

IMAGING ROTATION: RESIDENT GUIDE

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IDENTIFYING YOUR ROTATIONS

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

Note the Faculty guide has additional information and can be found [here](#).

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. These forms are found in Val's office the day before, and on the top tray the biopsy day
- 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:

- **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 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

1. Use DH login
2. Add the following rooms to your schedules on EPIC to identify patients
 - a. MHMH DB MAM ROOM 2 and ROOM 4 – screening
 - b. MHMH MAM ROOM 1, 3, 4, 5, 7 - diagnostic
3. To see all procedures including MRI guided biopsies and scheduled breast MRIs and biopsies (which will not appear on the above schedule) you need to set up a status board default.
 - a. Go to the status board tab. Click settings, scroll down to find “[MHMH Rad Mammo Procedures](#)” Select ‘make this my default’ at the bottom left. Click run.
 - b. It should then default to it when you open up the status board.
 - c. Change dates top right. You can click up and down a day

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

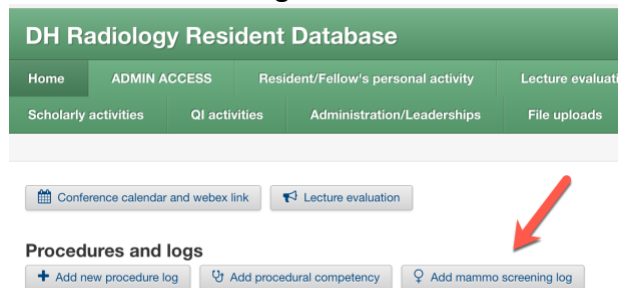
[Short video \(5 min\)](#) that discusses how to approach screening.

[Screening mammo workflow](#) – must review this

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

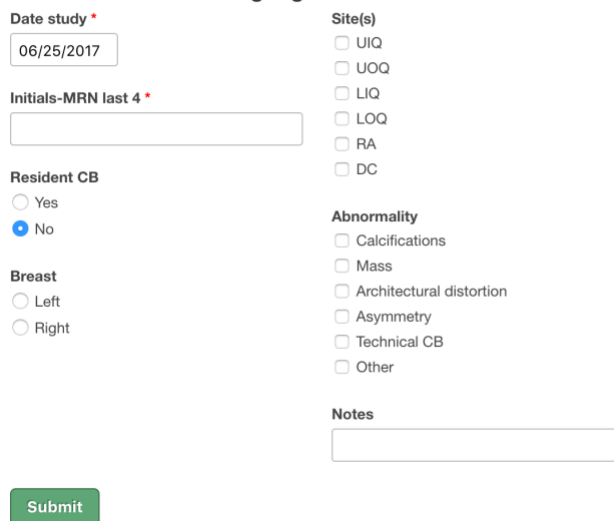
SCREENING PROTOCOL

All mammo screenings are recorded via Knack on the Resident Database



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

Add Mammo screening log



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

- 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.
- For all discordant studies (that appear in red on the table), you need to review the study, then mark this as 'reviewed'

Mammo screening logs

During last 6 weeks Today's reads This week All time

search by keyword

Showing 1-6 of 6 [export](#) 100 per page

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	p3567	06/14/2017	No	No				FNCB/RNCB	No		06/14/2017
1	1234	06/14/2017	No	Yes				FNCB/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

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

Screening mammography goals

Measure	R2	R3	R4
Screens/week	60	70	80
CB rate relative to faculty	100-300%	100-250%	75-200%
Concordance rate with faculty	>70%	>80%	>90%

[YOUR SUMMARY MAMMO SCREENING DATA](#)

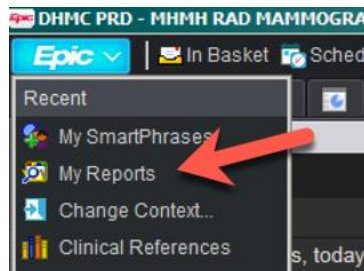
Mammo screening logs

FCB=Faculty call back
RCB=Resident call back
FNCB=Faculty no call back
RNCB=Resident no call back

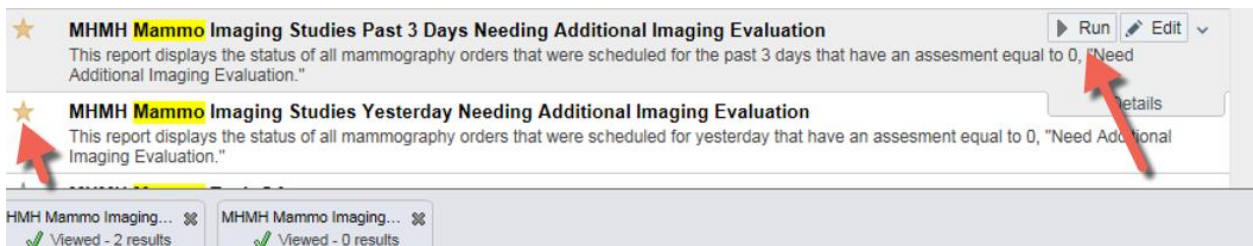
FINDING THE EPIC BIRADS ZERO LISTS

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).

- Click EPIC..My reports



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



POWERSCRIBE

- Default templates should work for most studies.
- We are updating these templates currently so it is a work in action
- There is an additional Breast' section in PS, which contains key templates

LESION NUMBERING

- We number each lesion side specific for all modalities
 - e.g. Left breast lesion 1, lesion 2. Right breast lesion 1 and lesion 2 rather than Left lesion 1, left lesion 2, right lesion 3, right lesion 4
 - Ensure consistency throughout reports, making sure that lesions are named the same number
 - Double diagnostics can have 2 separate BIRADs if needed.
 - Multiple lesions on MRI can have identified BIRADS specific to lesions.
 - E.g. R breast lesion 1 BIRADS 6
 - R breast lesion 2 BIRADS 4
- Complete CB/Biopsy forms as needed.
Contact Cindy York for BIRADS 3 on MRI reports to let her know follow up needs to be scheduled.

PROCEDURAL TRACKING

All residents should enter their breast procedures into the ACGME 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.

1. Complete the protocol on EPIC as shown in [Appendix 3](#)
2. Protocols that have been completed appear below the patient in the status board and can be amended as shown in [Appendix 4](#).
3. Fill in the differential diagnosis
4. Go into EDH and put in a pre-procedure note for each patient (use .proc 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).

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.

Giving results:

1. We preliminary biopsy reports until we have spoken to patients
2. We phone patients with results, except when we do nodal biopsies for ?metastatic melanoma, when I ask the oncologist to call.
3. Results are generally out 24-48 hrs after biopsy. We tell patients 2-3 working days. Check in EPIC
4. Remote access to EPIC, Powerscribe and PACS is via <https://dhapps.hitchcock.org/logon/LogonPoint/tmindex.html>
5. After phoning patients, document in powerscribe report and sign.
6. Indicate Yes/ No in the final biopsy report if you would like case reviewed at the monthly Radiology-Pathology Correlation Conference. These are usually challenging/unusual cases, discordant or possibly discordant results, good educational cases
7. For patients who need surgical referrals, send a message via EPIC to the DHMC COMP BREAST PROG [2000000548] (search under 'groups'). Note, they do not respond. They will contact the patient with surgery and MRI appointments as appropriate. You can use .sxap as dot phrase (import from petra).
8. If patients need 6m FU, message Cynthia York to arrange.

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.

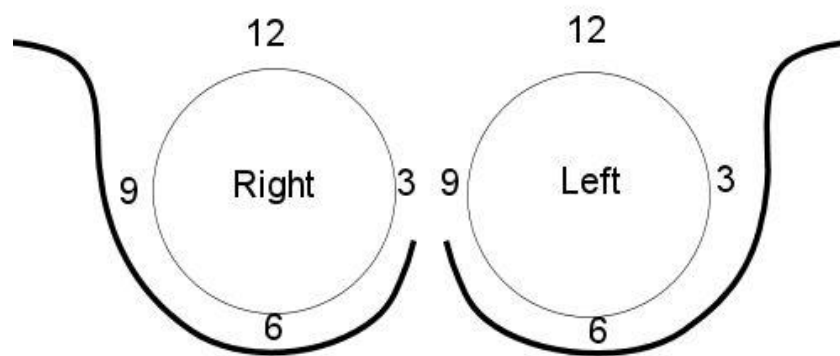
BREAST PACS FILES

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.



VIEWES 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. To see our standard views see [Appendix 1](#)

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

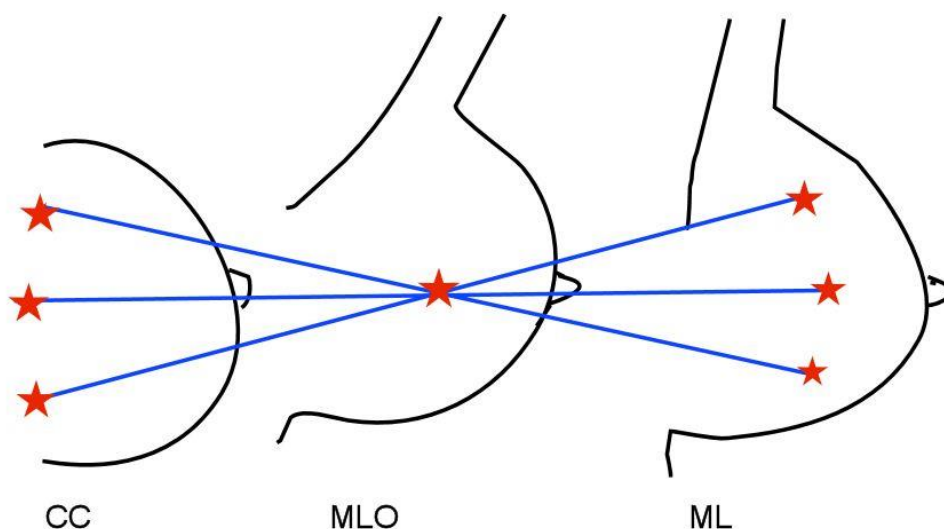
STANDARD VIEWS FOR CALLBACKS

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](#).



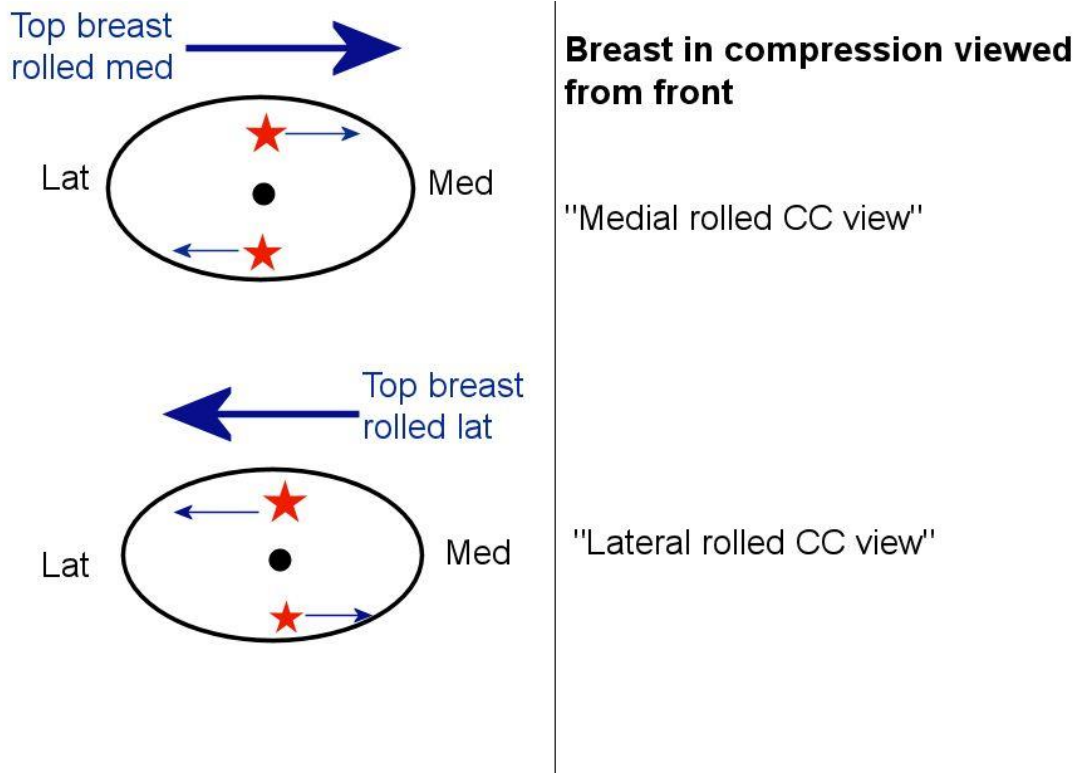
TRIANGULATING LESIONS FROM ROLLED VIEWS

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.

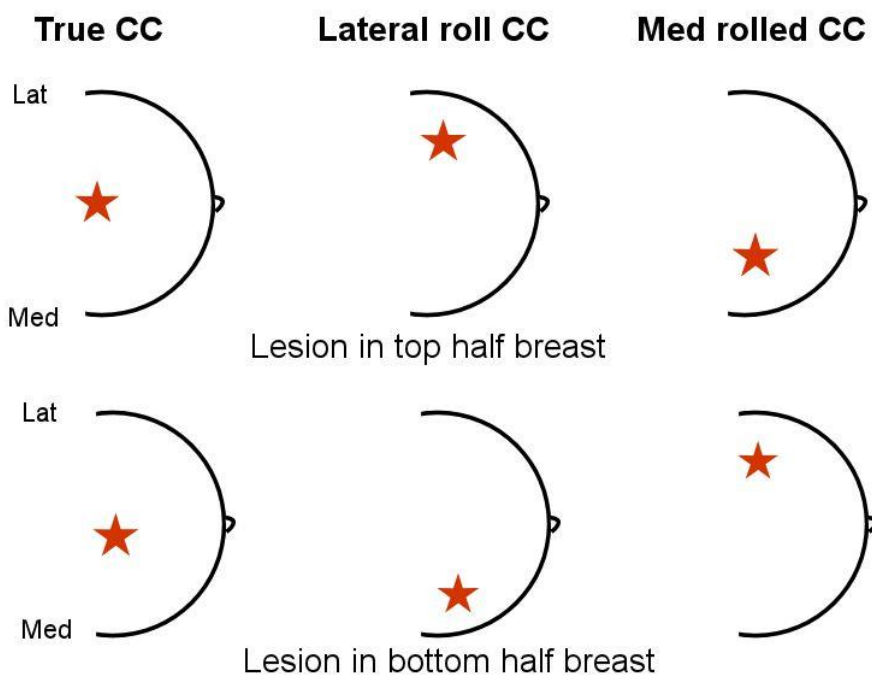
- Rolled views are named by the direction the top half of the breast is 'rolled'.

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 it 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]*

RESIDENT SELF-STUDY ASSIGNMENTS

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

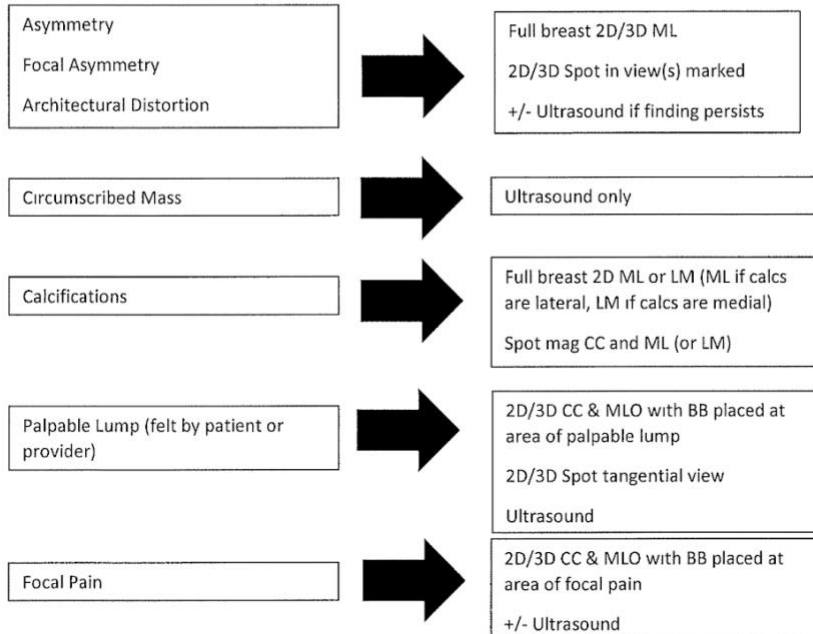
- identify the key sequence (usually G+ or subtraction) and image(s) on the breast MRI

- 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

APPENDICES

APPENDIX 1. DIAGNOSTIC WORK UP STANDARD VIEWS

Diagnostic Work Up Guidelines



Women under 30 = Ultrasound first +/- diagnostic mammo at Radiologist discretion
Male under 30 with lump = Ultrasound first +/- Mammo
Male over 30 = 2D/3D mammo first with BB placement if applicable +/- Ultrasound
Suspicious nipple discharge (see protocol) = 2D/3D full mammo, CC + ML Mags of nipple, +/- US
6 mo. f/u Calcs = CC + ML/LM mags
6 mo. f/u Mass/Asym = See Radiologist report, use best view and modality from prior imaging

Reviewed by *Rhonda A. Zuhl*

11/17/21

APPENDIX 2 BREAST IMAGING ORDERING GUIDELINES

- Clinical concerns: new lump, focal pain, Nipple discharge, skin dimpling or other changes.
- Should be ordered according to age as follows:

Orders

- **Women & men with clinical concern:**
 - 25 and over - Mammogram and US
 - Under 25 – ultrasound only
- Men always bilateral diagnostic mammogram

Scheduling

- 30 and over – mammogram scheduled first then ultrasound
- Under 30 – ultrasound scheduled first
- If patient has had bilateral mammogram within 8 months, unilateral affected side mammogram and ultrasound only should be ordered.
- If it has been longer than 8 months, bilateral mammogram and affected side ultrasound should be ordered

Requester/provider should indicate type of abnormality

- (i.e. lump) size (cm), location, Include breast quadrant,
- Distance from nipple, and o'clock position of abnormality.

If a patient is pregnant we would still do a mammogram and us.

Screening mammography eligibility.

- Routine screening mammogram may be scheduled for any woman 30 years and older.
- If patient under age 30, insurance is not likely to cover exam, patient should be informed to check with insurance company prior to scheduling.

Screening eligibility for patients 25 and older if any of the following apply.

- Strong family history (i.e. Mother or sister with premenopausal breast cancer begin screening 10 yrs. before the relative's age when the cancer was diagnosed)
- Prior *chest-wall radiation treatment* (treatment for Hodgkin's lymphoma), provided that at least 8 years have passed since the treatment ended.
- Known to carry a *breast cancer gene* (BRCA 1 or BRCA2.)

Physician referral is NOT required for these exams

MRI eligibility

- MRI may be scheduled for any woman meeting ANY of the following criteria:
- Women who have received *chest-wall radiation treatment* (see #3 above)
- Women known to carry a *breast cancer .gene* (see #4 above)
- Patients with *suspected implant rupture* who are younger than 35 may be scheduled for bilateral breast MRI without intravenous contrast; those age 35 and older should first be scheduled for bilateral diagnostic mammogram, followed by MRI only if mammogram results are unremarkable. Patient should be advised that this exam is intended to evaluate the integrity of the implants and not for breast cancer detection.

Lactating women

- Lactating women who are due for a screening mammogram should be nursing once per day or less in order to schedule an exam.
- For diagnostic mammograms ask patient to arrive 45 minutes prior to appointment time to pump prior to exam (Patient cannot substitute nursing infant for pumping).

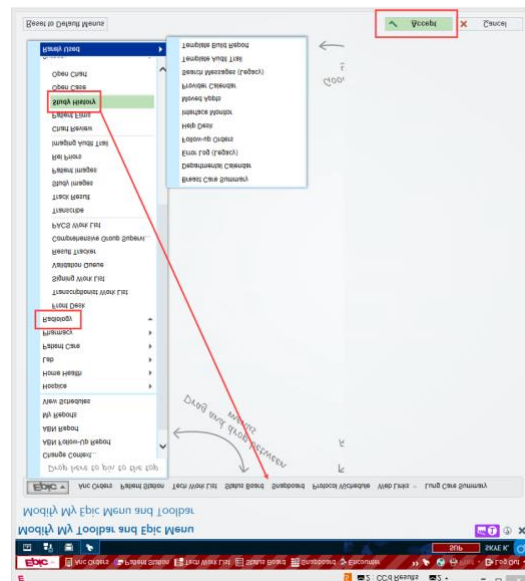
APPENDIX 4 HOW TO UPDATE A MAMMO PROTOCOL

First you need to add **Study History** to your top toolbar:



Click on the **Wrench** icon in the top right hand corner

- Under the long list find **Radiology**
Once you click on it a sub list will appear
Click and Hold on **Study History** to drag it up to your top toolbar, I would suggest placing it near Status Board



Press **Accept** in the bottom right hand corner

- To edit a Protocol you need to use **Study History**. There are multiple ways to open the patient in Study History:
 - If you have recently opened the patients chart click on Study History and find the patient under the Recent tab
 - If you have the MRN copied click on Study History and paste the MRN in
 - Otherwise you can find the patient by double clicking on the patient from the **Status Board**
- That will open the patients chart
- Now click on **Study History** and select the patients name
- Select **Imaging Study Lookup**
- Click **My Default**
- Click **Run**
This screen will not appear again

Study History - Imaging Study Lookup [1063]

Search available reports

Available Reports

- (New)
- Imaging Study Lookup
- Cardiology Study History
- CGP LCSR Study History
- DH LCSR Study History
- DH Mammo Study History
- DH RAD Study History

User: KERR, SKYE A

☒ My default

Criteria

☐ Show cancelled orders

Order Type

☒ Imaging orders ☐ All

Date

From:

To:

Procedure Category

- Sort the list of patients exams by **Visit Date**
- Find the exam you want to change on the list
- Click **Update Protocols**

Study History - Imaging Study Lookup - Total Count: 32

123 Changes

Imaging Study Lookup Add Work List Row height: 1

S	Visit Date	Order Date	End Date	End Time	Procedure
	01/12/2023	01/10/2023			Mammo Diagnostic Without Cad Left
	01/12/2023	01/11/2023			Mammo Us Biopsy Left
✓	01/05/2023	12/29/2022	1/5/23	10:03 AM	US Breast Limited Left
✓	01/05/2023	12/29/2022	1/5/23	09:37 AM	Mammo Call Back Diagnostic Cad and Tomo Left

- Change the Protocol as needed
- Click **Finalize** in the bottom right hand corner

Update Protocols, Order ID: 241496004

Chat Ant Orders Order & Edit Reassign Protocol No Protocol

Protocol Details

Mammo Us Biopsy Left

Order #: 241496004 Accession #: 11182812

Questions

Where will study be performed?

Is the patient on antiplatelet / anticoagulant therapy?

Reason for exam and clinical history

Reason for Exam

abnormal finding

Dr: Abnormal finding on breast imaging (B2.2 [C2D-10-CM])

Mammo BX Protocol

Mammo Procedure

Procedure Medication

For Stereo: Approach

For US BX

For Stereo/MRI

For Needle Loc

Hyperlink to Protocols

Differential Diagnosis

Comments for Technologist

Finalize Protocol

Finalize

APPENDIX 5: POST BIOPSY PATIENT INFORMATION

1. A radiologist will contact you with the results within 2 working days from the biopsy. Please ensure we have accurate contact information.
2. A little oozing, bruising and discomfort is normal. Most patients are able to resume normal activity and return as needed to (non-strenuous) work. A note for work will be provided if necessary.
3. If you need any pain relief afterwards, take ibuprofen or Tylenol (avoid aspirin).
4. Please limit activity on the affected side for 48 hours after your biopsy- this includes lifting more than 10 pounds and any aerobic-type activities such as running or exercise classes or shoveling snow.
5. You will be given ice packs to place on the biopsy site for comfort following the procedure. Feel free to use them as needed over the next day or so. (Hint: Frozen vegetables work in a pinch but do remember to protect your skin).
6. The morning after the biopsy, remove the paper tape and gauze, baby oil or taking it off in the shower helps remove the tape. but leave the thin steri-strips on for 5 days
7. If you feel any burning or itching of the skin around the skin nick you may be experiencing an allergy to the Steri-strips. Please remove them. Keep the area clean and dry. Replace the strips with clean gauze or a Band-Aid if needed.
8. The Steri-strips otherwise can be removed after 5 days
9. We will ask you NOT to shower until the next day after your biopsy due to the risk of infection. No swimming, tub baths or hot tubs for a week.

Potentially concerning symptoms:

If you have any of the following symptoms, please call the DHMC Breast Imaging Center at **(603) 650-4473** between the hours of 8:00am and 4:00pm, Monday through Friday. After hours: Call 603-650-5000 and ask to speak with the radiology Resident on Call.

- A lump that develops after the procedure and continues to grow.
- Active bleeding (i.e., bright red blood that soaks the bandage) from the biopsy area.
- Redness or discharge around the biopsy area or fever.

If you have continued active bleeding and are unable for some reason to contact us, please go to your nearest emergency room and bring this letter with you.

Dartmouth-Hitchcock Medical Center,
Division of Breast Imaging
March

22, 2019

APPENDIX 6: 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.

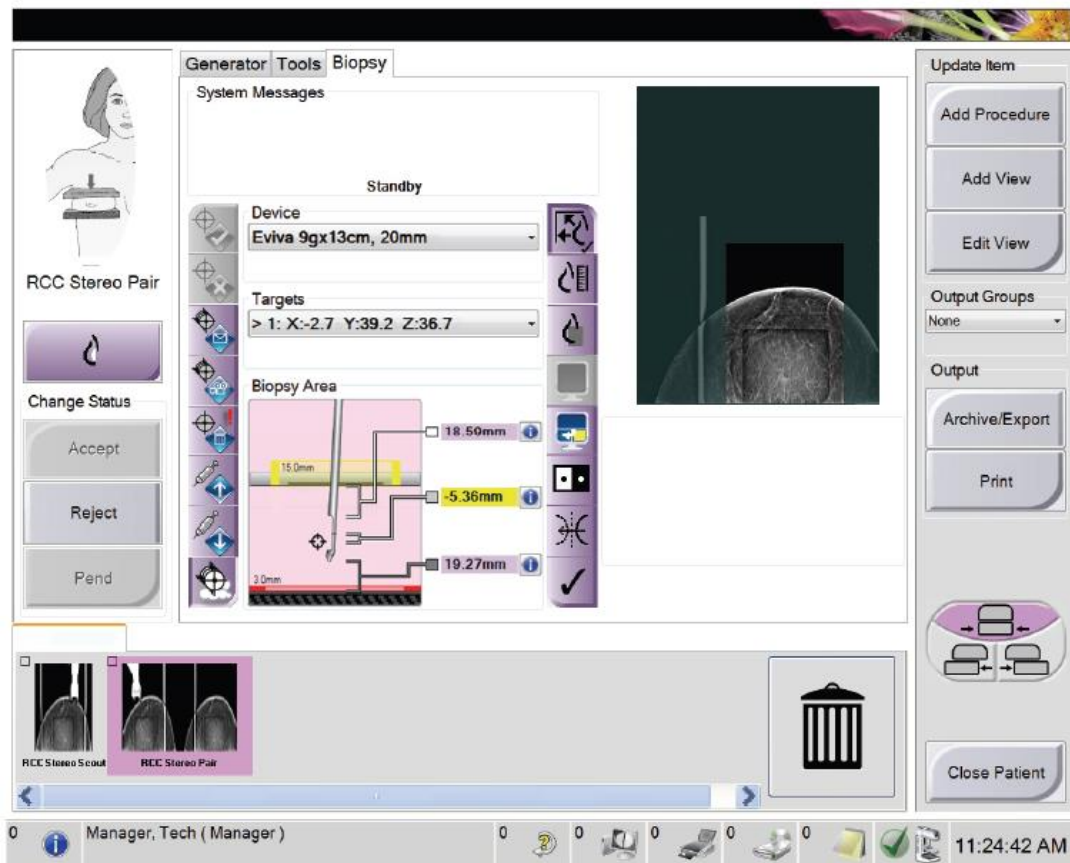
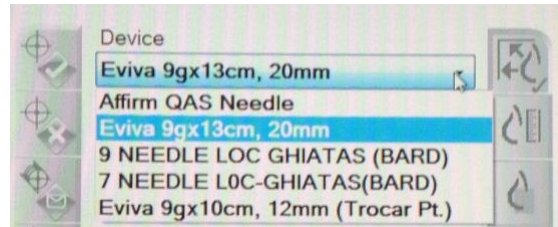
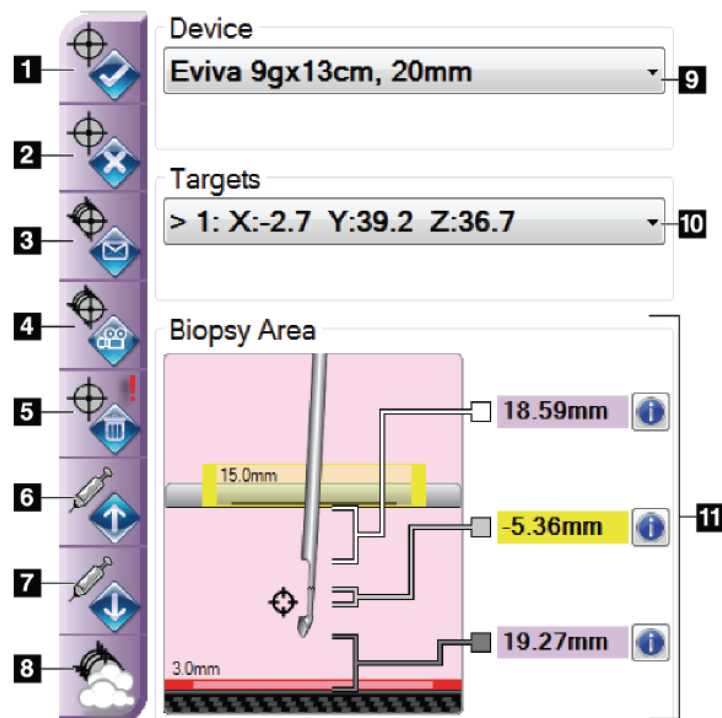


Figure 27: The Biopsy Tab

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.

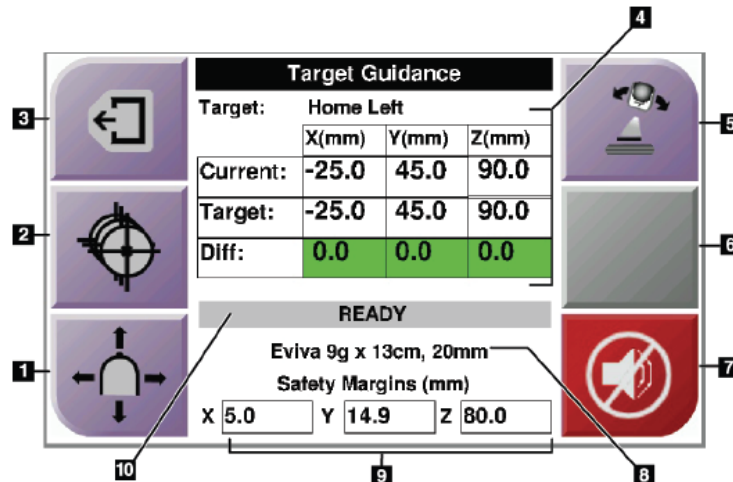


Figure 14: Target Guidance Screen

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 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.

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

APPENDIX 7: CURRICULUM

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 legislation
- 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 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 1 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 1 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 1 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

Dr. Lewis

March 5, 2023

APPENDIX 8: ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPAS) AND RESOURCES

EPA1A-BR SCREENING MAMMOGRAPHY

Description of Activity	<p>A radiologist involved in breast imaging must be able to identify abnormalities on screening examinations while adhering to Mammography Quality Standards Act and Program (MQSA) and determine the next steps in patient management.</p> <p>The key function which define this EPA in regards breast screening examinations include:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lists indications for each screening modality^{1,12,13} <input type="checkbox"/> Understand technique, patient positioning, standard imaging views and study protocol^{1,17,19,20,21} <input type="checkbox"/> Differentiate technically adequate and inadequate studies¹ <input type="checkbox"/> Differentiate benign findings from those that warrant additional work-up^{6,9,21} <input type="checkbox"/> Identify imaging artifacts and explain methods for correction^{4,13} <input type="checkbox"/> Identify the normal and abnormal appearance of the breast after surgical procedures (reduction, augmentation, implants, breast conserving therapy, or mastectomy)^{B,D,E,16} <input type="checkbox"/> Demonstrate the correct use of the BI-RADS lexicon terminology pertinent to the examination including assessment/management categories^{A,1,6,9} <input type="checkbox"/> Report and communicate results with the patient, referring physician (including primary physician, oncologist, surgeon), and staff when indicated^{F,11} <p>The key functions in regards to screening mammography include:</p> <ul style="list-style-type: none"> • Explain ACR/SBI screening mammography guidelines and how they vary from USPSTF guidelines (starting age, interval, etc, why different recommendations, general statistics)^{2,3,12} • Recognize the 4 breast density parenchymal patterns^{C,7,8,18,22} • Describe essential components of the mammogram report • Identify findings that warrant additional work-up (masses, calcifications, architectural distortion, asymmetries, focal asymmetries, global asymmetry, developing asymmetry, and abnormal lymph nodes)^{6,9,10,21,23} <ul style="list-style-type: none"> • Explain additional imaging needed in the diagnostic setting^{3,5,21}
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	<ul style="list-style-type: none"> • Identify the normal and abnormal appearance of the breast after surgical procedures (augmentation, reduction, lift, implants; breast conserving therapy)^{D,E,16} • Identify artifacts on mammography and determine how to correct^{4,13} • *Counsel patients and referring physicians about supplemental screening modalities (US, MRI)^{F,G,12} • Understand the basic requirements of the MQSA as it pertains to screening mammography^{14,15}
	<ul style="list-style-type: none"> • *Calculate basic screening mammography audit metrics including recall rate, positive predictive value 1 (PPV1), and cancer detection rate^{14,15} • Understand QA/QC requirements of analog and digital mammography⁴ <p>Superscript indicate resources below which address the key function</p> <p>Context: Outpatient imaging center</p> <p>Targeted transition point: Depending on the institution - First month for screening mammography, second month for ultrasound, third month for MRI. Items marked * may be more suitable for month 3 of mini-fellowship or fellowship for some programs</p>
Mapping to Domains of Competence	<p><input checked="" type="checkbox"/> Patient Care</p> <p><input checked="" type="checkbox"/> Medical Knowledge</p> <p><input checked="" type="checkbox"/> Systems-Based Practice</p> <p><input checked="" type="checkbox"/> Practice-Based Learning and Improvement</p> <p><input checked="" type="checkbox"/> Professionalism</p> <p><input checked="" type="checkbox"/> Interpersonal and Communication Skills</p>

Competencies within each domain critical to entrustment decisions	PC1: Reporting PC2: Clinical Consultation PC3: Image Interpretation MK1: Diagnostic Knowledge MK2: Physics MK4: Imaging Technology and Image Acquisition SBP6: Radiation Safety SBP8: Informatics P2: Accountability/Conscientiousness P3: Self-Awareness and Help Seeking ICS1: Patient- and Family-Centered Communication ICS2: Interprofessional and Team Communication
Suggested Resources (A) Article (B) Book Chapter (D) Document (S) Slides (W) Widget - interactive powerpoint (V) Video	<ul style="list-style-type: none"> A. A Pictorial Review of Changes in BI-RADS 5th Edition (A) Slide B. Update on Imaging of the Postsurgical Breast (A) C. Hormonal Effects on Breast Density, Fibroglandular Tissue, and Background Parenchymal Enhancement (A) D. Imaging of Breast Implant-associated Complications and Pathologic Conditions: Breast Imaging (A) E. Breast Reconstruction: Review of Surgical Methods and Spectrum of Imaging Findings (A) F. Maximizing Value Through Innovations in Radiologist-Driven Communications in Breast Imaging (A) G. Training and Standards for Performance, Interpretation, and Structured Reporting for Supplemental Breast Cancer Screening (A) <p>Mammography</p> <ol style="list-style-type: none"> 1. Screening Mammography - Presentation (V)

	<ol style="list-style-type: none"> 2. Screening and Diagnostic DBT SBI White Paper (A) 3. ACR Practice Guideline for Screening and Diagnostic Mammography (A) 4. Optimizing Digital Mammographic Image Quality for Full-Field Digital Detectors: Artifacts Encountered during the QC Process (A) 5. Digital Breast Tomosynthesis in the Diagnostic Setting: Indications and Clinical Applications (A) 6. Developing Asymmetries at Mammography: A Multimodality Approach to Assessment and Management (A) 7. Mammographic Breast Density: Impact on Breast Cancer Risk and Implications for Screening (A) 8. Breast Density: Clinical Implications and Assessment Methods (A) 9. Interpreting One-View Mammographic Findings: Minimizing Callbacks While Maximizing Cancer Detection (A) 10. Mammographic Signs of Systemic Disease (A) 11. Communication in Breast Imaging: Lessons Learned at Diagnostic Evaluation (A) 12. ACR Appropriateness Criteria Breast Cancer Screening (A) 13. Digital breast tomosynthesis: Image acquisition principles and artifacts (A) 14. National Performance Benchmarks for Modern Screening Digital Mammography: Update from the Breast Cancer Surveillance Consortium (A) 15. Audits, Benchmarks and Performance: What You Need to Know (S) 16. Implants on Breast Mammogram Widget (W) 17. Breast Anatomy Quiz (W) 18. Breast Density Quiz (W) 19. CC Breast Anatomy Interactive tool (W) 20. MLO Breast Anatomy Interactive tool (W) 21. Screening Mammography Need to Know Quick Review Document (D) 22. Breast Density ACR Brochure (D) 23. Introduction to Mammography (V)
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Required knowledge, skills, attitude and behavior, and experience	<p>Knowledge</p> <ul style="list-style-type: none"> • Knowledge of imaging abnormalities on mammography • Knowledge of correct BI-RADS terminology to describe imaging findings. • Knowledge of markers of image quality. <p>Skills</p> <ul style="list-style-type: none"> • Skill in identifying abnormalities on mammography screening exams. • Skill in discussing results of imaging exams with patients, referring physicians, and staff • Professional communication of screening exam results with patients, referring physicians, and staff. <p>Experience</p> <ul style="list-style-type: none"> • Screening mammography: 250-400 screening mammograms
Assessment	<u>Knowledge Assessment:</u>
Information sources to assess progress and ground summative entrustment decision	<p>RadExam Breast EPA1: Screening (under construction) RadExam Breast EPA1: MQSA & Audit (under construction)</p> <p>Review of interpretation of screening mammography with gradual decline in recall rate over time, if available (for example: 1st month: <50%; 2nd month: 30-50%; 3rd month: <30%)</p> <p>5-10 informal case-based discussions per modality with attending radiologist</p>
Entrustment level of supervision to be reached at which stage of training	<p>*Imaging studies should always be overread by an attending physician</p> <p><u>Residents:</u> Indirect supervision (level 3) prior to graduation - ability to identify at least 50% of the abnormalities identified by the attending radiologist</p> <p><u>Mini-fellows:</u> Distant supervision (level 4) prior to graduation - ability to identify 50-75% of the abnormalities identified by the attending radiologist</p> <p><u>Fellows:</u> Trust to perform unsupervised (level 5) or to supervise others (level 6) prior to graduation (ability to identify 75-100% of abnormalities identified by the attending radiologist and ability to teach concepts to residents)</p>
Expiration	<p>1 year after graduation</p>

*Modified from the work of Olle ten Cate, PhD

EPA1B-BR SCREENING ULTRASOUND

Description of Activity	<p>A radiologist involved in breast imaging must be able to identify abnormalities on screening ultrasound examinations and determine the next steps in patient management.</p> <p>The key function which define this EPA in regards to all breast screening examinations include:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lists indications for the screening modality¹ <input type="checkbox"/> Understand technique, patient positioning, standard imaging views and study protocol^{1,4,5,7} <input type="checkbox"/> Differentiate technically adequate and inadequate studies^{1,4,5} <input type="checkbox"/> Differentiate benign findings from those that warrant additional work-up^{C,2,3,4,5} <input type="checkbox"/> Identify imaging artifacts and explain methods for correction^{4,5} <input type="checkbox"/> Identify the normal and abnormal appearance of the breast after surgical procedures (reduction, augmentation, implants, breast conserving therapy, or mastectomy)^{D,E} <input type="checkbox"/> Demonstrate the correct use of the BI-RADS lexicon terminology pertinent to the examination including assessment/management categories^{A,1} <input type="checkbox"/> Report and communicate results with the patient, referring physician (including primary physician, oncologist, surgeon), and staff when indicated^{F,H} <p>The key functions in regards to screening ultrasound include:</p> <ul style="list-style-type: none"> ● Recognize the 3 different background parenchymal echotextures^{C,1,4} ● Differentiate benign findings from those that warrant diagnostic ultrasound work-up (cyst, mass)^{C,E,3,4,7} ● Correlate ultrasound findings with mammography^{4,7} ● Demonstrate understanding of ultrasound settings to optimize image quality^{4,5} ● Identify imaging artifacts and explain methods for correction⁵ <p>Superscript indicate resources below which address the key function</p> <p>Context: Outpatient imaging center</p> <p>Targeted transition point:</p>
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	Depending on the institution - First month for screening mammography, second month for ultrasound, third month for MRI. Items marked * may be more suitable for month 3 of mini-fellowship or fellowship for some programs
Mapping to	<u>X</u> Patient Care
Domains of Competence	<u>X</u> Medical Knowledge <u>X</u> Systems-Based Practice <u>X</u> Practice-Based Learning and Improvement <u>X</u> Professionalism <u>X</u> Interpersonal and Communication Skills
Competencies within each domain critical to entrustment decisions	PC1: Reporting PC2: Clinical Consultation PC3: Image Interpretation MK1: Diagnostic Knowledge MK2: Physics MK3: Protocol Selection and Contrast Agent Selection/Dosing MK4: Imaging Technology and Image Acquisition SBP3: System Navigation for Patient-Centered Care SBP6: Radiation Safety SBP8: Informatics PBLI1: Evidenced-Based and Informed Practice PBLI2: Reflective Practice and Commitment to Professional Growth P1: Professional Behavior and Ethical Principles P2: Accountability/Conscientiousness ICS1: Patient- and Family-Centered Communication ICS2: Interprofessional and Team Communication ICS3: Communication with Health Care Systems

<p>Suggested Resources</p> <p>(A) Article (B) Book Chapter (D) Document (S) Slides (W) Widget - interactive powerpoint (V) Video</p>	<p>All</p> <ol style="list-style-type: none"> A. A Pictorial Review of Changes in BI-RADS 5th Edition (A) Slides B. Update on Imaging of the Postsurgical Breast (A) C. Hormonal Effects on Breast Density, Fibroglandular Tissue, and Background Parenchymal Enhancement (A) D. Imaging of Breast Implant-associated Complications and Pathologic Conditions: Breast Imaging (A) E. Breast Reconstruction: Review of Surgical Methods and Spectrum of Imaging Findings (A) F. Maximizing Value Through Innovations in Radiologist-Driven Communications in Breast Imaging (A) G. Training and Standards for Performance, Interpretation, and Structured Reporting for Supplemental Breast Cancer Screening (A) H. Communication in Breast Imaging: Lessons Learned at Diagnostic Evaluation (A) <p>Ultrasound</p> <ol style="list-style-type: none"> 1. ACR Practice Guideline for Breast Ultrasound (A) 2. US Evaluation of Abnormal Axillary Lymph Nodes (S) 3. Distinguishing Breast Skin Lesions from Superficial Breast Parenchymal Lesions: Diagnostic Criteria, Imaging Characteristics, and Pitfalls (A) 4. Breast Ultrasonography: State of the Art (A) 5. Artifacts and Pitfalls in Sonographic Imaging of the Breast (A) 6. Screening Breast Ultrasound: Past, Present, and Future (A)
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	<p>7. Approach to Ultrasound (S)</p>
<p>Required knowledge, skills, attitude and behavior, and experience</p>	<p>Knowledge</p> <ul style="list-style-type: none"> • Knowledge of imaging abnormalities on ultrasound. • Knowledge of correct BI-RADS terminology to describe imaging findings. • Knowledge of markers of image quality. <p>Skills</p> <ul style="list-style-type: none"> • Skill in identifying abnormalities on breast screening exams. • Skill in discussing results of imaging exams with patients, referring physicians, and staff • Professional communication of screening exam results with patients, referring physicians, and staff. <p>Experience</p> <ul style="list-style-type: none"> • Screening ultrasound: 10-50 screening ultrasounds * institution specific

Assessment Information sources to assess progress and ground summative entrustment decision	<u>Knowledge Assessment:</u> RadExam Breast EPA1: Screening (under construction) Review of interpretation of screening ultrasound 5-10 informal case-based discussions per modality with attending radiologist
Entrustment level of supervision to be reached at which stage of training	*Imaging studies should always be overread by an attending physician <u>Residents:</u> Indirect supervision (level 3) prior to graduation - ability to identify at least 50% of the abnormalities identified by the attending radiologist <u>Mini-fellows:</u> Distant supervision (level 4) prior to graduation - ability to identify 50-75% of the abnormalities identified by the attending radiologist <u>Fellows:</u> Trust to perform unsupervised (level 5) or to supervise others (level 6) prior to graduation (ability to identify 75-100% of abnormalities identified by the attending radiologist and ability to teach concepts to residents)
Expiration	1 year after graduation

*Modified from the work of Olle ten Cate, PhD

EPA1C-BR SCREENING MRI

Description of Activity	<p>A radiologist involved in breast imaging must be able to identify abnormalities on screening MRI examinations and determine the next steps in patient management.</p> <p>The key function which define this EPA in regards to all breast examinations include:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lists indications for breast MRI^{A,2,8} <input type="checkbox"/> Understand technique, patient positioning, standard imaging views and study protocol¹ <input type="checkbox"/> Differentiate technically adequate and inadequate studies¹ <input type="checkbox"/> Differentiate benign findings from those that warrant additional work-up^{D,E,F,3,4,5} <input type="checkbox"/> Identify imaging artifacts and explain methods for correction⁶ <input type="checkbox"/> Identify the normal and abnormal appearance of the breast after surgical procedures (reduction, augmentation, implants, breast conserving therapy, or mastectomy)^{E,F} <input type="checkbox"/> Demonstrate the correct use of the BI-RADS lexicon terminology pertinent to the examination including assessment/management categories^{A,7} <input type="checkbox"/> Report and communicate results with the patient, referring physician (including primary physician, oncologist, surgeon), and staff when indicated^G <p>The key functions in regards to screening breast MRI include:</p> <ul style="list-style-type: none"> • Protocol breast MRI exams for technique (e.g. use of contrast)^{1,2} • Differentiate benign from suspicious abnormalities on breast MRI including masses, non-mass enhancement, postoperative findings, and lymph nodes^{D,E,F,3,5,8} • Correlate MRI findings with recent mammogram and ultrasound to determine which abnormalities require biopsy, follow-up, or additional imaging^{3,4} • Identify imaging artifacts and explain methods for correction⁶ <p>Superscript indicate resources below which address the key function</p> <p>Context: Outpatient imaging center</p> <p>Targeted transition point: Depending on the institution - First month for screening mammography, second month for ultrasound, third month for MRI. Items marked * may be more suitable for month 3 of mini-fellowship or fellowship for some programs</p>
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Mapping to Domains of Competence	<p><u>X</u> Patient Care</p> <p><u>X</u> Medical Knowledge</p> <p><u>X</u> Systems-Based Practice</p> <p><u>X</u> Practice-Based Learning and Improvement</p> <p><u>X</u> Professionalism</p> <p><u>X</u> Interpersonal and Communication Skills</p>
Competencies within each domain critical to entrustment decisions	<p>PC1: Reporting</p> <p>PC2: Clinical Consultation</p> <p>PC3: Image Interpretation</p> <p>MK1: Diagnostic Knowledge</p> <p>MK2: Physics</p> <p>MK3: Protocol Selection and Contrast Agent Selection/Dosing</p> <p>MK4: Imaging Technology and Image Acquisition</p> <p>SBP1: Patient Safety</p> <p>SBP5: Contrast Agent Safety</p> <p>SBP7: Magnetic Resonance (MR) Safety</p> <p>SBP8: Informatics</p> <p>PBL1: Evidenced-Based and Informed Practice</p> <p>PBL2: Reflective Practice and Commitment to Professional Growth</p> <p>P2: Accountability/Conscientiousness</p> <p>ICS1: Patient- and Family-Centered Communication</p> <p>ICS2: Interprofessional and Team Communication</p> <p>ICS3: Communication with Health Care Systems</p>

<p>Suggested Resources</p> <p>(A) Article (B) Book Chapter (D) Document (S) Slides (W) Widget - interactive powerpoint (V) Video</p>	<ul style="list-style-type: none"> A. A Pictorial Review of Changes in BI-RADS 5th Edition _ (A) Slide _ s B. Update on Imaging of the Postsurgical Breast (A) C. American Joint Committee on Cancer's Staging System for Breast Cancer, Eighth Edition: What the Radiologist Needs to Know _ (A) D. Hormonal Effects on Breast Density, Fibroglandular Tissue, and Background Parenchymal Enhancement _ (A) E. Imaging of Breast Implant-associated Complications and Pathologic Conditions: Breast Imaging (A) F. Breast Reconstruction: Review of Surgical Methods and Spectrum of Imaging Findings _ (A) G. Maximizing Value Through Innovations in Radiologist-Driven Communications in Breast Imaging (A) H. Training and Standards for Performance, Interpretation, and Structured Reporting for Supplemental Breast Cancer Screening (A) I. Imaging the Axilla Widget _ (W) <p>MRI</p> <ul style="list-style-type: none"> 1. Positioning in Breast MR Imaging to Optimize Image Quality _ (A) 2. ACR Practice Guideline for Breast MRI _ (A) 3. Breast MR Imaging for Equivocal Mammographic Findings: Help or Hindrance? (A)
	<ul style="list-style-type: none"> 4. Second-Look US: How to Find Breast Lesions with a Suspicious MR Imaging Appearance (A) 5. MR Imaging Assessment of the Breast after Breast Conservation Therapy: Distinguishing Benign from Malignant Lesions _ (A) 6. Recognizing Artifacts and Optimizing Breast MRI at 1.5 and 3T (A) 7. Auditing a Breast MRI Practice: Performance Measures for Screening and Diagnostic Breast MRI _ (A) 8. MRI of the Breast and Emerging Technologies _ (A)

Required knowledge, skills, attitude and behavior, and experience	<p>Knowledge</p> <ul style="list-style-type: none"> • Knowledge of imaging abnormalities on MRI. • Knowledge of correct BI-RADS terminology to describe imaging findings. • Knowledge of markers of image quality. <p>Skills</p> <ul style="list-style-type: none"> • Skill in identifying abnormalities on breast screening exams. • Skill in discussing results of imaging exams with patients, referring physicians, and staff • Professional communication of screening exam results with patients, referring physicians, and staff. <p>Experience</p> <ul style="list-style-type: none"> • Screening MRI: 20-50 screening MRIs
Assessment Information sources to assess progress and ground summative entrustment decision	<p><u>Knowledge Assessment:</u> RadExam Breast EPA1: Screening (under construction)</p> <p>Review of interpretation of screening MRI</p> <p>5-10 informal case-based discussions per modality with attending radiologist</p>
Entrustment level of supervision to be reached at which stage of training	<p>*Imaging studies should always be overread by an attending physician</p> <p><u>Residents:</u> Indirect supervision (level 3) prior to graduation - ability to identify at least 50% of the abnormalities identified by the attending radiologist</p> <p><u>Mini-fellows:</u> Distant supervision (level 4) prior to graduation - ability to identify 50-75% of the abnormalities identified by the attending radiologist</p> <p><u>Fellows:</u> Trust to perform unsupervised (level 5) or to supervise others (level 6) prior to graduation (ability to identify 75-100% of abnormalities identified by the attending radiologist and ability to teach concepts to residents)</p>
Expiration	<p>1 year after graduation</p>

*Modified from the work of Olle ten Cate, PhD

EPA2-BR DIAGNOSTIC MAMMOGRAPHY

<p>Description of Activity</p> <p>2b. Symptomatic patients are patients who present with: a palpable breast mass, palpable axillary mass, breast pain, nipple discharge, nipple changes, inflamed breast. The patient population includes pregnant and lactating women, men, and children.</p>	<p>A breast imaging radiologist is able to work-up abnormalities detected on screening mammography and determine whether additional mammography or sonography, alone or in conjunction, may be indicated for evaluation. Similarly, when a patient presents with a breast symptom, a radiologist must be able to determine the appropriate sequence and type of imaging evaluation and when biopsy is necessary.</p> <p>Once diagnostic imaging is complete, the appropriate BIRADS assessment must be determined along with management. The physician must be able to clearly and effectively convey the results and recommendations to the referring clinician and patient, using layman's terms when appropriate to increase understanding without raising alarm.^{27,28}</p> <p>The key functions which define this EPA include:</p> <ul style="list-style-type: none"> ● Determine which mammographic and/or sonographic views are indicated to evaluate an abnormal finding on screening mammography (technical recall, calcifications, asymmetry, focal asymmetry, mass, architectural distortion).^{1-6, 7-13} ● Differentiate benign, probably benign, suspicious and malignant findings on mammography and sonography and determine appropriate management.^{1-6, 7-13} ● Correlate ultrasound findings with screening mammography.^{7,8,10-12} ● Understand age and gender appropriate sequential imaging work-up for a male or female presenting with a breast symptom(s) and how that differs if patient is pregnant or breastfeeding. Symptoms include: <ul style="list-style-type: none"> ○ Palpable breast or axillary mass^{2,14} ○ Breast pain¹⁶ ○ Nipple discharge & changes (recognize key history and clinical findings that suggest benign or malignant etiology)¹⁷ ○ Inflamed breast^{18, 20-23} ● Differentiate mammographic and sonographic findings that are benign, probably benign, suspicious and malignant, including but not limited to: <ul style="list-style-type: none"> ○ Inflammatory breast cancer from abscess^{14,15,18} ○ Gynecomastia from male breast cancer^{22, 24-26} ● Manage focal symptoms when there is no associated imaging finding^{5,14}
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	<ul style="list-style-type: none"> • Recommend the appropriate modality for biopsy of suspicious findings^{6,8,14,16,17,19,24} • Identify when surgical referral is needed⁶ • Apply evidence based medicine to patient care^{6,8,16,17,19,24} • Display professional and compassionate communication with the patient, ordering physician, and ancillary staff and document in medical record when appropriate^{27,28} <p>Superscript indicate resources below which address the key function</p> <p>Context: outpatient imaging center</p> <p>Targeted transition point: third month rotation on breast imaging</p>
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<p>Suggested Resources</p> <p>(A) Article (B) Book Chapter (D) Document (S) Slides (W) Widget - interactive powerpoint (V) Video</p>	<p>The BIRADS Atlas should be a go to resource for this section A Pictorial Review of Changes in BI-RADS 5th Edition BIRADS Widget (W)</p> <p>Mammography</p> <ol style="list-style-type: none"> 1. Calcifications <ol style="list-style-type: none"> a. Segmental breast calcifications (A) b. Breast calcifications – the focal group (A) c. Linear breast calcifications (A) d. Breast Calcifications Morphology interactive tool (W) e. Breast Calcification Distribution interactive tool (W) f. Calcifications at Digital Breast Tomosynthesis: Imaging Features and Biopsy Techniques (A) 2. Masses <ol style="list-style-type: none"> a. Breast Lesion Localization Mammography Widget (W) b. Cystic masses of the breast(A) 3. Asymmetries <ol style="list-style-type: none"> a. Developing Asymmetries at Mammography: A Multimodality Approach to Assessment and Management (A) b. Interpreting One-View Mammographic Findings: Minimizing Callbacks While Maximizing Cancer Detection (A) 4. Architectural distortion <ol style="list-style-type: none"> a. Tomosynthesis-detected Architectural Distortion: Management Algorithm with Radiologic-Pathologic Correlation (A) b. Architectural Distortion of the Breast (A) c. Spectrum of diseases presenting as architectural distortion on mammography: multimodality radiologic imaging with pathologic correlation (A) d. The postconservation breast: Part 1, Expected imaging findings (A) e. The postconservation breast: part 2, Imaging findings of tumor recurrence and other long-term sequelae. (A) 5. Diagnostic work-up <ol style="list-style-type: none"> a. Rolled Views Mammography Widget (W)
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	<p>b. Mammographic Projection and Breast Lesion Localization (animated S)</p> <p>6. Miscellaneous</p> <p>a. ACR Practice Guideline for Screening and Diagnostic Mammography (D)</p> <p>b. Digital Breast Tomosynthesis in the Diagnostic Setting: Indications and Clinical Applications (A)</p> <p>c. Mammographic Signs of Systemic Disease (A)</p> <p>d. Breast Reconstruction: Review of Surgical Methods and Spectrum of Imaging Findings (A)</p> <p>e. Assessment and Management of Challenging BI-RADS Category 3 Mammographic Lesions (A)</p> <p>f. Utility of Breast MRI for Further Evaluation of Equivocal Findings on Digital Breast Tomosynthesis (A)</p> <p>Ultrasound</p> <p>7. Breast Masses on Ultrasound Widget (W)</p> <p>8. ACR Practice Guideline for Breast Ultrasound (D)</p> <p>9. US Evaluation of Abnormal Axillary Lymph Nodes (A)</p> <p>10. Distinguishing Breast Skin Lesions from Superficial Breast Parenchymal Lesions: Diagnostic Criteria, Imaging Characteristics, and Pitfalls (A)</p> <p>11. Breast Ultrasonography: State of the Art (A)</p> <p>12. Artifacts and Pitfalls in Sonographic Imaging of the Breast (A)</p> <p>13. Echogenic breast masses at US: to biopsy or not to biopsy? (A)</p> <p>Symptomatic breast</p> <p>14. Palpable breast or axillary mass</p> <p>a. Imaging Management of Palpable Breast Abnormalities (A)</p> <p>b. ACR Appropriateness Criteria Palpable Breast Masses (A)</p> <p>15. Pregnant Patient</p> <p>a. Breast Imaging of the Pregnant and Lactating Patient: Imaging Modalities and Pregnancy-Associated Breast Cancer (A)</p> <p>b. Breast Imaging of the Pregnant and Lactating Patient: Physiologic Changes and Common Benign Entities (A)</p> <p>16. Breast pain</p> <p>a. ACR Appropriateness Criteria Breast Pain (D)</p> <p>17. Nipple discharge & changes</p> <p>a. ACR Appropriateness Criteria Nipple Discharge (D)</p> <p>b. Nipple-Areolar Complex: Normal Anatomy and Benign and Malignant Processes (D)</p> <p>c. Imaging approaches to diagnosis and management of common ductal abnormalities</p>
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18. Inflamed breast

- a. [What Radiologists Need to Know about Diagnosis and Treatment of Inflammatory Breast Cancer: A Multidisciplinary Approach](#) (A)

	<p>b. Infections in the breast – common imaging presentations and mimics (A)</p> <p>c. Uncommon infections in the breast (A)</p> <p>19. Pediatric patient</p> <p>a. Pediatric and Adolescent Breast Masses: A review of pathophysiology, imaging, diagnosis and treatment (A)</p> <p>20. Breast Emergencies: Types, Imaging Features, and Management _ (A)</p> <p>21. Emergency Breast Video Module (V)</p> <p>22. Breast Masses in Men, Transgender, Pregnant & Post-partum powerpoint _ (S)</p> <p>23. Nonpuerperal Mastitis and Subareolar Abscess of the Breast _ (A)</p> <p>Male Breast</p> <p>24. ACR Appropriateness Criteria Evaluation of the symptomatic male breast _ (A)</p> <p>25. Male Breast - Presentation _ (S)</p> <p>26. From the Radiologic Pathology Archives: Diseases of the Male Breast: Radiologic-Pathologic Correlation _ (A)</p> <p>Communication</p> <p>27. Communication in Breast Imaging: Lessons Learned at Diagnostic Evaluation _ (A)</p>
Mapping to Domains of Competence	<p><input checked="" type="checkbox"/> Patient Care</p> <p><input checked="" type="checkbox"/> Medical Knowledge</p> <p><input checked="" type="checkbox"/> Systems-Based Practice</p> <p><input checked="" type="checkbox"/> Practice-Based Learning and Improvement</p> <p><input checked="" type="checkbox"/> Professionalism</p> <p><input checked="" type="checkbox"/> Interpersonal and Communication Skills</p>

Competencies within each domain critical to entrustment decisions	PC1: Reporting PC2: Clinical Consultation PC3: Image Interpretation MK1: Diagnostic Knowledge MK2: Physics MK3: Protocol Selection and Contrast Agent Selection/Dosing MK4: Imaging Technology and Image Acquisition SBP1: Patient Safety SBP3: System Navigation for Patient-Centered Care SBP6: Radiation Safety SBP8: Informatics PBL11: Evidenced-Based and Informed Practice PBL12: Reflective Practice and Commitment to Professional Growth P1: Professional Behavior and Ethical Principles P2: Accountability/Conscientiousness ICS1: Patient- and Family-Centered Communication ICS2: Interprofessional and Team Communication
	ICS3: Communication with Health Care Systems
Required knowledge, skills, attitude and behavior, and experience	Knowledge <ul style="list-style-type: none"> • Knowledge of breast and axillary anatomy on imaging • Ability to synthesize Imaging findings on multiple modalities • Basic knowledge of indications for and technique of image-guided biopsies Skill <ul style="list-style-type: none"> • Recognize imaging findings of benign and malignant breast disease on mammography and ultrasound • Request appropriate additional imaging, such as additional mammographic projections and ultrasound, as needed • Generate concise and accurate reports of pertinent findings on imaging Attitude and Behavior <ul style="list-style-type: none"> • Professional communication with patient, colleagues, and referring physicians • Recognize limits and know when to ask colleague for assistance Experience <ul style="list-style-type: none"> • Work up of a minimum of 20-50 abnormal screening mammograms and 10-30 symptomatic women

Assessment Information sources to assess progress and ground summative entrustment decision	<u>Knowledge Assessment:</u> RadExam Breast EPA2: Diagnostic Work-up (under construction) Case-based discussion of a minimum of 30-80 total cases with gradually increasing independence
Entrustment level of supervision to be reached at which stage of training	Residents: Indirect supervision (level 3) prior to graduation Mini-fellows: Distant supervision (level 4) prior to graduation Fellows: Able to perform unsupervised (level 5) or supervise others (level 6) prior to graduation
Expiration	1 year after graduation

*Modified from the work of Olle ten Cate, PhD

EPA3-BR: BREAST PROCEDURES

Description of Activity	<p>A key role of breast imaging radiologists is to accurately perform image-guided procedures by means of stereotactic, ultrasound and MRI guidance (those with fellowship training) from pre-procedure planning and execution to post-procedure follow-up, including radiologic-pathologic concordance.</p> <p>The key functions which define this EPA include:</p> <ul style="list-style-type: none"> ● Understand indications/contraindications for each case^{1,2,3} ● Determine appropriate patient positioning and biopsy approach^{1,2,3} ● Obtain informed consent² ● Display technical skills with guidance modality and procedure equipment while using sterile technique⁴⁻¹⁷ <ul style="list-style-type: none"> ○ Understand the physics behind 2D and 3D guided stereotactic biopsy^{3,4,5,6,7} ○ Determine appropriate adjustments when encountering technical limitations (needle repositioning, machine errors)^{1,4,5,6,16} ● Procure a sufficient sample and properly label the specimen^{2,23} ● Determine if the sample is adequate prior to clip placement/procedure termination²⁵ ● Provide appropriate post-biopsy care to obtain hemostasis^{2,18-20} ● Document procedural report including pathology addenda into the electronic medical record² ● Determine, communicate and document radiology-pathology concordance and post-procedural management^{2,21,22} ● Recognize symptoms and clinical signs of post-biopsy complications (infection, hematoma, expanding hematoma/continued bleeding from the puncture site, allergic reaction, milk fistula) and determine appropriate management¹⁸⁻²⁰ ● Display professional and compassionate communication with the patient, ordering physician, and ancillary staff and document in the medical record when appropriate²⁶⁻²⁸ <p>Superscript indicate resources below which address the key function</p> <p>Context: Outpatient clinic, hospital Targeted transition point: Third-month rotation in training</p>
Suggested	<p>1. Troubleshooting to Overcome Technical Challenges in Image-guided</p>

Resources

(A) Article
(B) Book Chapter
(D) Document
(S) Slides
(W) Widget -
interactive
powerpoint
(V) Video

[Breast Biopsy](#) (A)

2. [Breast Intervention: How I do It](#) (A)
3. [SBI : Breast Biopsy: Beyond the Basics](#) (S)

Stereotactic/Tomosynthesis biopsy

4. [Breast Stereo Pairs Widget](#) (W)
5. [Tomosynthesis guided biopsy](#) (A)
6. [Calcifications at Digital Breast Tomosynthesis: Imaging Features and Biopsy Techniques](#) (A)
7. [Comparison of Upright Digital Tomosynthesis-guided versus Prone Stereotactic Vacuum-assisted Breast Biopsy](#) (A)
8. [Upright Stereo Mammotome](#) (V)
[Prone Stereotactic biopsy](#) (V)
[Tomosynthesis guided biopsy](#) (V)

Ultrasound biopsy

9. [Centering on a lesion on US breast biopsy](#) (V)
10. [Biopsy deep breast lesions](#) (V)
11. [Concordant or Discordant? Imaging-Pathology Correlation in a Sonography Guided Core Needle Biopsy of Breast Lesion](#) (A)
12. [Imaging-Histological Discordance after Sonographically Guided Percutaneous Breast Core Biopsy](#) (A)
13. [A Novel technique for teaching Challenging Ultrasound Breast Biopsies to Radiology Residents](#) (A)
14. US guided Procedure Videos (V)
 - a. [Positioning](#)
 - b. [Preparation](#)
 - c. [Basic core biopsy technique](#)
 - d. [Tips and tricks 1](#)
 - e. [Tips and tricks 2](#)
 - f. [Tips and tricks 3](#)
 - g. [NLOC techniques](#)
 - h. [Vacuum needle techniques](#)

MRI biopsy

15. [MRI Breast Biopsy Challenges](#) (W)
16. [Manual targeting Breast MRI Biopsies](#) (W)
17. MRI Guided Biopsy (V)
 - a. [General Concepts](#)
 - b. [Basic Biopsy Technique](#)
 - c. [Tips and Tricks: Preparation to Biopsy](#)
 - d. [Tips and Tricks: Equipment](#)
 - e. [Tips and Tricks:Targeting](#)

Biopsy Complications

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| | <ol style="list-style-type: none">18. Breast Emergencies: Types, Imaging Features, and Management (A)19. Breast Emergencies and Guide to Management20. A Pictorial Review of Breast Biopsy Complications (S) |
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	<p>Radiology/Pathology Concordance (or we can put this in each respective section)</p> <ol style="list-style-type: none"> 21. Pathologists and Radiologists Stress Concordance Between Imaging and Lab (A) 22. Tomosynthesis Detected Architectural Distortion: Management Algorithm with Rad-Path Correlation (A) 23. Core Needle of the Breast; Updates (S) 24. Triple-Negative Breast Cancer: Correlation between MR Imaging and Pathologic Findings (A) 25. Fibrous Lesions of the Breast: Imaging-Pathologic Correlation (A) <p>Communication</p> <ol style="list-style-type: none"> 26. Patient Anxiety Before and Immediately After Imaging-Guided Breast Biopsy Procedures: Impact of Radiologist-Patient Communication (A) 27. Breaking Bad News (A) 28. Breaking Bad News: A Primer for Radiologist in Breast Imaging Setting (A)
Mapping to Domains of Competence	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Patient Care <input checked="" type="checkbox"/> Medical Knowledge <input checked="" type="checkbox"/> Systems-Based Practice <input checked="" type="checkbox"/> Practice-Based Learning and Improvement <input checked="" type="checkbox"/> Professionalism <input checked="" type="checkbox"/> Interpersonal and Communication Skills

Competencies within each domain critical to entrustment decisions	PC1: Reporting PC2: Clinical Consultation PC3: Image Interpretation PC4: Competence in Procedures MK1: Diagnostic Knowledge MK2: Physics MK3: Protocol Selection and Contrast Agent Selection/Dosing MK4: Imaging Technology and Image Acquisition SBP1: Patient Safety SBP3: System Navigation for Patient-Centered Care SBP4: Physician Role in Health Care Systems SBP5: Contrast Agent Safety SBP6: Radiation Safety SBP7: Magnetic Resonance (MR) Safety SBP8: Informatics PBLI1: Evidenced-Based and Informed Practice PBLI2: Reflective Practice and Commitment to Professional Growth P1: Professional Behavior and Ethical Principles P2: Accountability/Conscientiousness ICS1: Patient- and Family-Centered Communication ICS2: Interprofessional and Team Communication ICS3: Communication with Health Care Systems
Required	<u>Knowledge</u>
knowledge, skills, attitude and behavior, and experience	<ol style="list-style-type: none"> 1. Knowledge of breast and axillary anatomy 2. Ability to synthesize image findings and data prior and during the procedure <u>Skills</u> <ol style="list-style-type: none"> 1. Using necessary devices for biopsy and clip placement 2. Positioning patient appropriately to aide in localization 3. Acquiring proper pre-procedural data (allergies, anticoagulation, etc) 4. Obtaining adequate samples from the target <u>Attitude and Behaviour</u> <ol style="list-style-type: none"> 1. Professional and compassionate communication and behavior with the patient, families, referring physicians and ancillary staff <u>Experience</u> <ol style="list-style-type: none"> 1. All measures completed at least 3-10 times per biopsy approach

Assessment Information sources to assess progress and ground summative entrustment decision	<p><u>Knowledge Assessment:</u> RadExam Breast EPA3: Biopsies (under construction)</p> <p>Observation: satisfactory observation of technical procedure from start (informed consent) to finish (communication of results to patient/ordering physician) at least 5-10 times.</p> <p>10-20 Informal Case-based discussion per modality with an attending radiologist</p>
Entrustment level of supervision to be reached at which stage of training	<p>Residents: Indirect supervision (level 3) prior to graduation Mini-fellows: Distant supervision (level 4) prior to graduation Fellows: Able to execute without supervision (level 5) or supervise others (level 6) prior to graduation</p>
Expiration	<p>One year after completion</p>

*Modified from the work of Olle ten Cate, PhD

EPA4-BR BREAST CANCER STAGING

Description of Activity	<p>Key roles for radiologists involved in breast imaging are to stage and restage breast cancer, both locoregionally and systemically, and to be an imaging consultant to multidisciplinary teams involved in the patient's care.</p> <p>The key functions which define this EPA include:</p> <ul style="list-style-type: none"> ● Perform ultrasound evaluation and biopsy of the axilla for metastatic nodal disease³ <ul style="list-style-type: none"> ○ Describe the 3 surgical levels of axillary lymph nodes^{2,3,4} ○ Recognize findings of abnormal lymphadenopathy ○ Determine when tissue sampling is indicated ○ Apply evidenced based criteria to the evaluation of axillary disease¹ ● Interpret breast MRI scans for multifocal, multicentric, contralateral or locally recurrent disease^{19,20,21,22,23} <ul style="list-style-type: none"> ○ Identify signs of lymphadenopathy (internal mammary and axillary) ○ *Determine when second-look ultrasound, short interval follow up, or MRI guided biopsy are indicated⁹ ○ Recommend the appropriate modality for biopsy of suspicious findings (MR, US, MG) correlating findings with recent imaging¹⁰ ● *Describe key changes in tumor size, node involvement, and metastasis that change cancer staging using National Comprehensive Cancer Network (NCCN) and American Cancer Society (ACS) guidelines⁸ ● Describe the typical appearance of post surgical/radiation changes on mammography, ultrasound and MRI^{11,13,14} ● Differentiate fat necrosis, post-surgical scar or other benign post-treatment change from recurrent disease on mammography, ultrasound and MRI^{11,13,14} ● *Identify typical changes associated with common types of breast reconstruction on mammography and MRI¹³ ● *Evaluate the effects of neoadjuvant chemotherapy by MRI, ultrasound and/or mammography^{15,16} ● *Describe the utility in PET/CT and bone scanning in staging patients with breast cancer⁸ ● *Collaborate with surgeons, radiation therapists, pathologists, oncologists and other specialists involved with the care of the breast cancer patient to define appropriate problem solving imaging strategies^{17,18}
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	<p>Superscript indicate resources below which address the key function</p> <p>Context: Outpatient imaging, ambulatory care, hospital</p> <p>Targeted transition point: Depending on the institution - End of 3rd month of mammography. Items marked * may be more suitable for month 3 of mini-fellowship or fellowship for some programs</p>
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<p>Suggested Resources</p> <p>(A) Article (B) Book Chapter (D) Document (S) Slides (W) Widget - interactive powerpoint (V) Video</p>	<p><u>Breast Cancer Staging</u></p> <ol style="list-style-type: none"> 1. Axillary Staging of Breast Cancer: What the Radiologist Needs to Know (A) 2. Resident and Fellow Education Feature: US Evaluation of Axillary Lymph Nodes (S) 3. Stavros' YouTube US eval of the Axilla (V) 4. Imaging the Axilla Widget (W) 5. American Joint Committee on Cancer Staging System for Breast Cancer, Eighth Edition: What the Radiologist Needs to Know (A) 6. Powerpoint: Breast Cancer workup for Medical Students and Residents (S) 7. What Radiologists Need to Know about Diagnosis and Treatment of Inflammatory Breast Cancer: A Multidisciplinary Approach (A) 8. NCCN breast cancer staging guidelines (need free sign up) 9. MR-Directed ("Second-Look") Ultrasound Examination for Breast Lesions Detected Initially on MRI: MR and Sonographic Findings (A) 10. ACR Practice Parameter for Performance of Contrast Enhanced Magnetic Resonance Imaging (MRI) of the Breast (A) <p><u>Post Surgical Breast</u></p> <ol style="list-style-type: none"> 11. Update on Imaging of the Postsurgical Breast (A) 12. Imaging of Breast Implant-associated Complications and Pathologic Conditions: Breast Imaging (A) 13. Breast Reconstruction: Review of Surgical Methods and Spectrum of Imaging Findings (A) 14. MR Imaging Assessment of the Breast after Breast Conservation Therapy: Distinguishing Benign from Malignant Lesions (A) <p><u>Neoadjuvant Therapy</u></p> <ol style="list-style-type: none"> 15. Imaging Neoadjuvant Therapy Response in Breast Cancer (A) 16. Multimodality Imaging for Evaluating Response to Neoadjuvant Chemotherapy in Breast Cancer (A) <p><u>Multi-disciplinary Team</u></p> <ol style="list-style-type: none"> 17. A Multidisciplinary Approach to the Management of Breast Cancer, Part 1: Prevention and Diagnosis (A) 18. You tube video: Working with breast interdisciplinary teams as a radiologist (V) <p><u>Breast MRI interpretation</u></p>
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	<p>19. You tube video: Breast MRI interpretation (V)</p> <p>20. You tube video: 2013 ACR Bi-RADS for Breast MRI (V)</p> <p>21. Non-mass Enhancement on Breast MRI: Review of Patterns With Radiologic-Pathologic Correlation and Discussion of Management (A)</p> <p>22. You tube video: Breast MRI current uses (V)</p> <p>23. You tube video: Breast MRI Common Findings and cases (V)</p>
Mapping to Domains of Competence	<p><input checked="" type="checkbox"/> Patient Care</p> <p><input checked="" type="checkbox"/> Medical Knowledge</p> <p><input checked="" type="checkbox"/> Systems-Based Practice</p> <p><input checked="" type="checkbox"/> Practice-Based Learning and Improvement</p> <p><input checked="" type="checkbox"/> Professionalism</p> <p><input checked="" type="checkbox"/> Interpersonal and Communication Skills</p>

Competencies within each domain critical to entrustment decisions	PC1: Reporting PC2: Clinical Consultation PC3: Image Interpretation MK1: Diagnostic Knowledge MK3: Protocol Selection and Contrast Agent Selection/Dosing MK4: Imaging Technology and Image Acquisition SBP1: Patient Safety SBP3: System Navigation for Patient-Centered Care SBP4: Physician Role in Health Care Systems SBP5: Contrast Agent Safety SBP6: Radiation Safety SBP7: Magnetic Resonance (MR) Safety SBP8: Informatics PBL11: Evidenced-Based and Informed Practice PBL12: Reflective Practice and Commitment to Professional Growth P1: Professional Behavior and Ethical Principles P2: Accountability/Conscientiousness ICS1: Patient- and Family-Centered Communication ICS2: Interprofessional and Team Communication ICS3: Communication with Health Care Systems
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Required knowledge, skills, attitude and behavior, and experience	<p>Knowledge</p> <ul style="list-style-type: none"> • Knowledge of the normal and abnormal appearance of axillary nodes and on ultrasound, mammography and MRI • Knowledge of the defining criteria for multifocal, multicentric, locally advanced and metastatic disease • Explain how specific imaging findings may impact surgical and medical approaches to management • Knowledge of the role of auxiliary imaging studies eg PET, CT for staging <p>Skill</p> <ul style="list-style-type: none"> • Identifying findings on MRI, ultrasound and mammography that indicate more extensive or recurrent disease • Interpreting imaging findings that indicate treatment response • Identifying typical treatment changes • Synthesizing current and previous imaging findings into an assessment of patient's stage and further potential imaging options <p>Attitude and behavior</p> <ul style="list-style-type: none"> • Professional communication with patients and multiple providers • Ability to present imaging data concisely and coherently in a multidisciplinary conference setting • Willingness to consult with others on complex cases <p>Experience</p> <ul style="list-style-type: none"> • Independent axillary scanning (>10) • Independent interpretation of follow up mammogram after BCT (>50) • *Independent MRI interpretation of staging studies (>15) • Attendance and observation at multidisciplinary conferences (>5) • *Preparation of cases for multidisciplinary conferences (>5) • *Presenting at multidisciplinary conferences (>2) <p>* Institution specific, as may be more suitable for breast imaging mini-fellows and fellows</p>
Assessment Information sources to assess progress and ground summative entrustment decision	<p><u>Knowledge Assessment:</u> RadExam Breast EPA4: Breast Cancer Management (under construction)</p> <p>Observation of axillary scanning (>10 cases) Reviews of interpretations of staging and follow up imaging studies (>20 cases) Discussion of cases prepared for conference (>5) Observation of multidisciplinary conference presentations(>2)</p> <p>10-20 Informal case-based discussion with attending radiologist (either cases for tumor board or diagnostic mammograms/ultrasound/MRI).</p>

Entrustment level of supervision to be reached at which stage of training	Residents: Indirect supervision (level 3) prior to graduation Mini-fellows: Distant supervision (level 4) prior to graduation Fellows: Able to execute without supervision (level 5) or supervise others (level 6) prior to graduation
Expiration	2 years after graduation

*Modified from the work of Olle ten Cate, PhD

EPA5-BR PRESURGICAL LOCALIZATION

EPA Title	Performing presurgical localization using ultrasound or mammographic guidance
Description of Activity	<p>A breast imaging radiologist should be able to accurately perform presurgical localization of breast pathology using modality specific imaging guidance prior to surgical management.</p> <p>The key functions which define this EPA include:</p> <ul style="list-style-type: none"> • List indications for pre-surgical localization¹ • Determine appropriate localization modality, needle length and localization approach^{1,2} • Obtain informed consent⁵ • Display technical skill to perform localization procedure using the locally available methods (Needle/wire, radioactive seed, magnetic seed, savi scout)^{1,2,3,4,6,8} • Label post localization images¹ • Determine adequacy of specimen radiography¹ • Report and communicate results with the surgeon^{1,6} • Display professional and compassionate communication with the patient, ordering physician, and ancillary staff and document in medical record when appropriate⁶ <p>Superscript indicate resources below which address the key function</p> <p>Context: Ambulatory surgery, operating room, or outpatient center Targeted transition point: second or third month rotation on breast imaging (institution specific)</p>

Suggested Resources (A) Article (B) Book Chapter (D) Document (S) Slides (W) Widget - interactive powerpoint (V) Video	<ol style="list-style-type: none"> 1. Mammographically guided needle localization _ (V) 2. Ultrasound guided needle localization _ (V) 3. Savi Scout Reflector Placement (S) 4. The Wire and Beyond: Recent Advances in Breast Imaging Pre-operative Localization _ (S) 5. Obtaining informed consent (A) 6. ACR Radiology Communication Skills training module _ & Breast Imaging video 1 and videos 2 _ (V) 7. Preoperative Radioactive Seed Localization for Nonpalpable Breast Lesions: Technique, Pitfalls, and Solutions _ (A) 8. Beyond Wires and Seeds: Reflector-guided Breast Lesion Localization and Excision (A)
Mapping to Domains of	<input checked="" type="checkbox"/> Patient Care <input checked="" type="checkbox"/> Medical Knowledge
B Radiology E A S Tool	
Competence	<input checked="" type="checkbox"/> Systems-Based Practice <input checked="" type="checkbox"/> Practice-Based Learning and Improvement <input checked="" type="checkbox"/> Professionalism <input checked="" type="checkbox"/> Interpersonal and Communication Skills
Competencies within each domain critical to entrustment decisions	PC1: Reporting PC2: Clinical Consultation PC3: Image Interpretation PC4: Competence in Procedures MK4: Imaging Technology and Image Acquisition SBP1: Patient Safety SBP3: System Navigation for Patient-Centered Care SBP4: Physician Role in Health Care Systems SBP6: Radiation Safety SBP8: Informatics PBL12: Reflective Practice and Commitment to Professional Growth P1: Professional Behavior and Ethical Principles P2: Accountability/Conscientiousness ICS1: Patient- and Family-Centered Communication ICS2: Interprofessional and Team Communication ICS3: Communication with Health Care Systems

Required experience, knowledge, skills, attitude and behavior	<p>Knowledge</p> <ul style="list-style-type: none"> • Knowledge of breast and axillary anatomy on imaging and real time • Ability to synthesize imaging findings and pathology to understand when deviations from standard one site localization is indicated <p>Skill</p> <ul style="list-style-type: none"> • Skill in using necessary devices for localization • Skill in positioning patient appropriately to aide in localization <p>Attitude and behavior</p> <ul style="list-style-type: none"> • Professional communication with patient and surgeon • Proactive alertness in case of patient fainting • Willingness to ask for assistant from technologist or nurse if needed <p>Experience</p> <ul style="list-style-type: none"> • All measures done at least 5 times
Assessment Information sources to assess progress and ground summative entrustment decision	<p><u>Knowledge Assessment:</u></p> <p>RadExam Breast EPA5: Surgical Localization (under construction)</p> <p>Observation (Attending Checklist): satisfactory observation of technical procedure from start (informed consent) to finish (post localization image labelling) at least 5-10 times and specimen radiography evaluation 5-10 times</p> <p>5-10 Informal case-based discussion with an attending radiologist</p>
Entrustment level of supervision to be reached at which stage of	<p>Residents: Indirect supervision (level 3) prior to graduation</p> <p>Mini-fellows: Distant supervision (level 4) prior to graduation</p> <p>Fellows: Able to supervise others (level 5) prior to graduation</p>

B Radiology E A S Tool	
training	
Expiration	1 year after graduation

*Modified from the work of Olle ten Cate, PhD

