## DXA Exam Protocol TRA/MultiCare





Prepared and submitted for final review by:

Radiologist – Patrick Bacon MD Imaging Quality Manager – Jeffery Perez Imaging Supervisor – Tracy Armstrong Imaging Lead Tech – Traci Little

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# TRA/MultiCare Imaging Protocol DXA Scan

Procedure Guidelines for Bone Density (DXA) Scanning

- This manual is intended as a guideline and standard for the Technologist and support staff working at any of the MultiCare locations under the direction of the TRA Radiologists.
- Reference guidelines up to date per the 2023 ISCD Adult Official Positions and the 2019 ISCD Pediatric Official Positions. <u>Official Positions – ISCD</u>

This Manual was instructed, reviewed, and approved by:

- Douglas Seiler, MD TRA Radiologist
- Patrick Bacon, MD TRA Radiologist
- Jill Taylor AVP Acute Imaging Services
- Jeffery Perez Imaging Quality Manager
- Tracy Armstrong Supervisor Imaging Services
- Traci Little Lead DXA Technologist

## **Table of Contents**

Content	Slide Number
Patient Preparation for Exam	4
Primary Scan Sites, Table Weight Limit, & Pediatric Scan Ages	5
Lumbar Spine – Positioning	6
Analyzing the Lumbar Spine	7
Evaluating the Lumbar Spine Based on T-score	8
Evaluating the Lumbar Spine - continued	9
Hips and Foot - Positioning	10
Hip and Foot Repositioning	11
Analyzing the Hip	12
Forearm - Positioning	13
Forearm Left- Positioning for Supine Examinations	14
Forearm Right- Positioning for Supine Examinations	15
Analyzing the Forearm	16
Pediatric Whole-Body Scans - Positioning	17
Whole-Body Scan Regions of Interest	18
Whole-Body Scans Regions of Interest continued	19
Transgender & Gender Non-conforming Individuals	20
Manually Entering Prior Scans	21
Manually Entering Prior Scans - continued	22
DICOM Reports for PACS	23
How to Force FRAX	24

## Patient Preparation for the exam

Patients that have had a PET scan should wait 24hrs before having the exam to allow for elimination of the contrast.

#### **Patient Examination Preparation - IV or Oral Contrast**

Patients that have had I.V. contrast or oral contrast for a radiological exam should wait 7 days before having the exam to allow for elimination of the contrast.

**Patient Examination Preparation - Previous NM Study** 

Patients that have had a Nuclear Medicine study should wait 7 days before having the exam to eliminate the radioisotopes.

**Patient Examination Preparation - Attire / Clothing** 

Patients should wear clothes that do not contain metal.

#### **Patient Examination Preparation - Questionnarire**

The bone density questionnaire should be filled out by every patient if possible to the best of their ability to remember. If it uncertain if the patient has ever taken any bisphosphonate therapy, check their medication history in Epic if it is available. You can do this by clicking on the Medication tab in Chart Review, unchecking "Current Meds", clicking "Filter", then "Therapeutic Class", and finally, "Endocrine & Metabolic Drugs".

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## Primary Scan Sites, Table Weight Limit, & Pediatric Scan Ages

#### **Primary Scan Areas of Interest**

The optimal exam will have two sites of interest. Primary sites of interest are the L-Spine and Left Hip. If the Left Hip is unable to be scanned due to metal artifact or fracture history, scan the Right Hip. If either the L-Spine or a hip is unable to be scanned due to metal artifact or fracture history, scan the non-dominant forearm as the first option. When the non-dominant forearm is not usable due to surgical history or known fracture, use the dominant forearm. When only 2 lumbar vertebral levels are usable, include a forearm scan.

When a patient presents with a history of hyperparathyroidism or hypercalcemia, follow the above protocol, but make sure to include the non-dominant forearm; for instance, L-Spine, Left Hip, and non-dominant Forearm.

## **Table Weight Limit**

If the patient exceeds the table weight limit of 450 lbs., scan the non-dominant forearm only. If the non-dominant forearm is not usable due to metal artifact or fracture history, scan the dominant forearm.

#### Pediatric Whole-Body Scan

A pediatric whole-body scan is performed only on patients aged 8 through 19 years of age. A 7-year-old can be scanned, but the age would need to be adjusted to that of an 8-year-old. The normative database starts at age 8.

## Lumbar Spine - Positioning

### Lumbar Spine

 Place the patient on their back with their head at the right end of the table in the center of the table.

• On the table control panel, press Center.

• Place the block sponge under the lower legs so that the legs are ideally at a 90° angle. (Figure -1)

 Use the table control panel buttons to move the table so the laser cross hair is placed approximately 1-2 inches below the iliac crest and center to the patient's mid-line.

• Instruct the patient to remain still and breathe normally.

Include the top of S1, scanning into T12. (Figure – 2)

 Adjust the length as needed for taller patients so that you can image from S1 to T12.



Figure - 1





## Analyzing the Lumbar Spine



Figure - 3

#### Lumbar Spine

• When a prior exam is available, match the previous ROI (Region of Interest) for a consistent comparison to the previous exams.

• Center the intervertebral lines between individual vertebral bodies to match the angle of the disc spaces.

 Make sure to draw in any boney areas that may not have been captured by the software and delete any excess bone, such as prominent transverse processes. It is important to use the window and level function to brighten the scan to see areas of bone that were missed by the software. (Figure – 3)

 Reasons for eliminating vertebral levels include, but are not limited to surgical hardware, surgical removal of bone, and the Greater than 1.0
 Standard Deviation rule.



## **Evaluating the Lumbar Spine Based on T-Score**

AP Spine Bone Density Trend



Region	BMD (g/cm²)	Young-Adult T-Score	Age-Matched Z-Score
L1	1.147	0.1	0.3
L2	1.250	0.4	0.6
L3	1.429	1.9	2.1
L4	1.440	2.0	2.2
L1-L2	1.198	0.3	0.4

Figure - 4

#### Lumbar Spine - T-Score

• The greater than 1.0 Standard Deviation rule applies to T-Scores that are greater by a positive value of 1.1 or more. T-Scores that are greater by 1.0 will remain as part of the evaluation. When there is a standard deviation of at least 1.1 or more, the vertebral level with the largest positive number would be eliminated.

• Begin the evaluation with L1 as the baseline, review each vertebrae top to bottom (always work down from L1). Compare the T-Score value to L2. When the T-Score is greater than 1.0 standard deviation, you would eliminate L2 from the evaluation.

• Compare L2 to L3. When the T-Score of L3 is greater than L2 by more than 1.0 you would eliminate L3 from the evaluation.

• When a vertebral level is eliminated, compare the next level down to the last vertebral level you have kept for the evaluation.

• For example, on the image to the left, L3 was eliminated after comparing to L2. L3 is greater than L2 by 1.5 Standard Deviations. Now compare L4 to L2. L4 will be removed because the Standard Deviation is 1.6. When L4's value is less than or equal to 1.0 Standard Deviations from L2, it would remain as part of the evaluation.

#### 8 DXA Exam Protocol

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## **Evaluating the Lumbar Spine - continued**



	BMD	Youn	g-Adult	1
Region	(g/cm²)	(%)	T-score	_
ц	0.782	67	-3.2	
L2	0.805	65	-3.6	
13	1.017	82	-1.9	
L4	0.965	78	-2.3	
L1-L2	0.793	66	-3.4	

Figure - 5

#### **Evaluate Lumbar Spine - continued**

• (Figure-5), L3 has been eliminated from this evaluation because it is greater than L2 by 1.7 Standard Deviation. L3 is more positive in value than L2.

 L4 has been eliminated not only because of the Standard Deviation value of 1.3, but also due to metal artifact.

 L1 may be removed from the evaluation while the remaining levels are kept if L1's value is greater in positive value to the remaining vertebra if it is greater than 1.5 Standard Deviation as compared to L2-L4.

Example:	L1	T-Score	1.3
	L2	T-Score	-0.6
	L3	T-Score	-0.8
	L4	T-Score	-1.2

L1 is greater in a positive direction to remaining vertebral levels by more than
 1.5 Standard Deviation

• Once the vertebral level has been eliminated from evaluation, it will be eliminated from further exams in the future.

• Lumbar spine is reported as an average. If 3 of the 4 vertebral levels have been removed from the evaluation, the entire spine will be removed from the report. An average score will not be examined from 1.

 If the lumbar spine has been eliminated from the exam, scan the non-dominant forearm.

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## **Hip and Foot Positioning**









## Hip and Foot Repositioning

### Hip Repositioning the scan

- Select the Reposition Scan before the scan is completed.
- Position the cursor over the hip image.
- Click and drag the image to the intersection of the two blue lines.
- Position so the vertical line (A) touches the outer edge of the Greater Trochanter (B)
- Horizontal positioning line (C) is centered the Greater Trochanter (B)



Figure - 7

## Analyzing the Hip

#### Analyzing the Hip

• Select the top line of the area to be analyzed. The blue line should run through the joint space of the acetabulum.

 Select the medial line of the area to be analyzed. The blue line should run through the joint space of the acetabulum.

• Select the bottom line of the area to be analyzed. The blue line should be inferior to the lessor trochanter.

• Select the lateral line of the area to be analyzed. The blue line should run laterally to the greater trochanter.

• The midline should go through the middle of the femoral neck.

• The Trochanter line should be at the base of the greater trochanter, slightly above the mid-line.

• The top lateral corner of the Neck box should be the only corner touching boney anatomy. If necessary, remove a portion of the Ischium so that the neck box is excluded from the analysis.





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## Forearm - Positioning

#### **Forearm - Positioning**

• In centimeters, measure the patient's forearm from the elbow to the ulna styloid. (Figure 09)

• Position the patient to lean over the table with the forearm in line with the laser cross hair. The radius and ulna must appear straight and centered. (Figure 10)

Scan through the forearm to at least the first row of carpals. (Figure 11)



Figure - 09



Figure - 10



Figure - 11



## Forearm Left – Positioning for Supine Examinations







## Forearm Right – Positioning for Supine Examinations





# RIGHT - Forearm Positioning Right Forearm position: (Figure 13) • Position left hip near outer edge of the table. • Position left arm across the chest.

- Position the elbow parallel with the long side of the table.
- Align the bones of the forearm with the long axis of the laser.

• Start scan at the carpal bones. Scan to mid-forearm. Confirm the first row of carpal bones are within 6 inches of the starting point. Measure 5 inches from the pisiform.

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## Analyzing the Forearm

### Analyzing the Forearm

Forearm Review: (Figure 14)

- Place the Global ROI box over the top area of the ulna styloid.
- Position the ROI line over the radius, until the blue line is touching the lateral edge of the radius.
- Position the ROI line on the ulna side, until the blue line is touching the lateral edge of the ulna. This will allow 1-2 cm of air within the Global ROI.
- Edit the bone mapping if needed to include missing bone.
- The mid-line should be centered to the ulna and radius. The top should be to where the ulna and radius meet.





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## Pediatric Whole-Body Scan - Positioning

### **Pediatric Whole-Body Scan**

• Position the patient supine within the outline of the table pad.

• Tall patients must be positioned within the table outline; move the patient toward the top of the table.

 If the patient is still too long, it is ok to let the patient's feet hang off the table.

 If the patient's PA hands do not fit within the outline, place hands in a lateral position.

• If the patient's body habitus is too wide to allow the entire body within the outline, shift the patient to one side so that one arm is within the outline, allowing the other to be outside of the outline. Best to shift the patient to the left to keep them away from the tower.

• Slightly separate and rotate legs medially until toes touch.







## Whole Body Scan Regions of Interest

#### Whole-Body Scan

- (1) Verify that the neckline is just under the patient's jaw.
- (2) Verify that the T12-L1 line in the spine is at the appropriate level.
- (3) Verify that the Upper Pelvic line is just above the iliac crest.
- (4) Verify that the Lower Pelvis divider lines separate the legs and torso





## Whole-Body Scan Regions of Interest continued

#### Whole-Body Scan Table Position

- (1) Verify that the chest lines are close to the chest.
- (2) Verify that the spine lines are close to the spine.
- (3) Verify that the leg lines are close to the legs.
- (4) Verify that the leg divider line evenly separates the legs and feet.



Figure - 17



## Transgender & Gender Non-conforming Individuals - continued

- T-scores should be calculated using a uniform Caucasian (nonrace/ethnicity adjusted) female normative database for all transgender individuals of all ethnic groups
- Calculate Z-scores using normative database <u>that matches the</u> <u>gender identity of the individual</u>
- If specially requested, Z-scores may be calculated using the normative database that matches the sex recorded at birth or for both male and female databases
- In gender-nonbinary individuals use normative database that matches sex recorded at birth

## Manually Entering Prior Scans



 Patients Patient Scans		
Minual Scientifie) X Pa	tient ID:	Scan Entry
BMD Results fipm Lunar . Month: .	Region Details Entry	×
Day.	BMC	Area
Scan Sile Spine Year:	11	
BMD Betriese Included in Total		
Total 1.125 PL1 PL2 PL3 PL4 Region Details	/13 1	
	14 1	1
OK Cancel	OK	Cancel
	/	





## Manually Entering Prior DXA scans continued

Manually Entering DXA Scans	Manually Entering Hip Scans	
<ul> <li>Select the Filing Cabinet at the top of the screen</li> <li>Enter the patients name and select Patient Scans</li> <li>If the patient is a new patient, you will need to first go to Perform Exam and begin the patient like you would any new patient on your worklist for the day. Once they have been begun, the patient can be found in the Filing Cabinet.</li> </ul>	For manually entering Hip data (Figure 19) • Follow the same process as for the spine and select Left or Right Hip	
<ul> <li>Select Scan Entry to the right of the Box</li> <li>In the BMD Results From drop down box, select the scanner type the results are from (Lunar or Hologic are the most common)</li> </ul>	<ul> <li>Fill in the BMD data for the Total and Neck only</li> </ul>	
<ul> <li>For Scan site, select Spine</li> <li>Enter the scan Month, Day, and Year</li> </ul>	Manual Scan Entry BMD Results from: LunarMonth:	
•Select/Check the box beside all the regions included in the total	Scan Site : Right Hip Year. Year.	
Enter the BMC and Area for only the vertebral levels included in the total BMD	OK Cancel	
	L Figure - 19	

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## **DICOM Reports for PACS**

## **DICOM Reports Import to PACS**

• When a Lumbar level is eliminated from the evaluation open the Configure Optional Reports. Check the Extended AP Lumbar Spine Report box to ensure the information regarding the individual vertebrae is sent to PACS for review.



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## How to Force FRAX



## Force FRAX

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- To force a FRAX report to include with the exam, select the Scan Icon on the right side of the application
- Select the All Scans and enter the patient's name
- Select Scan Detail on the right side of the box
- Select the Force FRAX on the bottom of the Scan Properties box
  - 24 DXA Exam Protocol