

Ergonomics for Mammographers: How to Avoid and Improve Technologist Pain and Injury

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Journal
Ergonomics >
Volume 47, 2004 - Issue 2

466 23 0
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Original Articles

Perceived physical stress at work and musculoskeletal discomfort in X-ray technologists

Shrawan Kumar, Lil Moro & Yogesh Narayan



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Abstract

A structured questionnaire/interview was designed to explore demographic, personal, occupational and occupational health factors as well as recreational physical activities which can affect X-ray technologists' musculoskeletal symptoms. This questionnaire was piloted for clarity and validity. Subsequently, a random sample of 20 volunteer participants (18 female, 2 male) from two University hospitals were administered the questionnaire in the presence of the investigators to ensure that questions were correctly understood. The data obtained were analysed for magnitude, duration and frequency of activities and for severity, duration and recurrence of morbidity. The X-ray technologists in the sample were found to be a young group of professionals ranging from between 20 - 54 years of age. Eighty-nine per cent of the technologists were physically active and 44% indulged in physical recreational activities. Despite the young age and active life style, the X-ray technologists had significant and diverse musculoskeletal problems; 83% of technologists had backache and 39% of the female technologists had neck pain and 28% shoulder pain. The majority of technologists had suffered multiple episodes of pain. Fifty per cent of the female sample and both male volunteers suffered from upper extremity pain.



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Occupational Safety and Health Administration

English | Spanish

OSHA - WORKER - EMPLOYER - STANDARDS - ENFORCEMENT - CONSTRUCTION TOPIC - NEWS/RESOURCES - DATA -

TRAINING -



Estimator Background

Back to OSHA Small Business

OSHA's "Safety Pays" program can help employers assess the impact of occupational injuries and illnesses on their profitability. This program uses a company's profit margin, the average costs of an injury or illness, and an indirect cost multiplier to project the amount of sales a company would need to cover those costs. The program is intended as a tool to raise awareness of how occupational injuries and illnesses can impact a company's profitability, not to provide a detailed analysis of a particular company's occupational injury and illness costs.

The "Safety Pays" program will:

- Allow users to pick an injury type from a drop-down list or to enter their workers' compensation costs
- Prompt users for information to do the analysis, including their profit margin and number of injuries
- Generate a report of the costs and the sales needed to cover those costs



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osha.gov

Estimated Total Cost

The extent to which the employer pays the direct costs depends on the nature of the employer's workers' compensation insurance policy. The employer always pays the indirect costs.

Injury Type	Instances	Direct Cost	Indirect Cost	Total Cost	Additional Sale (Indirect)	Additional Sale (Total)
Carpal Tunnel Syndrome	1	\$ 30,882	\$ 33,970	\$ 64,852	\$ 1,132,340	\$ 2,161,733

[Remove](#)

Totals


Estimated Direct Costs:

Estimated Indirect Costs:

Combined Total (Direct and Indirect Costs):

Sales To Cover Indirect Costs:

Sales To Cover Total Costs:



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osha.gov

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[Remove](#)

Totals


Estimated Direct Costs:

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Sales To Cover Total Costs:



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What About Breast Imagers?

- Ultrasonographers
- Mammographers



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What About Breast Imagers?

- **Ultrasonographers**
- Mammographers



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SOCIETY OF DIAGNOSTIC MEDICAL SONOGRAPHY
Susan Murphey, BS, RDMS, RDCS, CECD
WHITE PAPER SERIES

90% of clinical sonographers
experienced symptoms of WRMSDs⁶

Costing employers over
\$120 billion yearly
in direct and indirect costs²



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What About Breast Imagers?

- Ultrasonographers
- **Mammographers**



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No published studies on mammography
related pain and injury.



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Most Common Causes of Musculoskeletal Pain Problems

- Repeated movements
- Sustained postures

Particularly when performed with improper alignment or mechanics!



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Source: Sahrman, SA 2011

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Common Pain and Injury

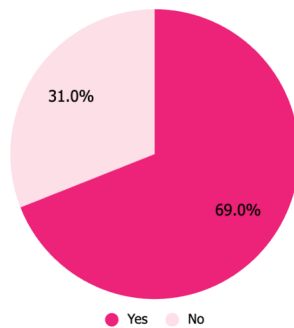
- Shoulder
- Wrist
- Neck
- Back



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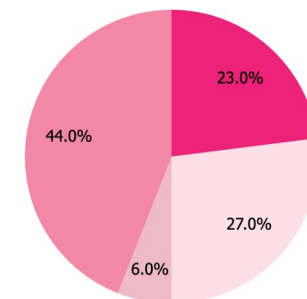
Do you (or have you had) workplace injuries that you feel are related to mammography positioning?



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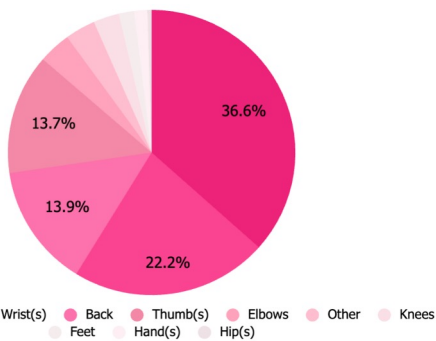
If you have had a positioning-related injury did this cause any of the following:



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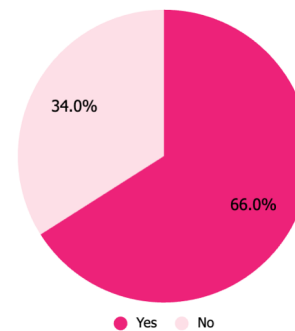
If you have had a positioning-related injury, where was the injury?



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If you have had a positioning-related injury, did you have to seek medical treatment?



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Causes

- Equipment design
- Improper use of equipment
- Lack of updated standardized training
- Little or no consistency and reproducibility in positioning sequence
- Little or no consistency and reproducibility in positioning technique
- Lack of use of proper body ergonomics



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Causes

- **Equipment design**
- Improper use of equipment
- Lack of updated standardized training
- Little or no consistency and reproducibility in positioning sequence
- Little or no consistency and reproducibility in positioning technique
- Lack of use of proper body ergonomics



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FS/FFDM/DBT

- Increased length of the IR by up to 40%
- Increased thickness of the IR by up to 80%
- Increased width of face shield up to 50%



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Causes

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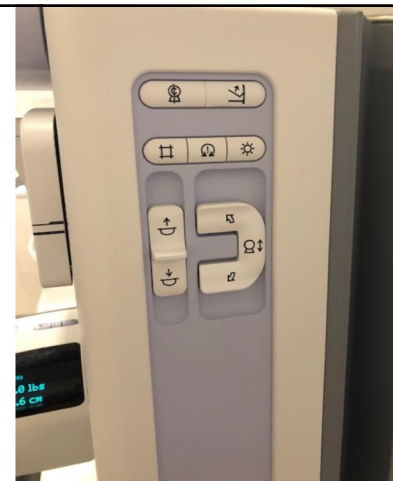
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- Use controls located most conveniently on machine.
- Keep foot controls under your feet



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Causes

- Equipment design
- Improper use of equipment
- **Lack of updated standardized training**
- Little or no consistency and reproducibility in positioning sequence
- Little or no consistency and reproducibility in positioning technique
- Lack of use of proper body ergonomics

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https://www.acr.org/-/media/ACRAccreditation/Documents/Mammography/1999_Mammo_QCManual_Book_final.pdf

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Causes

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Most medical imaging exams are done using the *same* positioning technique, in the *same* sequence.



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But in mammography...
we are “all over the map.”

- LCC, LMLO, RMLO, RCC
- RCC, LCC, RMLO, LMLO
- RMLO, RCC, LMLO, LCC
- LCC, RCC, LMLO, RMLO
- RCC, RMLO, LMLO, LCC
- LCC, LMLO, RCC, RMLO
- LMLO, LCC, RCC, RMLO



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My Suggestion:

- Do CC's first
- Then do the MLO on the side you just finished the CC on
- Finally, do the other MLO

Example: RCC, LCC, LMLO, RMLO



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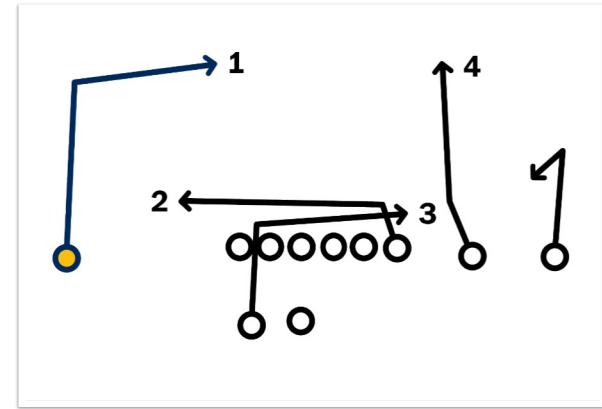
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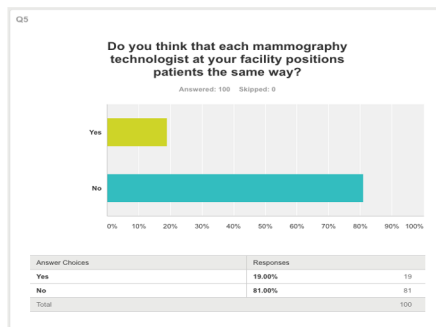
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Most technologists *do not* practice a standardized method of positioning.



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In Mammography:

- Most technologists have not been taught a standardized method of positioning.
- Most technologists have not been trained by a qualified trainer.



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How did this happen?

- No current standardization for positioning for FFDM and DBT
- CEUs for hands-on positioning not required
- Initial 25 mammograms required, but under whose supervision?



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How did this happen?

- Updated positioning trainings are not provided by employers.
- Until recently, there was no current published data to establish parameters for positioning criteria.



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How did this happen?

- Technologists are getting most CEUs online (no actual education for positioning).
- Radiologists are passing inadequate images and/or can only give feedback regarding positioning criteria.



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How did this happen?

No updates for positioning with FFDM or DBT (and the new equipment design requires a modification of positioning techniques used for FS).



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So, the problem is...

- No standardization or follow-through
- Which means less consistency and reproducibility
- More repeats and rejects
- More accreditation failures
- Increased exposure
- More job-related injuries
- Increased costs to employers
- MISSED BREAST CANCERS???



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STANDARDIZATION IS KEY!!



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WHY???

- Consistency
- Reproducibility
- Efficiency
- Proficiency
- Use of proper body mechanics



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FS/FFDM/DBT

- Increased length of the IR by up to 40%
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Causes

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Quick Steps for the LMLO

The following steps should be performed AFTER:

1. The proper compression size is chosen and shifted, as needed
2. The proper degree of angulation is determined and selected on the gantry
3. The IR is lowered, as needed



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Source: Mammography Educators



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Quick Steps for the LMLO

Patient Preparation:

- Stand on the medial side of the breast to be imaged
- Patient is facing the machine with both feet, hips and shoulders forward and level
- Patient should move medially towards you, so that the bottom of the IR is directly below the plane of the nipple (halfway between the ASIS and umbilicus)



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Source: Mammography Educators

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Quick Steps for the LMLO

1. Stand perpendicular to the patient with your sternum pressing against patient's right humerus
2. Lift patient's left shoulder/arm up over the corner of the IR with your left hand in the patient's axilla. At the same time, your right hand should "meet" your left hand in the axilla and help to lift the patient's left shoulder up and over the IR
3. IR is placed in back of axilla (just interior to latissimus dorsi)
4. Patient's left hand should be resting on bar, with their elbow bent behind the IR
5. Place your left hand on patient's left shoulder (if possible) to keep the shoulder relaxed and down
6. Your right hand, with palm facing up, slides down lateral side of breast to pull on lateral breast tissue and smooth out any skin folds
7. Once your right hand is at the bottom of the breast, turn your right hand over so that your hand is now palm down on the breast with the base of your thumb just anterior to the IMF
8. Push the breast up and out with the base of your thumb, keeping continuous contact with the breast (Don't let go!)
9. At the same, ask the patient to lift and flatten their other breast, as needed. (Caution: Do not ask the patient to pull their breast back)
10. Continue to hold the breast in the up and out position until compression is complete



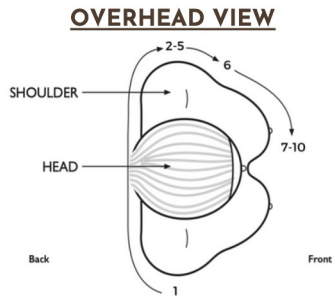
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Source: Mammography Educators



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Quick Steps for the LMLO



Source: Mammography Educators

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Quick Steps for the LCC

The following steps should be performed AFTER:

1. The proper compression size is chosen
2. Machine is at 0 degree angulation



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Source: Mammography Educators

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Quick Steps for the LCC

Patient Preparation:

- Stand on the medial side of the breast to be imaged
- Patient is facing the machine with feet, hips and shoulders facing forward and level
- Patient should be standing back about 2" from the IR with the nipple centered to the IR (or as close as possible)



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Source: Mammography Educators

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Quick Steps for the LCC

1. Elevate breast/IMF (until the PNL is perpendicular to the chest wall)
2. Adjust IR height (so top edge is parallel with elevated IMF)
3. Pull the breast onto the IR with both hands (left hand on top; right hand on bottom). At the same time, ask the patient to step forward into the machine (not to lean in) and have her turn her face towards you
4. Anchor the breast with the base of your right thumb (after switching hands)
5. Lift the opposite/contralateral breast onto IR with your left hand, palm facing up, then ask the patient to turn her right hip forward
6. Guide the patient's head forward and around the face shield, if possible
7. Place your left elbow and forearm at the mid thoracic region (where her bra clasp would be) and gently push the patient forward
8. Relax her left shoulder with your left hand (if possible)
9. Slide superior breast tissue forward by placing the base/edge of your right thumb on the top of the breast against the chest wall, then apply compression while continuing to "push" the patient forward



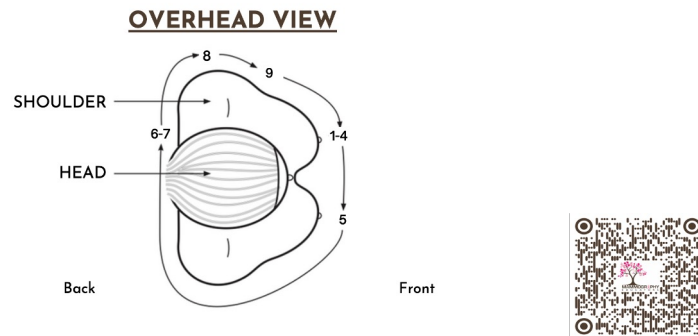
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Source: Mammography Educators

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Quick Steps for the LCC



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INCORRECT METHODS



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Hand Position



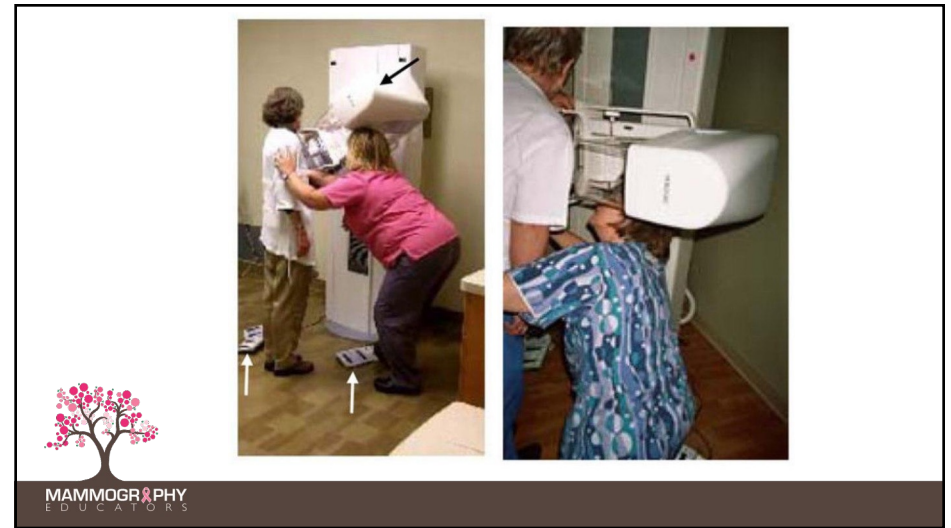
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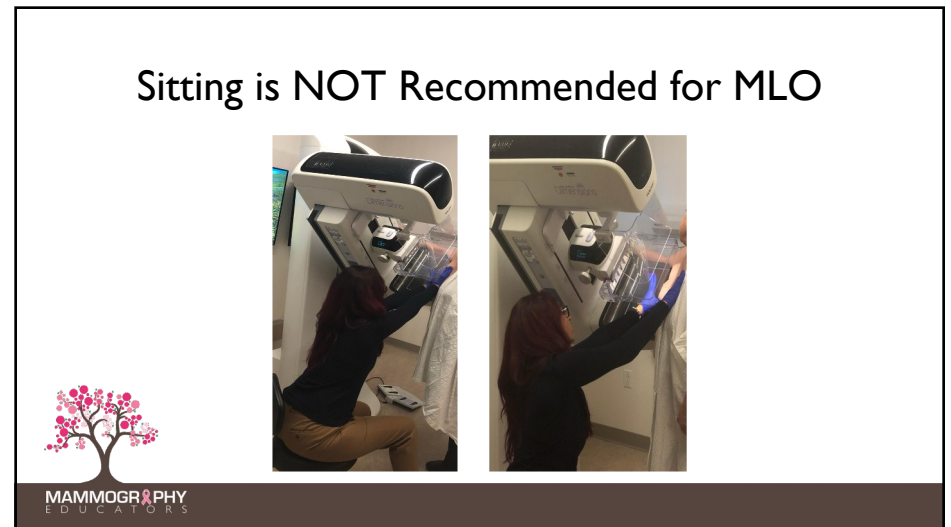
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Technologist Sitting for the MLO is NOT Recommended *Unless*:

- The patient is extremely short or the technologist has previous injuries or pain that prohibits standing.
- Sitting is usually the cause of shoulder pain and injury and will actually exacerbate the problem.



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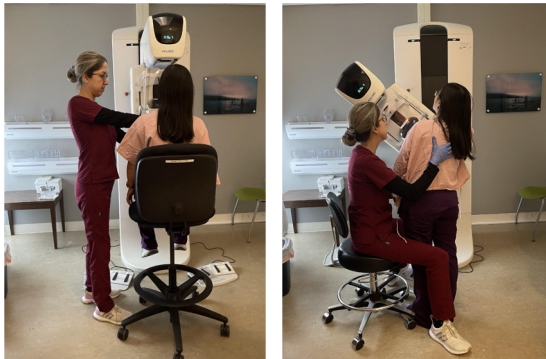
Tall Patient – Short Technologist



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Tall Technologist – Short Patient



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Positioning Techniques That Use Proper Ergonomics



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Stand Up Straight!



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My Mom Says So!



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And Stand on the **Medial** Side of the Breast to be Imaged



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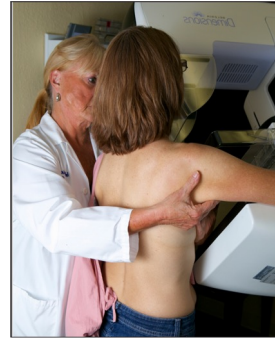
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Thumb Up and Elbow Below Shoulder



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“Walking Around” to Place the Shoulder



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Suggestions for Improvement

- Use equipment controls and foot paddles to eliminate stretching
- Keep elbows and hands below shoulder level
- Stand up straight!!
- Make sure patient is in proper position (facing machine with both feet, hips and shoulders)



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Suggestions for Improvement

- Stand close to the patient and use your whole body to position her
- Stand on medial side of breast being imaged for CC and MLO
- Use flats of hands and base of thumb to support and position the breast



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Control the Patient With Your Body



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Hand Position **IS** Important for the CC and MLO



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Hand Position



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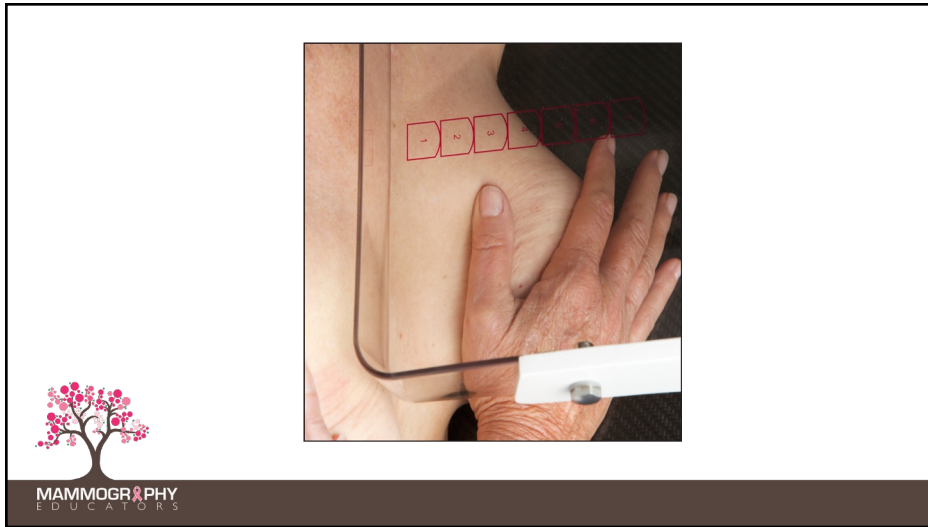
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Thumbs Up....Wrist Straight!

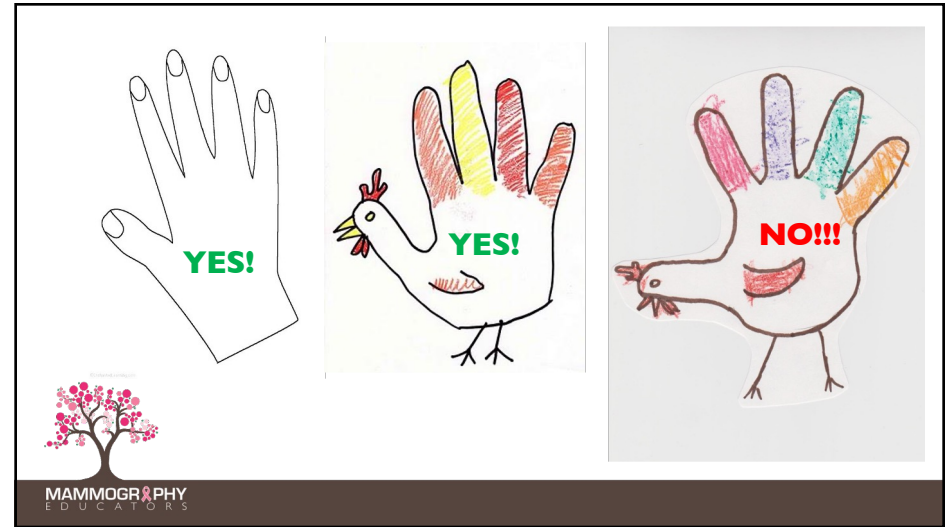


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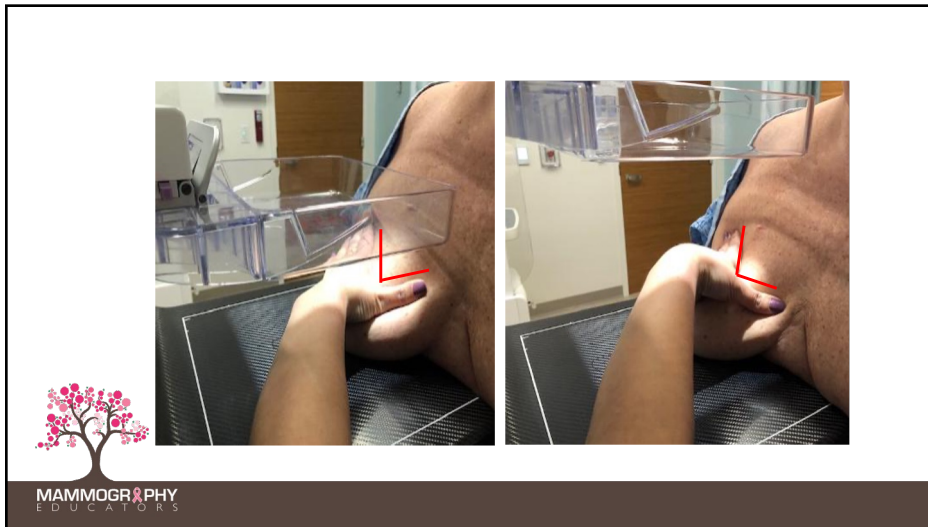
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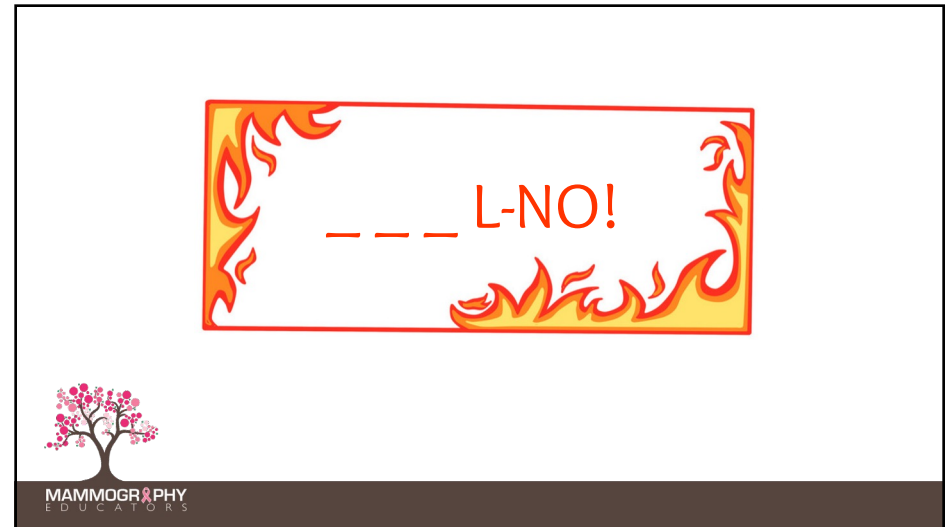
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82



83



84

YES!!!



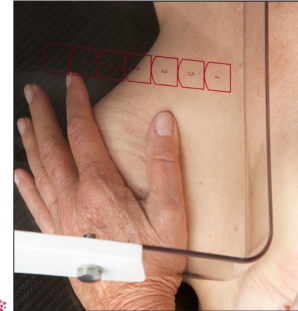
NO!!!



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YES!!!



NO!!!



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Excuses

- I have never done it standing
- I can't change
- It feels too weird
- It's harder
- I've been doing it this way for 20 years and my images are good



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When are you going to learn that your life would be so much easier if you would just do what I tell you to do?



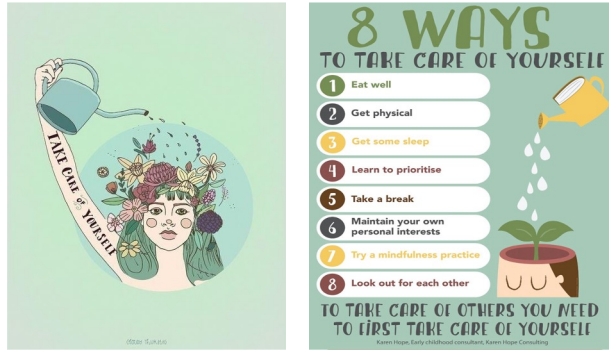
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Taking Care of Yourself!



Simple Exercises Can Reduce Pain and Potential Injury

- Hands/wrists
- Neck and shoulder

How Can We Make Things Better

- Consistency
- Reproducibility
- Proper use of body mechanics

Thank You!

Services we offer, include:

- Onsite Positioning Training
- Assistance with Accreditation & Inspection
- Live Webinars and Conferences
- On-Demand Continuing Education

For questions or more information:

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