 CLSA ÉLcV Canadian Longitudinal Study on Aging Étude longitudinale canadienne sur le vieillissement	Title:	Bone Density by Dual- energy X-ray Absorption (DXA) – Whole Body Scan		
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Data Collection Site (DCS)	Version:	2.3	Number of Pages:	6

1.0 Purpose:

The purpose of this document is to describe the standardized procedure for completing bone mineral density (BMD) and body composition measurements of the whole body on the Hologic Discovery A Dual Energy X-Ray Absorptiometry (DXA) machine.

2.0 Scope:

This document is to be used by the DCS staff when administering the BMD and body composition measurements of the whole body to a participant.

3.0 Responsibilities:

It is the responsibility of the DCS staff to perform the procedures as described in the current and approved version of the standard operating procedure.

4.0 Related Documents:

- **MAN_DCS_0014** – Additional training for the Dual-energy X-ray Absorptiometry (DXA)
- **SOP_DCS_0014** – Bone Density Questionnaire
- **SOP_DCS_0043** – Dual-energy X-ray Absorption (DXA) SOP – Calibration (Quality Assurance) and Maintenance
- **SOP_DCS_0066** – DEXA Gold Standard Process

5.0 Definitions:

- **Glenoid fossa:** The concavity in the head of the scapula that receives the head of the humerus to form the shoulder joint.
- **Shoulder Joint:** Formed by the humerus and the shoulder girdle.

6.0 Equipment:

- DXA machine (Hologic Discovery A)

7.0 Supplies:

- Radiation badges;
- Straps for positioning; and,
- Disinfectant spray/wipes.

8.0 Procedure Steps:

Contraindications:

- Weight over 450lbs (204kg);
- Height over 6'2" (187.96cm);

- From the Contraindications Questionnaire;
 - Pregnancy;
 - Unable to stand unassisted;
 - Participated in nuclear medicine studies within the last 2 days;
 - Had a IV CT or MRI contrast test within 24 hours;
 - Had a barium test within the last 7 days; and,
- Please make a note of the following conditions from the Contraindications Questionnaire in the comments section of Onyx:
 - Pacemaker or defibrillator;
 - Cochlear implant or hearing aid;
 - Cast on the hand arm or leg (Contraindications Questionnaire);
 - Prosthetic limbs or joints (e.g., hip replacement);
 - Previous breaks or fractures;
 - Laminectomy ;
 - Polio;
 - Arteriovenous shunt/Fistula; or,
 - Note the test type is participant was involved in nuclear medicine more than 48 hours ago but less than 7 days ago.

Sponges

Sponges can be used to provide participant comfort or support during DXA scans on an **as needed basis**. The sponge provides comfort to an **already existing** gap; it should not provide a further elevation or a further bend in the knee (i.e., if a participant is unable to place their head against the DXA table during a whole body scan or they already have a slight bend in their knee and require support as they are uncomfortable with holding the position). Sponges are not used to routinely position during bone density, but only in extreme cases where participants need some support from the positioning.

Whole Body Scan

- Step 1:** Before this scan can be performed the Bone Density Questionnaire stage must be completed. Refer to *SOP_DCS_0014 - Bone Density Questionnaire* and complete the **Starting the BD Questionnaire** section.
- Step 2:** To Start the scan refer to *SOP_DCS_0014 - Bone Density Questionnaire* and complete the **Starting Each DXA Scan** section.
- Step 3:** The participant must be positioned in the middle of the table, centred according to the centre lines on the head and foot of the table pad. To ensure that they are in the centre, stand at one end and look at the alignment of the body.

Pull the participant's feet at their calves or from the head pull under their shoulders to make sure the participant's spine is straight.

Make sure that the participant's body is entirely within the scan limit borders on the pad. Alternatively you could ask the participant to 'wiggle' or move slightly to the side or other until the spine is straight.

Step 4: The legs should be straight and feet apart. Flex feet and point toes inward to rest against each other. Big toes can rest against each other but not overlap. Use a strap around the toes to support the legs in this position and to reduce movement. Be sure that the feet are within the scan limit borders.

Step 5: The participant should lie flat on the table without a pillow. If the participant has trouble lying flat and requires support under their head or neck, use the radiolucent pillow to support the head. The pillow is not completely radiolucent so use only as necessary. If the pillow does not supply sufficient support, use the radiolucent block or wedge. If support is requested under the knees, a radiolucent support can also be supplied. If the participant continues to have difficulty lying flat or with the head slightly supported, exclude him or her from the exam.

Step 6: Place the participant's arms straight at his/her sides, palms down (fingers should be tight together), with a separation from the thighs. Elbows should be slightly bent. Make sure the arms are within the scan limit borders.

- For a large participant, hands can be placed vertically next to their thighs to ensure that the hands and arms remain in the scan. There must be space between the participant's arms and sides whenever possible.
- If it is not possible to get both hands in, cut equal amounts on both sides off in the scan.

Step 7: Select **Whole Body** from the list of scans and then select **Next**.

Step 8: If the participant is positioned correctly for the whole body scan, press **Start Scan** to begin. Tell the participant to close their eyes. The participant should remain still until the scan is complete. Make sure the participant's arms are included in the scan on the first and last pass of the C-arm.

NOTE: If the Control Panel X-ray indicator fails to shut off within 10 seconds after the end of the scan, press the red **Emergency Stop** button immediately. Before the machine can be used again, the Hologic service representative should be called. To complete this task, refer to the *SOP_DCS_0043 - DEXA Calibration and Maintenance SOP*.

Step 9: When the exam completes, remove the strap from around the participant's feet and clean it with disinfectant spray.

Step 10: On the 'Exit Exam' window press **Analyze Scan**.

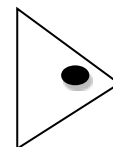
Step 11: On the 'Analyze Setup' window, click **Next**.



Adjusting Image Quality:



Image contrast can be adjusted by selecting the **Sun/Moon** symbol on the bottom left of the screen, then move the circle within the triangle to change the lightness or darkness of the image.



- Once contrast is optimal, select the **Sun/Moon** again to set the contrast.

Adjusting the Image:

- Press the **zoom** button twice.
- Centre the image using the arrow keys.
- First move the horizontal lines using **Line Mode** and the arrow keys.
 - The top line should be just below the chin and above the shoulders.
 - The second line should be between T12 and L1 (last rib).
 - The third line should be just above the pelvis (iliac crests).
- Next adjust the vertical lines. Move the two inner vertical lines to just touch the spine on either side.
- Use the **Point Mode** to put the shoulder lines past the head of the humerus.
- Shoulder points should be just clear of glenoid fossa
NOTE: Point Mode may also be needed to bend the lines either side of the spine, if the spine is not straight.
 - Un-zoom by clicking on **Sun/Moon** to move the image out. Click **Sun/Moon** again to return.
 - In **Point Mode** move hip triangle past the soft tissue, but not touching the hands. Move the lower triangle point down until the line passes through the femoral neck on both sides.
 - Adjust the bottom leg points to include the soft tissue, moving the lines outwards. Check the center line is between the two feet.
 - Verify that the shoulder points do not need adjusting.
 - Click on **A/G regions**, then click on **Results**.
 - Click on the **Sub Region** then the **Sub Region Results** button below.
 - Click **Close**.

Step 12: The 'DAP Report' window will open, click **OK**.

Step 13: Select **Report** and the 'Select Patient' window will pop up, click on the participant's whole body scan to select, click on **Next**.

Step 14: Minimize the APEX program.

- Step 15:** In Onyx at the *Interview Tab*, select **Start** in the 'Bone density – whole body' row. The 'Bone density – whole body scan: Start' window will appear.
- Step 16:** Scan the Interview ID barcode, click on **Continue**.
- Step 17:** Press **Start** in the 'Instrument application launch' to open the Hologic software. A 'Hologic Apex Receiver' box will pop up.
- Step 18:** Go back to the APEX program. Make sure the report type selected is 'Interpreting' with one copy. Select **DICOM/IVA**. The 'DICOMM/IVA' page will come up, click on **Send**.
- Step 19:** One or two messages will pop up, click on **OK** (for each message), until you are back to the 'DICOM/IVA' page.
- Step 20:** In Onyx press the **Capture** button and wait until the 2 rows below turn green, click **OK**.
- Step 21:** Press **Refresh** so that the scans will appear on this page. If there is more than the required amount of scans, delete the appropriate ones.
- Step 22:** Click on **Next**. The 'Bone density – Whole Body: Finish' screen will appear.
- Step 23:** Click **Finish** and indicate in the comments field if there was anything that may have affected the measurement. Ensure that comments do not contain any personally identifying information.
- Step 24:** Click **Continue** to return to the *Interview Tab* page.
- Step 25:** Return to the APEX program - Report and click on **Cancel**.
- Step 26:** Press the **Patient ON/OFF** switch on the control panel and wait for the C-arm to move to the far left and extend the table out from the base.
- Step 27:** Click on **Exit** in the bottom right corner.
- Step 28:** Return to the 'APEX program – Report' and click on **Cancel**.
 - You will now move on to the next scan. If the participant is unable or unwilling to do this scan, or no further scan is prompted, then refer to the **Final Steps** section of *SOP_DCS_0014 - Bone Density Questionnaire*.

9.0 Documentation and Forms:

- **CRF_DCS_0014_1** – DXA Case Report Form

10.0 References:

- Body Composition Procedures Manual. NHANES; 2006.
- Discovery QDR Series: Operator's Manual. Document No. MAN-01794 Revision 002. Hologic, Inc.; 2010.

F1 Revision History:

New Version #	Revision Date	Revision Author	Content Approval
2.3	2017-AUG-09	Lorraine Moss	Harriet Sauve

Summary of Revisions			
SOP edited to correct the Contraindications and to be noted sections for this measurement.			
General formatting to the document.			
Removed information regarding starting and ending scans			
New Definition added for shoulder joint.			
New Version #	Revision Date	Revision Author	Content Approval
2.2	2015-OCT-30	Lorraine Moss	Mark Oremus
Summary of Revisions			
Added disinfectant wipes to the list of supplies.			
Wording changes made to Steps 5, 6, and 7 to clarify positioning of legs, hands, and the use of pillows and other supports.			

Follow-up 2