**BREAST IMAGING PROTOCOL FOR TECHNOLOGISTS**

**High Risk Screening, Mammography, US and MRI workflow**

**HIGH RISK SCREENING**

**Prescreening by technologist**

Prescreening questions to ask patient:

1) History of breast or ovarian cancer

2) History of biopsied high risk lesion such as ADH and LCIS

3) Known history of genetics-based increased risk

4) History of chest radiation

5) Family history of breast cancer in first degree relative (mother, sister, or daughter).

Please include the answers to these questions in the technologist comments section.

If the patient says yes to any of these questions (besides history of breast cancer), then proceed with Tyrer Cusak. If patient has known history of breast cancer, do not proceed with Tyrer Cusak as they are already known high risk.

Scan in Tyrer Cusak form results to MI.

**MAMMOGRAPHY BREAST IMAGING WORK FLOW**

**Screening Exam Follow Up:**

**Calcifications**

* Calcifications seen on CC and MLO
* ML, spot mag views in CC and ML projections
* Calcifications seen on CC view only
* ML, spot mag view in CC projection
* If found on ML, then spot mag in ML projection
* May need to call rad – consider tangential views to prove skin calcs
* Calcifications seen on MLO view only
* ML, spot mag views in ML projection
* May need to triangulate based on whether the calcs rise or fall on the ML view (calcs in medial breast wall will rise, calcs in lateral breast will fall – remember **M**uffins rise (**M**edial), **L**ead sinks (**L**ateral)
* May need XCCL/spot mag in XCCL projection, etc
* For all cases that tangential views are performed for possible skin calcs, please call rad to review the case prior to letting the patient go

**Masses/Asymmetries**

* Mass seen on CC and MLO
* ML, spot compression in both CC and MLO projections, then Ultrasound
* Please us the small compression paddle when possible
* Focal asymmetry – an asymmetry that is seen in both views
* ML, spot compression in both CC and MLO projections then Ultrasound
* Asymmetry – one view asymmetry (seen on either the CC view or MLO view only)
* CC view asymmetry – Rolled CC views, spot compression in CC view, ML view
* MLO view asymmetry – ML view, spot compression in the MLO view (consider XCCL view)
* Ultrasound – Scan based on quadrants/Hemisphere

**Architectural Distortion**

* If seen in two views, then follow the focal asymmetry protocol
* If seen in one view, then follow the asymmetry protocol
* Ultrasound – Scan based on Quadrant/Hemisphere. US tech must indicate location by clock/position in notes

**Diagnostic Exams For New Problems:**

**Palpable Mass**

\*A DEFINATIVE LOCATION MUST BE INDICATED BY THE PATIENT OR ON THE PATIENT ORDER BY DOCTOR

\*THE TECH MUST INDICATE THE LOCATION IN TECH NOTES

* Palpable mass – age <25
* Ultrasound only
* Palpable mass – age <35 (but >25)
* Ultrasound first – to be reviewed by radiologist. In general:
* If ultrasound is negative or simple/complicated cyst, then likely no mammo
* If ultrasound is positive (solid mass, complex mass, etc) then diagnostic mammogram
* Palpable mass – age > or = 35 and no prior mammograms or prior mammogram >1 year ago
* Bilateral diagnostic mammogram – skin marker for palpable on all views
* Bilateral CC, MLO views, unilateral ML and spot compressions in the CC and MLO projections(bilateral ML and spot views if bilateral palpable)
* Unilateral targeted ultrasound of palpable (if bilateral palpable, then bilateral US)
* Palpable mass – age > or = 35, prior mammogram <1 year ago
* If prior mammogram <6 months ago, then unilateral ML and spot compression in the CC and MLO projections (bilateral if bilateral palpable)
* If prior mammogram >6 months ago, (but <1 year), then unilateral whole breast CC, MLO and ML views and spot compression in the CC and MLO projections (bilateral if bilateral palpable)
* Unilateral targeted breast ultrasound (bilateral if bilateral palpable)

**Breast Pain:**

* Focal pain +/- palpable mass, then follow guidelines above for palpable mass
* If focal pain without palpable – write pain under history in tech notes with position (quadrant, clock face, etc)
* Targeted US of focal pain
* Diffuse/generalized pain – routine CC and MLO views (unilateral or bilateral)
* Mark generalized pain in tech notes

**Nipple Discharge/New Nipple Inversion:**

* Unilateral nipple discharge
* If <35, then US only (subareolar breast)
* If > or = 35 and no prior mammogram or prior mammogram >1 year ago
* Bilateral CC and MLO views, ML view, spot compression mag views of the subareolar breast in the CC and ML projections
* US of the subareolar breast (consider imaging the contralateral breast for comparison/symmetry)
* If age > or =35, prior mammogram >6 months ago (but <1 year)
* Unilateral CC and MLO views, ML spot compression mag views of the subareolar breast in CC and ML projections
* US of the subareolar breast (consider imaging the contralateral breast for comparison/symmetry)
* If age > or =35, prior mammograms <6 months ago
* Unilateral spot compression mag views of the subareolar breast in the CC and ML projections
* Ultrasound of the subareolar breast (consider imaging the contralateral breast for comparison/symmetry)
* Bilateral nipple discharge
* If age <35, ultrasound only (subareolar breast)
* If age >35
* Bilateral CC and MLO views (mark bilateral nipple discharge in tech notes and indicate color, frequency of the discharge and if spontaneous vs nonspontaneous/with expression)
* Ultrasound of the subareolar breast bilaterally
* If there is an associated mass with either the nipple discharge or the nipple inversion, please place a skin marker on the palpable and take spot compression views of the palpable (if in location other than the subareolar breast). Also, evaluation of the palpable mass must be included in the breast ultrasound.

**Male Patient: *\*Requires a bilateral diagnostic mammogram order***

* Palpable mass in male: Mammography is first study in all patients regardless of age
* Skin marker placed on skin indicating palpable – the tech must specifically ask patient if the palpable is a mass behind the nipple or associated with the nipple, or away from the nipple
* Bilateral MLO views, unilateral CC view
* Review with radiologist – if the palpable correlates to gynecomastia (i.e. behind the nipple) and if mammo is consistent with gynecomastia, then no Ultrasound, **unless** order indicates ultrasound
* If palpable is away from nipple, then Ultrasound must be performed

**6 Month Follow Up Mammogram: Please check to see if patient is due for her annual mammogram**

* Follow up for calcifications
* CC and MLO whole breast views, ML and spot mag views in CC and ML projections
* Follow up mass/asymmetry
* CC and MLO whole breast views, ML and spot compression in CC and MLO projections
* Ultrasound based on either the Radiologists recommendations on prior report or referring doctors order

**Breast Feeding:**

* US examination to be performed first
* Review with radiologist prior to leaving to determine if need mammogram
* In general, in patients >40, the annual screening mammogram should be performed 6 months after cessation of breast feeding, unless there is a new clinical concern (then to be performed immediately – follow above protocol)

**Pregnant Patients:**

* US examination to be performed first
* Review with Radiologist prior to leaving to determine if need mammogram

**Breast Cancer Follow Up:**

* Ideally, first post op mammogram to be performed as a diagnostic mammogram at 6 months
* Whole breast CC and MLO views, ML spot compression magnification of lumpectomy site in the CC and ML projections
* Then annual bilateral screening mammogram (unless referring physician wants to schedule as an annual diagnostic)
* Perform routine CC and MLO views if the patient is asymptomatic
* Otherwise, follow guidelines above depending on patient’s symptoms

**NEW: For Screening Mammogram using Tomosynthesis (CB only):**

* For patients with implants --> use Standard 2D mammogram CC and MLO with implants and use 3D + 2D for CC and MLO implant displaced views
* If breasts are larger than detector size --> use 3D + 2D CC and MLO views for majority of breast tissue, then use 2D only for remaining breast

**Diagnostic Mammogram Callbacks using Tomosynthesis Protocol (CB only):**

* **Callback for Calcifications** --> do Magnification views using 2D only (using same protocol as above), review with Radiologist, may proceed with US as needed
* **Callback for Asymmetry, Focal Asymmetry, or Architectural Distortion**  --> proceed with US first, ultrasound technologist to review with Radiologist, may proceed with additional tomosynthesis spot compression views as indicated by discretion of radiologist.

**Diagnostic Mammogram for New Problem using Tomosynthesis (CB only)**

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* Ultrasound first – to be reviewed by radiologist. In general:
* If ultrasound is negative or simple/complicated cyst, then likely no mammo
* If ultrasound is positive (solid mass, complex mass, etc) then diagnostic mammogram
* Palpable mass – age > or = 35 and no prior mammograms or prior mammogram >1 year ago
* Bilateral diagnostic mammogram – place marker for palpable on all views
* Bilateral CC and MLO views with 2D and 3D, (NO lateral view), with spot compressions in the CC and MLO projections using 3D only
* Unilateral targeted ultrasound of palpable (if bilateral palpable, then bilateral US)
* Palpable mass – age > or = 35, prior mammogram <1 year ago
* If prior mammogram <6 months ago, then spot compression in the CC and MLO projections with 2D and 3D (bilateral if bilateral palpable)
* If prior mammogram >6 months ago, (but <1 year), then unilateral whole breast CC and MLO with 2D and 3D and spot compression in the CC and MLO projections using 3D only (bilateral if bilateral palpable)
* Unilateral targeted breast ultrasound (bilateral if bilateral palpable)

**Breast Pain:**

* Focal pain +/- palpable mass, then follow guidelines above for palpable mass
* If focal pain without palpable – write pain under history in tech notes with position (quadrant, clock face, etc)
* Targeted US of focal pain
* Diffuse/generalized pain – routine CC and MLO views using 2D + 3D (unilateral or bilateral)
* Mark generalized pain in tech notes

**Nipple Discharge/New Nipple Inversion:**

* Unilateral nipple discharge
* If <35, then US only (subareolar breast)
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* Bilateral CC and MLO views using 2D + 3D, spot compression mag views of the subareolar breast in the CC and ML projections using 2D only
* US of the subareolar breast (consider imaging the contralateral breast for comparison/symmetry)
* If age > or =35, prior mammogram >6 months ago (but <1 year)
* Unilateral CC and MLO views using 2D + 3D, ML spot compression mag views of the subareolar breast in CC and ML projections in 2D only
* US of the subareolar breast (consider imaging the contralateral breast for comparison/symmetry)
* If age > or =35, prior mammograms <6 months ago
* Unilateral spot compression mag views of the subareolar breast in the CC and ML projections using 2D only
* Ultrasound of the subareolar breast (consider imaging the contralateral breast for comparison/symmetry)
* Bilateral nipple discharge
* If age <35, ultrasound only (subareolar breast)
* If age >35
* Bilateral CC and MLO views using 2D + 3D (mark bilateral nipple discharge in tech notes and indicate color, frequency of the discharge and if spontaneous vs nonspontaneous/with expression)
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* Bilateral MLO views, unilateral CC view using 2D + 3D
* Review with radiologist – if the palpable correlates to gynecomastia (i.e. behind the nipple) and if mammo is consistent with gynecomastia, then no Ultrasound, **unless** order indicates ultrasound
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**Pregnant Patients:**

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**Breast Cancer Follow Up:**

* Ideally, first post op mammogram to be performed as a diagnostic mammogram at 6 months
* Whole breast CC and MLO views using 2D + 3D, spot compression magnification of lumpectomy site in the CC and ML projections using 2D only
* Then annual bilateral screening mammogram using 2D + 3D (unless referring physician wants to schedule as an annual diagnostic)
* Perform routine CC and MLO views if the patient is asymptomatic
* Otherwise, follow guidelines above depending on patient’s symptoms

**Ultrasound Technologists**

When performing an ultrasound for further evaluation of a mammographic abnormality, the first thing to do is to make sure that the ultrasound finding corresponds to the mammographic finding. The ultrasound and mammogram findings must be correlated by: size, shape, location and surrounding tissue density.

All ultrasound techs must look at the mammogram prior to performing the ultrasound. They must know how to use the measuring tool and must know the basic understanding of mammography for lesion location.

In general, for lesions seen on the CC view only, the entire medial or lateral breast must be scanned (from subareolar breast out to the edge of the breast tissue). If the report or radiologist state that it may be in axillary tail/low axilla, then these areas must be scanned as well.

In general, for lesions seen on the MLO view only, the ML view will help determine if the lesion is in the medial or lateral breast. If a lesion is seen in the superior breast on the MLO view only and drops on the ML view, then the lesion is located in the lateral breast. Remember L-lateral, L-lead → lead sinks. So lesions in the lateral breast will “sink” on the ML view. If a lesion is seen in the superior breast on the medial, M-muffin → muffins rise. So lesions in the medial breast will “rise” on the ML view. The further away the nipple, the more the lesion will move between the MLO and ML views. This typically requires a large area to be scanned (scanning 1-5:00 for lesions thought to be near 3:00).

Using the above method of deduction, lesions that are seen in the central breast, posterior to the nipple on the MLO view will either be located in the upper inner quadrant (muffins rise) or lower outer quadrant (lead sinks). You can also use this rule to work backwards: lateral lesions that lie at the level of the nipple will project more superiorly on the MLO and medial lesions that lie at the level of the nipple will project more inferiorly on the MLO.

Sometimes the lesions don’t move or are not well visualized. In these cases, the entire superior or inferior breast should be scanned.

In general, lesions that lie posterior to the nipple on the CC view are likely located near the 6:00 or 12:00 positions.

In terms of depth, compression applied during the mammogram will move the lesions closer to the nipple, while sonographic compression will push the lesion closer to the chest wall.

The distance from the nipple and depth of the lesion must also be correlated. All techs must know how to use the measuring tool to get an idea of where the lesion is in relationship to the nipple. If there are any questions, please ask the radiologist before scanning.

While most of the time, the mammographic size is provided, it is important to always correlate the size of the ultrasound finding to the mammographic finding. If the size is not provided to you then either ask the radiologist to use the measuring tool to measure the lesion marked on the mammogram.

\*If sonographic and mammographic findings do not correlate, then there might be two lesions.

When scanning a palpable mass, always ask the patient the size of the mass and correlate your finding to the patient’s palpable. Some helpful things to ask the patient (when they can’t give you the size): is it the size of a pea? A quarter? A golf ball? Or larger? This way, you can feel confident that the 5 mm cyst corresponds to the “pea-sized” clinically palpable mass. You can always ask the patient to feel the lump yourself so you can understand what they are feeling.

General rules for Ultrasound:

* Always call the radiologist if there is a question about the mammo finding or location, or a question about the ultrasound finding.
* Standardized imaging technique:
* Finding should be recorded with and without calipers – must be able to assess all characteristics of the mass (margins, echogenicity, etc). Four pictures required.
* Picture of the finding in long axis (either transverse or long) – no calipers.
* Same picture as above, but now with calipers/measurements – measure in the longest axis, the second measurement perpendicular to longest measurement.
* Third picture is the orthogonal view (if prior was trans, now take in long, or vice versa) – no calipers.
* Same picture as above, but now with calipers/measurements.
* If the ultrasound is negative, please take negative pictures in the radial and antiradial planes labeled at the appropriate clock face and distance from the nipple (i.e. if the mammo finding is a focal asymmetry at 12 o’clock, 5 cm from the nipple, please take images at this location and label them 12 o’clock, 5 cm from the nipple).
* Setting of multiple cysts – representative images are sufficient, then measure the largest cyst (in each breast if bilateral).
* When imaging the axilla and subareolar breast – if the findings appear abnormal or questionable, consider imaging the contralateral side for symmetry/comparison.
* Always scan two clock positions proximal and distal to the stated clock position on a radiologist report or requested order.
* Ask patient prior to leaving if they are okay getting results from their doctor. Results should be available the next day. If patient insists on getting results prior to leaving then call radiologist.

**BREAST MRI PROTOCOL/SCHEDULING**

For Screening High Risk asymptomatic patients Schedule MRI Breast with/without Contrast 7-14 days after 1st day of patient’s menstrual cycle

For Diagnostic (symptomatic) patients and patients with recent biopsy proven malignancy that require pre-operative breast MRI Try to schedule similar to screening patients as best as possible but do not delay scheduling of the procedure based on the menstrual cycle

Breast MRI ONLY to be performed without contrast if only evaluating for breast implant integrity/rupture, all other reasons REQUIRE contrast

**Technologist to indicate in Tech Impression section:**

1) If Diagnostic patient what are their symptoms (pain, lump, discharge, etc), which breast and where, technologist to place marker on area of patient’s lump/pain

2) If nipple discharge indicate color, frequency of the discharge and if spontaneous vs nonspontaneous (with expression)

3) History of breast cancer which side, treatment: mastectomy vs lumpectomy, and when

4) If high risk screening patient what are their risk factors: prior history of breast cancer, history of biopsied high risk lesion such as ADH and LCIS, genetics-based increased risk such as BRCA 1 or 2, history of chest radiation, family history of breast cancer: indicate which relatives

5) If for evaluation of breast implant integrity what type of implants and what and where are their symptoms

**SUPPLEMENTATAL IMAGING FOR HIGH RISK PATIENTS INCLUDING BREAST DENSITY**

* There is a positive association between increased breast density and increased risk for breast cancer.
* Breast density is one of the factors calculated in the Tyrer Cuzick model.
* For patients with greater than 20% lifetime risk, genetic counselling and annual Breast MRI is recommended in addition to annual mammography regardless of breast density.
* We recommend supplemental screening with Screening Breast Ultrasound for patients with dense breast tissue who have 10 – 20% calculated lifetime risk for developing breast cancer.
* In patients who qualify for but cannot tolerate or have contraindications to breast MRI, then screening breast US should be considered.