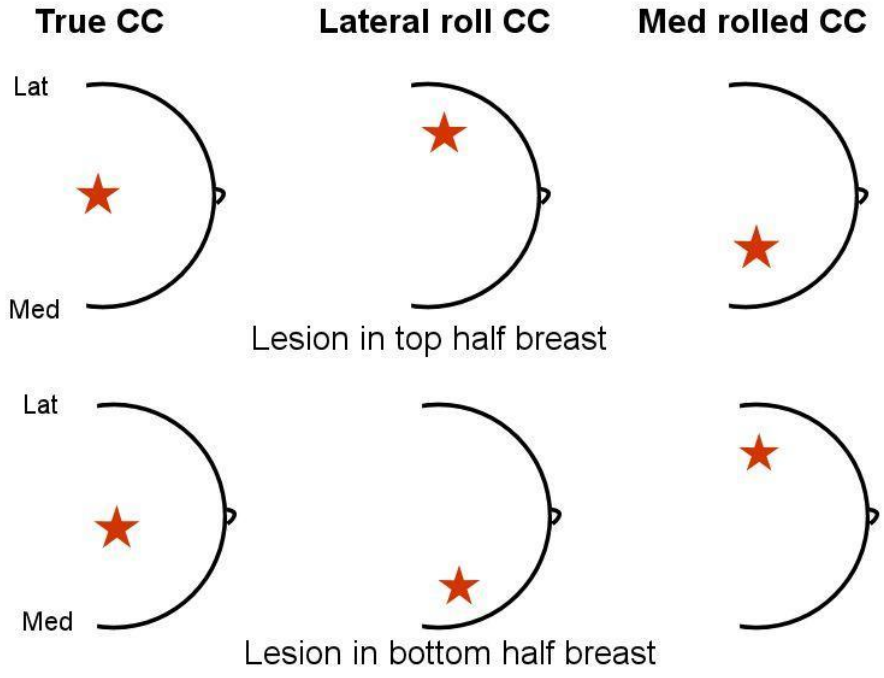
- Rolled views are named by the direction the top half of the breast is 'rolled'.

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)

Communication with patients

Our patients are very anxious and most come in with 'this might be cancer' on their minds. Sometimes they can be rude, or non-communicative and you must understand that these states come from this anxiety. They may behave differently each time you interact with them. They may be very different with the technologist than us. Do not assume that you know what it is they are worried about. A major part of our role as breast imagers is to understand and relieve (if we can) these concerns. On occasions saying to a patient "I can see that you are very anxious, can you tell me your major concern?" It is not always that they think they have cancer. On the other hand it is important to be frank and honest with patients who have highly suspicious lesions. Some of our patients are less well educated, and using terms like 'lesion' and 'biopsy' can confuse them. They may not know that cysts are not cancer unless you explain it. Do not be afraid to use the word cancer! E.g. " This is NOT cancer" or "This might be cancer but most likely not, but we need to take a piece of it to check" or "I am very worried that is might be cancer". Even (usually after biopsying a BIRADS 5 lesion) "I am sorry but this is almost definitely going to be cancer" can seem cruel and tough to say but can help patients deal with the later phone call.

As you progress through the breast rotations, we will have you listen to our conversations with patients, be observed talking to them when we will give feedback, and later convey good and bad news yourselves. Remember that even the 'you need a biopsy' conversation is bad news to a patient.

We suggest that you develop some variant of the following common 'scripts' to convey news to patients in a way that virtually all patients understand and you can modify according to the circumstances. Conversations should be done preferably with the patient sitting up, certainly covered up. You should be at the same level as them (so sit down usually) .Sometimes you need to ask if they want their significant other in the room with them.

Cysts

"I am glad to tell you that you have a cyst. This is just a little balloon filled with fluid that happens because a milk duct gets blocked. It isn't cancer, it isn't going to turn into cancer. They can get bigger or smaller or disappear completely. If you feel NEW lumps appear you should still come and see us if they don't go away during your next cycle [*if patient premenopausal*] as although it is most likely another cyst, it may not be."

Calcifications

"The reason you were called back today is because you have calcifications in your breast. Calcium is part of your bones and your teeth and we see it in the breast for a lot of reasons, many totally harmless or benign. When we look at calcifications on the special views we did today, we look at their shape, number, size and the patterns they form to decide how concerned we are about them. Some patterns are more concerning than others and some are definitely harmless. Looking at yours: [*depending on likelihood*]

1. "They are what is called milk of calcium, this is calcium in a fluid floating in cysts and it is always benign. We do not need to do anything, you can have your next screening mammogram in a year"
2. "I am concerned that they might be early cancer and we need to sample them by taking some pieces using what is called a stereotactic biopsy [*go onto explain the procedure*]"
3. "Your calcifications are most likely benign but we can't tell without sampling them using what is called a stereotactic biopsy [*go onto explain the procedure*]. It will take a couple of days to get the results."

Solid masses that need biopsy

"You have a small lump in your breast that is [*most likely not cancer but needs testing*] [*concerning for an early cancer*] and we need to take some pieces of it to send to the lab for testing. This is called a biopsy and we will do it using a special needle under local anesthetic, using the ultrasound to guide the needle. It will take a couple of days to get the results."

Solid masses that need follow up

"You have a small lump in your breast that is very unlikely to be cancer, we feel it is almost definitely something called a [*fibroadenoma, papilloma etc*] which is a benign, harmless type of tumor. To be on the safe side though we recommend that we follow it with [*ultrasound/mammography*] by seeing you in 6 months. If this is going to make you very anxious, we can biopsy it now or at any time, but we feel that chances of it being cancer are very small"

Breast pain

"I am sorry that you are having trouble with breast pain. The good news is that we do not see anything wrong. Breast pain is very rarely due to breast cancer which is usually painless [*many patients think that pain means they have cancer*]. Unfortunately we don't have any specific treatment to give you. Most breast pain goes away by itself but it can take months. You can take simple pain killers like Tylenol if you need to. Having a good supportive bra can help. Reducing your caffeine intake sometimes helps"

Phoning results:
Do not leave results on answerphones, leave your cell # to call back. Give patients time to ask questions and check understanding. Try and assess how much information to give, especially if malignant results. Many patient's minds go blank as soon as they are told they have cancer, especially if not expected. Preparation at the time of biopsy helps a lot. Too much detail at that point can confuse. If questions are beyond your ability to answer, don't hesitate to say that you will get a staff member to talk to them.

Giving benign results
"Hello [Ms X], I have your biopsy results. Are you ok to talk now? I am pleased to tell you that your biopsy was completely benign. This means that you do not have breast cancer. [*explain the path only if straight forward as some are very difficult for them to understand*] You just need to have another mammogram in a year. How is your breast feeling?"

Giving malignant results
"Hello [Ms X], I have your biopsy results. Are you ok to talk now? Unfortunately it did come back as a [*very small, very early – if appropriate*] breast cancer. That does not mean it is not treatable or curable, but it does mean that you need some treatment. [*Pause, give them time for that to sink in and ask questions*] . We need to organize the next steps which will be for me to contact the Comprehensive Breast Program here. They will set up appointments for you to see a surgeon and possibly have an MRI scan of your breasts. The surgical appointment is a talking appointment to discuss the options for surgery. I will contact them as soon as we are done with this call. They will call you today or tomorrow. Is this phone number the best number?" [*At this time depending on the patient and the tumor I may give them more information such as "with your tumor, they should be able to just take it out – do a 'lumpectomy', likely with radiation treatment afterwards", or "because your tumor is (large/multifocal), they may need to recommend a mastectomy but that is up to you and the surgeon to decide". I usually tell them if they ask that the decision for chemotherapy is not usually made until after all the surgery is done, unless they have larger tumors in which case they may give chemo first*]

All articles are linked from the website

ROTATION 1

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.

Book/Chapters

- BIRADS 4th Edition Atlas (in department)
- Chapters 4, 5 of Cardenosa

PACS teaching files

Start on the divisional Breast Imaging Basics PACS file

WEEK 2

Book/Chapters

- Tabar Atlas (in department)
- Chapters 6, 7 of Cardenosa

Online resources

ACR Appropriateness Criteria for Breast Imaging : Screening, Palpable masses,

PACS teaching files

Continue going through the Breast Imaging Basics PACS file

WEEK 3

Online resources

- AIRP Breast syllabus: Breast calcifications, Breast masses benign and malignant Chapters 1, 15, 16 of Cardenosa

PACS teaching files

Continue going through the Breast Imaging Basics PACS file

WEEK 4

Book/Chapters

- Chapters 9,10,11,12,13,14 of Cardenosa

Articles

1. Solid Breast Nodules: Use of Sonography to Distinguish between Benign and Malignant Lesions. Stavros et al. Radiology 1995; Volume 196: Number 1- July 1995. 123-134.
2. Performance Benchmarks for Diagnostic Mammography. Sickles et al. Radiology: Volume 235: Number 3- June 2005. p775-90

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

1. Periodic Mammographic Follow-up of Probably Benign Lesions: Results in 3,184 Consecutive Cases. Sickles. Radiology: Volume 179: Number 2. May 1991- p463-468
2. Mammographic Findings after Breast Conservation Therapy. Krishnamurthy. Radiographics 1999 pS53-62
3. Breast Cancer Screening: A Summary of the Evidence for the U.S. Preventive Services Task Force. Humphrey et al. Annals of Internal Medicine: Volume 137: Number 5 (Part 1) - September 2002. E-347-E-367.
4. Screening for Breast Cancer: An Update for the U.S. Preventive Services Task Force. Nelson et al. Annals of Internal Medicine: Volume 151: Number 10 - November 2009. p727-737
5. United States Preventive Services Task Force Screening Mammography Recommendations: Science Ignored. Hendrick et al. American Journal of Radiology: 196, February 2011. W112–W116
6. Radiation Doses and Cancer Risks from Breast Imaging Studies. Hendrick. Radiology: Volume 257: Number 1- October 2010. p246-253
7. Abbreviated Breast MRI https://www.ajronline.org/doi/pdf/10.2214/AJR.16.17205

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 Breast Imaging 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

1. Comparison of Digital Mammography alone and Digital Mammography Plus Tomosynthesis in a Population-based Screening Program. Skaane et al. Radiology: Volume 267: Number 1—April 2013. p47-56.
2. Assessing radiologist Performance Using combined Digital Mammography and Breast Tomosynthesis compared with Digital Mammography alone: Results of a Multicenter, Multireader Trial . Rafferty etc a. Radiology: Volume 266: Number 1—January 2013 p 104-113
3. Diagnostic Performance of Digital versus Film Mammography for Breast-Cancer Screening . Pisano et al. N Engl J Med 2005;353. P1-11
4. Diagnostic Accuracy of Digital versus Film Mammography: Exploratory Analysis of Selected Population Subgroups in DMIST. Pisano et al. Radiology: Volume 246: Number 2—February 2008 p376-83
5. The Mammography Audit: A Primer for the Mammography Quality Standards Act (MQSA). Linver et al American Journal of Radiology Volume 165- February 1995. p19-25
6. Efficacy of MRI and Mammography for Breast-Cancer Screening in Women with a Familial or Genetic Predisposition. Kriege et al. The New England Journal of Medicine. Volume 351: Number 5- July 2004. p427-437
7. MR Imaging of the Ipsilateral Breast in Women with Percutaneously Proven Breast Cancer. Liberman et al. American Journal of Radiology: Volume 180. April 2003. p901-910
8. MR Imaging Findings in the Contralateral Breast of Women with Recently Diagnosed Breast Cancer. Liberman et al. American Journal of Radiology: Volume 180. February 2003. p333-341

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

PACS teaching files
General Breast Imaging PACS teaching files

Breast biopsy-path conference - Resident instructions

This conference takes place at 7am on the first TUESDAY of the month on 4th floor Borwell – your badge is needed for entry, go through doors, turn left, turn right at the coffee and it is on the right. During COVID this is virtual (see faculty for link).

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 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

Stereotactic biopsy instructions (TOMO UNIT)

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.

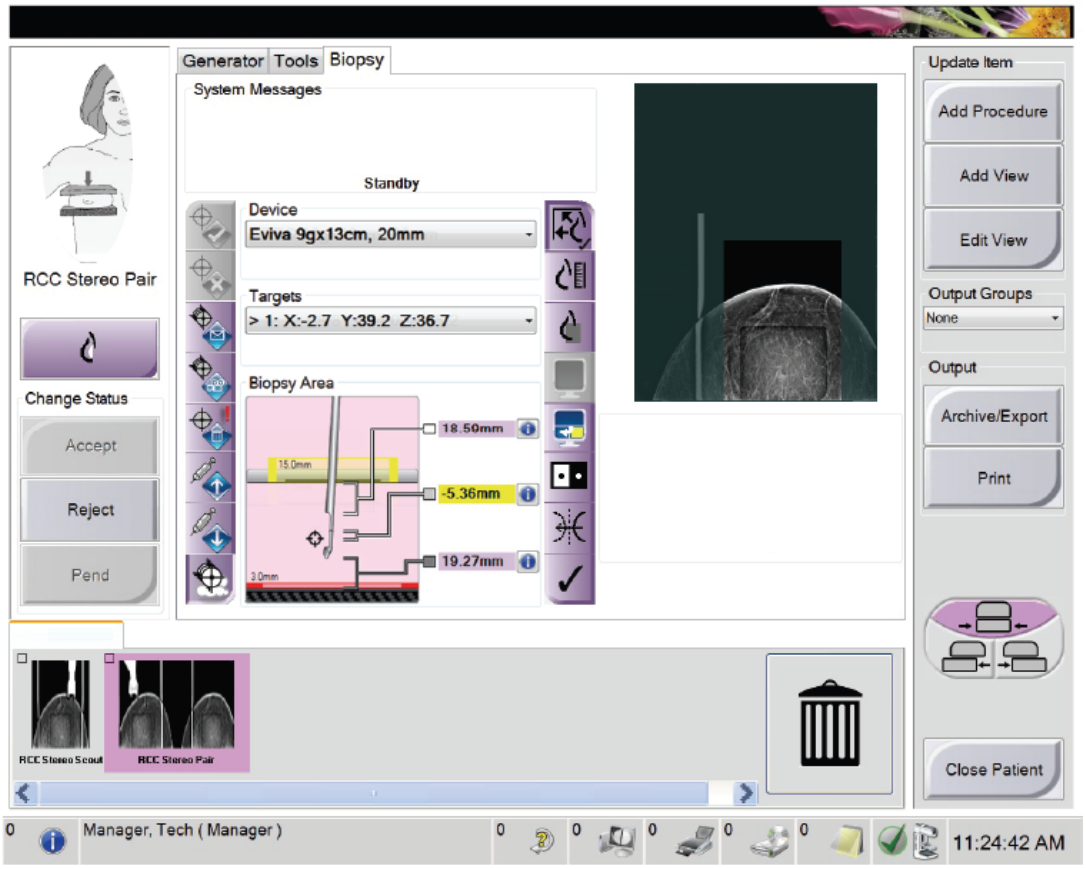
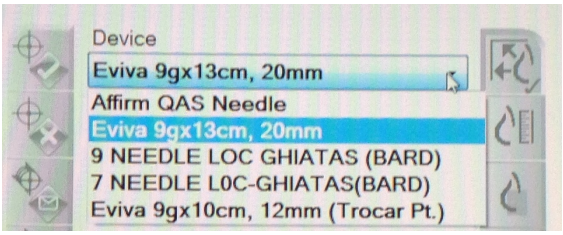
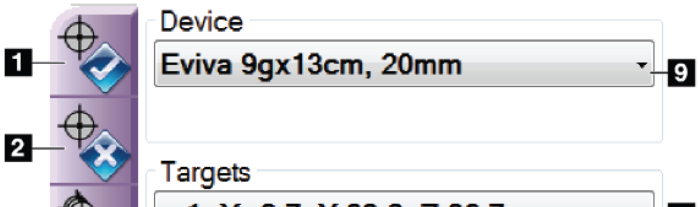


Figure 27: The Biopsy Tab

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.

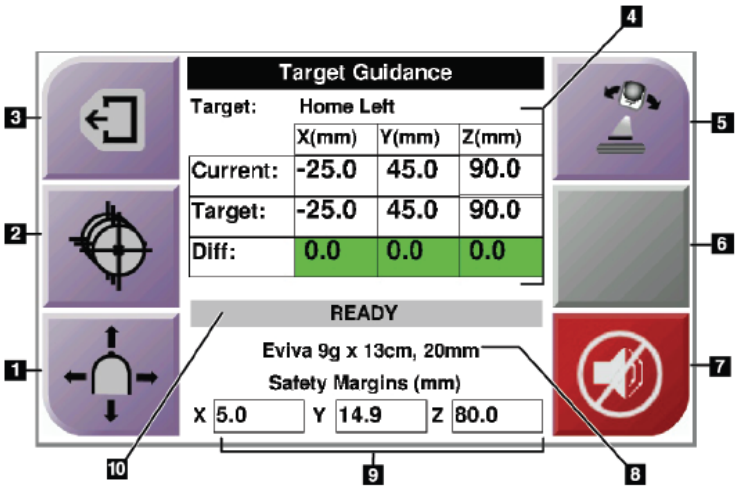


Figure 14: Target Guidance Screen

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 scapel 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 macine
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.

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 12 months of residency, to meet the MQSA initial-experience requirement for the direct supervision of at least 240 mammography interpretations in a 6 month period during the last 2 years of residency.
By means of lectures, textbooks, syllabi, journal reprints, video-links, teaching files, and other teaching materials, a resident will become familiar with and understand the following topics:

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
- Full-field digital mammography
    - Characteristics of full-field digital mammographic systems, including advantages and limitations
    - Effects of post-processing on the digital mammographic image
    - Effect of signal-to-noise ratio on radiation dose
    - Dedicated high-luminance, high-resolution viewing monitors
    - ACR Practice Guideline for the Performance of Whole Breast Digital Mammography
- Digital Breast Tomosynthesis
    - Characteristics of DBT systems, including advantages and limitations
    - Advantages and disadvantages of different DBT systems
    - Awareness of sweep angle, #source exposures, reconstruction algorithms of different DBT platforms.
    - Radiation dose considerations specific to DBT.

Mammography quality assurance

- Familiarity with content in the ACR *Mammography Quality Control Manual*
- Purpose and frequency of performance of quality control tests performed by the technologist and physicist
- Demonstrate proficiency in recognizing the mammographic appearance of artifacts for both screen-film and DBT
- Regulation
    - 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
    - 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
- ACR Bi-RADS Lexicon and terminology using the BI-RADS® 2013 criteria
    - Understand the meaning of the BI-RADS categories
    - Apply the appropriate terminology to calcifications, masses, asymmetries and other lesions

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
- Breast density legistation
- 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

Reference sources:

- ACR Practice Guideline for the Performance of Screening Mammography

Diagnostic (problem-solving) mammography

- Techniques and indications for, and value of, supplementary mammographic views
- Demonstrate proficiency in:
    - The standard work up for calcifications, asymmetries, architectural distortion, masses and palpable masses.
    - The additional views required for specific lesions such as skin calcifications, lesions outside of the normal field of view
    - 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 for known-malignant lesions
- ACR Practice Guideline for the Performance of Diagnostic Mammography

Breast ultrasound

- Equipment and physical principles
- Techniques
- Indications
- Demonstrate proficiency in
    - Scanning the breast, 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)

Reference sources:

- ACR Practice Guideline for the Performance of a Breast Ultrasound Examination
- ACR Breast Ultrasound Accreditation Program

Breast MRI

- Equipment and physical principles
- Techniques including abbreviated breast MRI
- 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 and staging breast MRI examination

Reference sources:

- ACR Practice Guideline for the Performance of MRI of the Breast

Reporting and medicolegal aspects of breast imaging

- Demonstrate proficiency in producing breast imaging reports, including
    - ACR BI-RADS® lexicon terms for mammography, ultrasound, and MRI
    - Lesion location
    - Categorization of breast composition (BI-RADS® breast density descriptors)
    - Final assessment categories (ACR BI-RADS®; 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
    - 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
- Post procedure follow-up imaging

Reference sources:

- ACR Practice Guideline for the Performance of Ultrasound-Guided Breast Interventional Procedures
- ACR Practice Guideline for the Performance of Stereotactically Guided Breast Interventional Procedures
- ACR Ultrasound-Guided Breast Biopsy Accreditation Module (part of the ACR Breast Ultrasound Accreditation Program)
- ACR Stereotactic Breast Biopsy Accreditation Program

Therapeutic and management considerations

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

Reference sources:

- ACR Practice Guideline for the Management of Ductal Carcinoma In-Situ of the Breast
- ACR Practice Guideline for Breast Conservation Therapy in the Management of Invasive Breast Carcinoma
- ACR Appropriateness Criteria™ for breast microcalcifications, nonpalpable breast masses, palpable breast masses, stage I breast carcinoma

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 Curriculum components

- 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 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 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
- RadExam end of rotation assessments

ACR Practice Standards

ACR Practice Parameter for the Performance of Screening and Diagnostic Mammography Res. 35 – 2018

ACR Practice Parameter for the Imaging Management of DCIS and Invasive Breast Carcinoma Res. 13 – 2013

ACR Practice Parameter for the Performance of a Breast Ultrasound Examination Res. 38 - 2016

ACR Practice Parameter for the Performance of Contrast-Enhanced Magnetic Resonance Imaging (MRI) of the Breast Res. 12 – 2013

ACR Practice Parameter for the Performance of Stereotactic-Guided Breast Interventional Procedures Res. 36 - 2016

ACR–AAPM–SIIM Practice Parameter for Determinants of Image Quality in Digital Mammography Res. 42 – 2017

ACR Practice Parameter for the Performance of Ultrasound-Guided Percutaneous Breast Interventional Procedures Res. 37 - 2016

ACR Practice Parameter for the Performance of Magnetic Resonance Imaging-Guided Breast Interventional Procedures Res. 35 - 2016

ACR Practice Parameter for the Performance for the Performance of Digital Breast Tomosynthesis (DBT) Res. 36 – 2018

ACR Appropriateness Criteria for Breast Imaging

https://acsearch.acr.org/list

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.

Estimated Planned: 12 screening sessions, remainder biopsy/diagnostic (one in clinic

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 described in the manual. At least 60 mammograms/week

Diagnostic goals: (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
- RadExam

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:

- The day before biopsies mornings that you will be attending:
    - Review procedural videos
    - Review all cases – PACS, EDH.
    - Consider modality, approach, needle type, risks, challenges
    - Discuss any questions with staff who will be performing the biopsy
    - Write the pre procedure note
- 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 procedures in Resident Database

Practice Based Learning and Improvement

See Rotation 1 self study assignments in the Breast Imaging Manual

- Prepare cases for Pathology-Core Conf. (first Thursday of the month) during l or 2 sessions on the days preceding the conference and attend. See instructions in manual.
- 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 (see reading list in manual)
- 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 Clubs related to breast imaging

Assessment

- Global ratings by faculty
- Conference attendance and participation

Professionalism

- Review the introduction to breast imaging letter.
- Demonstrate respect, compassion and integrity
- Maintain an 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, HIPAA regulations
    - Demonstrate professional values and ethical behavior including professional integrity, honesty, empathy and compassion

Assessment

- Global ratings by faculty
- Medical Student Evaluations
- 360 evaluation

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 using BI-RADS® terminology
- Use the divisional templates for 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

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 related to breast imaging.
- Begin to understand screening costs and how it relates to national health care goals

Assessment

- Global ratings by faculty
- ACR In-service Exam
- RadExam

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.

Medical Knowledge

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

Screening goals: See current screening protocol in handbook. 3-4 screening sessions /week, 70 exams min/week

Diagnostic goals:

- 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 and shadow clinic rad.

Assessment

- Global ratings by faculty
- ACR In-service examination
- RadExam
- Boards review sessions
- ABR core exam
- 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 health care 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 check lists

Biopsy goals:

- Review biopsy videos if necessary
- 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

Assessment

- Global ratings by faculty
- Procedure competency check lists

Practice Based Learning and Improvement

See Rotation 2 self study assignments in handbook

- Prepare cases for Pathology-Core Conf. (first Thursday of the month) during l or 2 sessions on the days preceding the conference and attend. See instructions in handbook.
- 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
- Procedure Log

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
- 360 evaluation

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

System Based Practice

- Attend at least one mini tumor board and noon tumor board
- Present at noon wed tumor board at least once
- 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
- RadExam

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.

Medical Knowledge

- Review physics specific to mammography.

Screening goals: 80 per week

- 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
- ACR In-service examination
- RadExam

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:

- Review biopsy videos if needed
- The day before biopsies mornings that you will be attending:
    - Review all cases – PACS, 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
- Procedure competency log

Practice Based Learning and Improvement

See Rotation 3 self study assignments in handbook

- Prepare and present cases for Pathology-Core Conf. (first Thursday of the month) during l or 2 sessions on the days preceding the conference and attend. See instructions in handbook
- 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 procedure log in Resident database
- 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

Assessment

- Global ratings by faculty
- 360 degree evaluation
- Medical Student evaluations

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
- 360 evaluations

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
- 360 Evaluations

System Based Practice

- Review (week 1-2) / Present (weeks 3-4) cases for Breast Tumor Board (Wednesdays 12-1).
- Review (week 1-2) / Present (weeks 3-4) cases for Mini tumor Board (Wednesdays 9-10).

- 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 as they relate to breast imaging

Assessment

- Global ratings by faculty
- RadExam

Drs. Lewis and Zuurbier

April 19, 2021