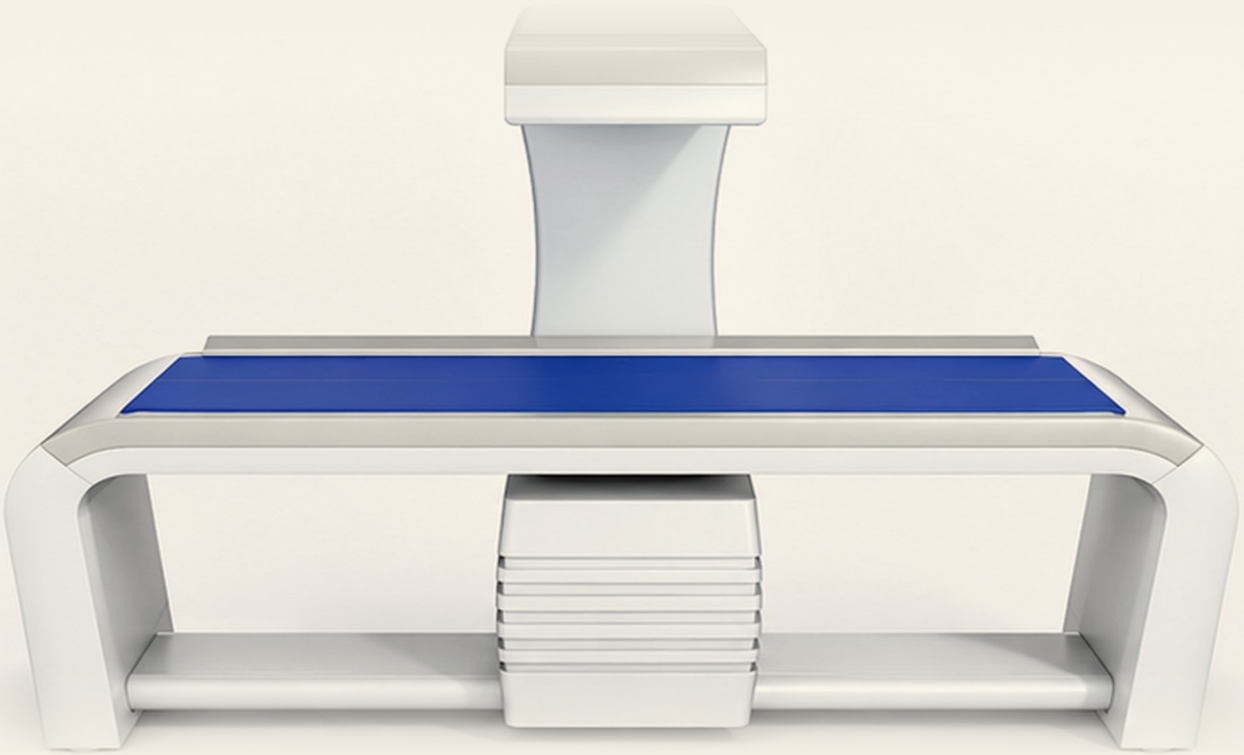
BONEDENSITY PREP · FREE GUIDE

The DXA Technologist's Path

A practical starter guide for future bone densitometry technologists



Inside

How DXA works · patient prep · positioning · artifacts · analysis · real-image cases
VFA and TBS · QC and LSC with examples · radiation safety · checklists · self-check · CBDT®

Edition 2.2 · October 2026 · based on the 2023 ISCD Official Positions
Independent educational resource. Not affiliated with or endorsed by ISCD.

digitaltrainingprep.com

BEFORE YOU BEGIN

About this guide

A short introduction to the work of a bone densitometry (DXA) technologist — from patient preparation to quality control — and to what the CBDT® exam covers.

The text is written in our own words from open professional sources, chiefly the 2023 Official Positions of the International Society for Clinical Densitometry (ISCD)[1]. The schematics were drawn for this guide. Real images come from the public-domain CDC NHANES manual and from the author's de-identified archive; the source is given under each image. Bracketed numbers point to the source list at the end.

> **Important**
> This guide is educational. It does not replace manufacturer training, your facility's protocols, state requirements or a physician's judgment. Always check current ISCD documents before the exam.

Contents

1 What DXA is and what it measures
2 Who should be scanned
3 Patient preparation
4 Positioning
5 Artifacts
6 Scan analysis
7 Real-image case review
8 VFA, TBS and other exams
9 Quality control, precision and LSC
10 Radiation safety
11 Reporting and terminology
12 Checklists
13 The CBDT® exam and career path
— Self-check, answers and key terms
— Sources and legal information

CHAPTER 1

What DXA is and what it measures

Dual-energy X-ray absorptiometry (DXA) is the standard method for measuring bone mineral density (BMD) to diagnose osteoporosis and monitor treatment.

The scanner sends an X-ray beam at two energy levels through the body. Bone and soft tissue attenuate them differently, so the software can subtract soft tissue and estimate bone mineral[4]. The radiation dose is very low (see the radiation safety chapter).

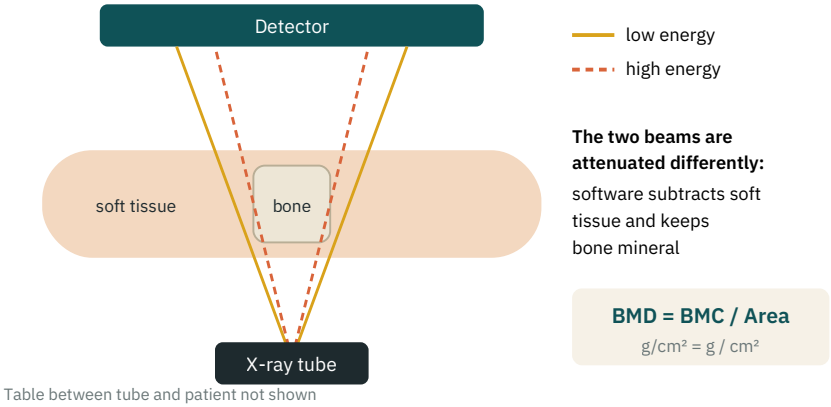


Fig. 1. The DXA principle. The tube is below the table and the detector above the patient.

DXA gives **areal** density: grams of mineral per square centimeter of projected bone. It is not volumetric density, which QCT measures[4]. Bone size and patient position therefore affect the result — which is why precise positioning matters.

Measure	What it is	Unit
BMC	Mineral mass in the region of interest	g
Area	Projected bone area	cm²
BMD	BMC divided by Area	g/cm²

Two ways to get two energies

Some systems switch the tube voltage and use an internal calibration wheel (for example, Hologic). Others filter the beam with a K-edge filter and separate the energies on a photon-counting detector (for example, GE Lunar)[4]. Results from different manufacturers cannot be compared directly.

Pencil-beam and fan-beam

Pencil-beam systems scan point by point with a narrow beam: generally slower, with no geometric magnification and a lower dose. Fan-beam systems use a fan of X-rays and a detector array: usually faster, with better resolution and VFA capability, but with magnification and more scatter[4]. Actual dose, time and resolution depend on the model and scan mode — check your system's documentation[6].

CHAPTER 2

Who should be scanned

ISCD recommends DXA for all women aged 65 and older and all men aged 70 and older, and for younger people with risk factors[1].

- Postmenopausal women under 65 and men under 70 with low body weight, prior fracture, high-risk medication or a disease associated with bone loss.
- Women in the menopausal transition with clinical risk factors.
- Adults with a fragility fracture, or with a disease or medication associated with bone loss.
- Anyone being considered for, or treated with, osteoporosis therapy — to monitor response.

T-score or Z-score

A **T-score** compares the patient with young adults at peak bone mass; a **Z-score** compares with people of the same age and sex. ISCD recommends a uniform White female reference (NHANES III for the hip) for T-scores in all patients[1].

Patient	Use	Interpretation
Postmenopausal women, women in the menopausal transition, men 50+	T-score	WHO classification (scale below)
Premenopausal women, men under 50, children	Z-score	Z ≤ −2.0 is “below the expected range for age”

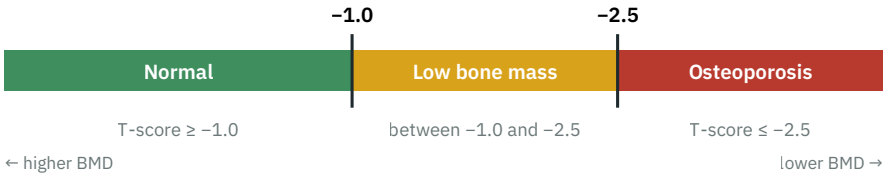


Fig. 2. WHO densitometric classification by T-score. Diagnosis uses the lowest T-score of L1–L4, femoral neck and total hip; the 33% radius in specific situations[1].

> **Remember**
> ISCD prefers “low bone mass” to “osteopenia.” In men under 50, osteoporosis cannot be diagnosed from BMD alone[1].

FRAX® and fracture risk

Physicians often estimate fracture risk with FRAX®, which gives the 10-year probability of hip and major osteoporotic fracture for untreated people aged 40–90[3][7]. One detail matters to technologists: BHOF recommends entering the femoral neck BMD in g/cm² with the scanner make, not the T-score[3]. FRAX estimates fracture risk; it does not replace BMD measurement and is not designed to assess treatment response.

CHAPTER 3

Patient preparation

Most errors can be prevented before the scan — a short interview takes one minute.

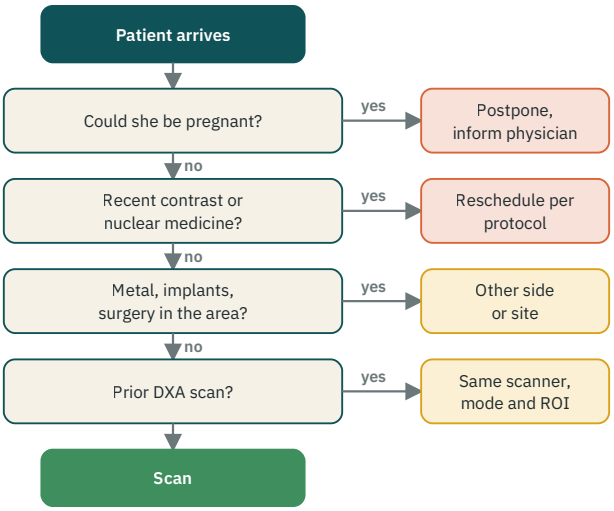


Fig. 3. Pre-scan screening. Waiting periods after contrast and nuclear medicine vary between sources (3 days to 2 weeks), so follow your facility and manufacturer protocol[4][5].

What to ask the patient

- No calcium supplements for 24 hours before the exam: an undissolved tablet in the scan field raises BMD[4].
- Wear comfortable clothing with no metal — zippers, buckles, underwire — and empty the pockets[5].
- Bring prior DXA results: follow-up scans are best done on the same scanner[1].

Check the patient's weight: every scanner has a table limit (often 136–227 kg, about 300–500 lb)[4][6]. If the patient exceeds it, ISCD recommends measuring the forearm[1].

CHAPTER 4

Positioning

Positioning is the largest source of error the technologist controls. The goal is a technically valid, reproducible scan: correct positioning, repeated the same way at every visit[4].

ISCD recommends measuring the PA lumbar spine and the hip in all patients[1].

Spine (PA, L1–L4)

- Patient supine, centered on the table; check the “nose – navel – between the feet” line.
- Lower legs on the positioning block, hips and knees flexed to about 90°: lordosis is reduced and the spine lies flat[5]. Use a block of the same height at follow-up.
- Arms at the sides, out of the scan field.
- On the image: spine straight and centered, equal soft tissue on both sides, iliac crests at the bottom and the last ribs (T12) at the top[5].

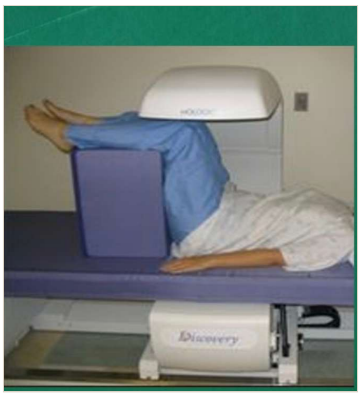


Fig. 4. PA spine setup: lower legs on the positioning block. *Author’s archive, de-identified*

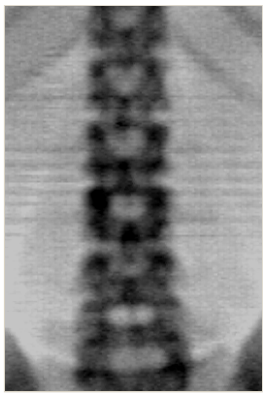


Fig. 5. Correctly positioned spine. *Source: CDC/NCHS, NHANES DXA Procedures Manual, 2007 — public domain*[5]

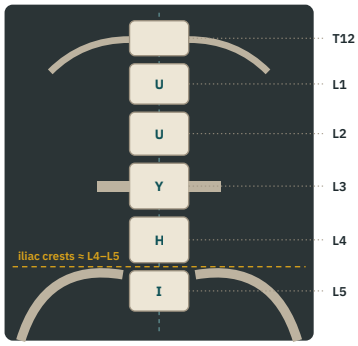


Fig. 6. Labeling landmarks: posterior-element shapes; iliac crests ≈ L4–L5.

Hip

- Leg straight, foot strapped in the positioner with about 15–25° internal rotation. Rotate the whole leg from the hip, not just the foot[5].
- Femoral shaft straight and parallel to the long axis of the table.
- In the field: head, neck, trochanters and about 7–8 cm (3 in) of shaft[5].
- Lesser trochanter small or barely visible. A large lesser trochanter means insufficient internal rotation[4].
- Either hip may be scanned. With a prosthesis or fracture, use the opposite side[1].
- In patients with a large abdominal pannus, ask them to hold it away from the hip and document this[5].

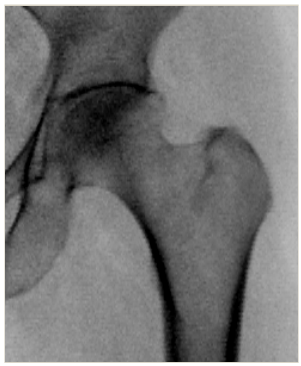


Fig. 7. Correct: straight shaft, lesser trochanter barely visible. *Source: CDC/NCHS, NHANES DXA Procedures Manual, 2007 — public domain*[5]



Fig. 8. Error: shaft not straight, no internal rotation — reposition. *Author's archive, de-identified*

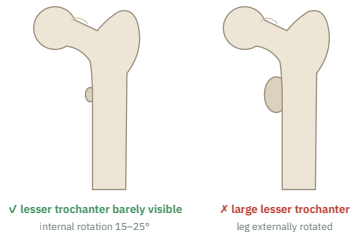


Fig. 9. Schematic: how rotation changes the lesser trochanter.

Forearm

The forearm is measured when the spine or hip cannot be assessed, in hyperparathyroidism, and when the patient exceeds the table weight limit. Only the 33% (one-third) radius of the non-dominant arm is used for diagnosis[1]. The patient usually sits beside the table with the arm resting on it and immobilized[4]. If that arm has a fracture or hardware, scan the other one and document it.

On the image: radius and ulna straight and parallel to the edge of the field, forearm centered, distal ends included. The software marks the UD (ultradistal), MID and 1/3 regions; only 1/3 is used for diagnosis.

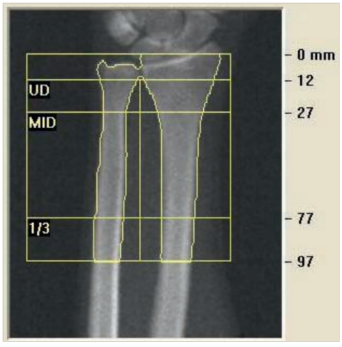


Fig. 10. Forearm: UD, MID and 1/3 (33% radius) regions. *Author's archive, de-identified*

> **Follow-up scans**
>
> Same scanner, same scan mode, same positioning. Open the prior image and reproduce it as closely as possible[4]. If the scanner has changed, see the quality control chapter: results cannot be compared without cross-calibration[1].

CHAPTER 5

Artifacts

Most artifacts in the spine falsely **raise** BMD and can hide osteoporosis[4].

Artifact	Effect on BMD	Action
Osteophytes, facet sclerosis, degenerative change	↑ raises	Check whether the vertebra is evaluable; exclude only by the criteria in the analysis chapter and document why
Vertebral compression fracture	↑ raises	Assess by the analysis criteria; tell the physician you suspect a fracture
Aortic calcification	↑ usually small	Note it in the record
Calcium tablets, contrast, stones in the field	↑ raises	Reschedule or exclude the area
Metal: hardware, prostheses, piercings, clothing	↑ raises	Remove items; with implants choose another site
Laminectomy (posterior elements removed)	↓ lowers	Exclude the vertebra by the analysis criteria
Patient motion	Distortion	Rescan immediately

Rescanning while the patient is still on the table is far easier than calling them back[4]. Before the patient leaves, check once more that there was no motion.

CHAPTER 6

Scan analysis

The software places the regions of interest (ROI) automatically, but the technologist must check every analysis[4].

Spine

- Use L1–L4. Exclude only vertebrae with structural change or artifact[1].
- A vertebra may be excluded if it is clearly abnormal or its T-score differs from adjacent vertebrae by more than 1.0[1].
- At least two vertebrae are needed for diagnosis. A single vertebra is used neither for diagnosis nor for monitoring[1].
- After exclusion, the T-score is calculated from the BMD of the remaining vertebrae, not by averaging their T-scores[1].
- Check labeling from the bottom up: the iliac crests are usually at L4–L5, L4 posterior elements look like an "H" or "X," L5 like an "I," and the last ribs are at T12 (see Positioning). Anatomical variants are common.
- BMD normally increases from L1 to L4. If an upper vertebra is clearly denser than the one below, look for a fracture or artifact.

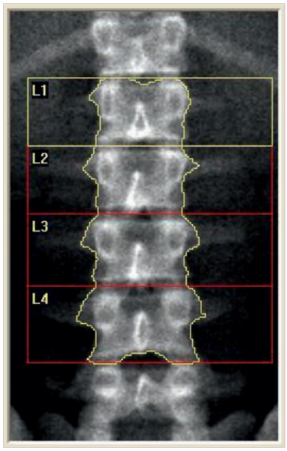


Fig. 11. Correct L1–L4 analysis: straight, centered spine; intervertebral lines in the disc spaces; bone edges traced. *Author's archive, de-identified*



Fig. 12. Correct hip analysis: neck ROI perpendicular to the neck axis, clear of the greater trochanter and ischium. *Author's archive, de-identified*

Hip

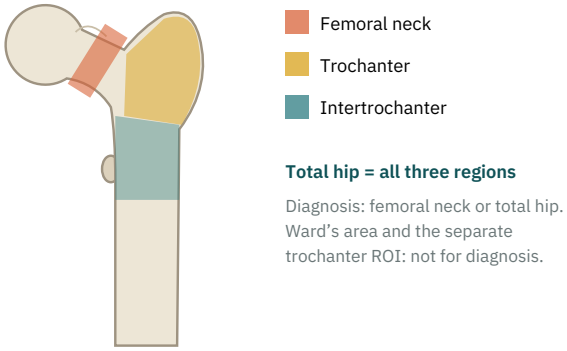


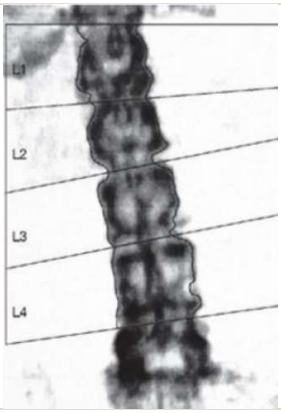
Fig. 13. Proximal femur regions. Exact ROI shapes vary by manufacturer.

- Diagnosis uses the lower of the femoral neck and total hip[1].
- If both hips were scanned: the lowest T-score of either side for diagnosis; the mean total hip for monitoring[1].
- Make sure the neck ROI does not include the ischium or the greater trochanter and that bone edges are found correctly.
- At follow-up, use the compare/copy function so ROIs match the prior scan[4].

CHAPTER 7

Real-image case review

A rule is easier to apply once you have seen it on an image. For each example: what we see, what the technologist does and why. The physician makes the final interpretation.



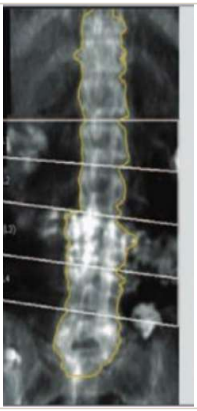
Author's archive, de-identified

Spine not positioned straight

What we see. The spine is curved and shifted, the vertebrae are slightly rotated and the disc spaces are uneven.

What to do. Straighten and center the patient and rescan while they are still on the table.

Why. Rotation changes the projection of the vertebrae: area and BMD become inaccurate and the follow-up scan cannot be reproduced.



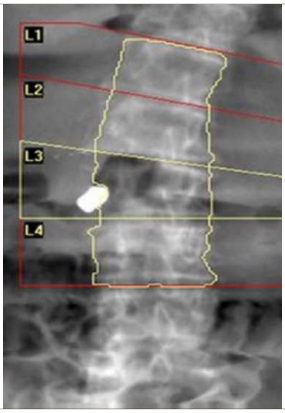
Author's archive, de-identified

Contrast from another exam

What we see. Dense material in the bowel overlies the lower lumbar vertebrae.

What to do. Do not analyze as usual: reschedule per facility protocol once the contrast has cleared.

Why. Contrast adds "mineral" to the ROI and falsely raises BMD.



Author's archive, de-identified

Foreign body over a vertebra

What we see. A metal foreign body (bullet) projects over L3; the vertebra below is also not evaluable.

What to do. Exclude the affected vertebrae (here L3–L4) and analyze L1–L2 — at least two vertebrae. Document the reason.

Why. Metal falsely raises BMD. ISCD allows diagnosis from two vertebrae, but not from one.



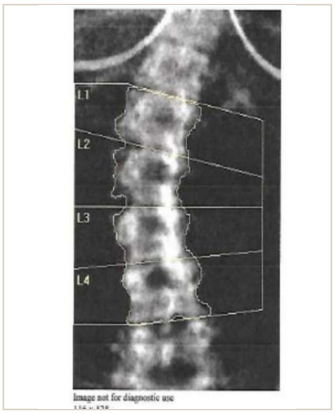
Author's archive, de-identified

Hardware in the hip

What we see. Hip prosthesis in the analysis region.

What to do. Do not analyze this hip. Scan the opposite hip, or the forearm (33% radius) if neither hip is usable.

Why. Metal makes hip BMD invalid; ISCD allows either hip to be measured.



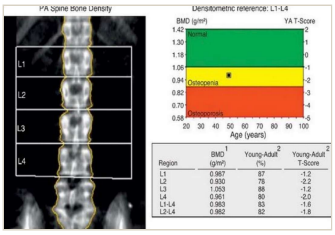
Author's archive, de-identified

Scoliosis and degenerative change

What we see. Lumbar rotoscoliosis with probable facet sclerosis along the concave side.

What to do. Check each vertebra against the exclusion criteria and note the findings. If fewer than two vertebrae are evaluable, rely on the hip or forearm.

Why. Degeneration and rotation raise spine BMD and can mask osteoporosis.



Author's archive, de-identified

Exercise: exclude L2?

Positioning is correct: straight spine, level crests, T12 ribs visible. T-scores: L1 −1.2; L2 −2.2; L3 −1.2; L4 −2.0.

Question. Should L2 be excluded by the T-score difference criterion?

Answer. No. The ISCD criterion is a difference of *more than* 1.0 from adjacent vertebrae; here it is exactly 1.0. Without structural change the vertebra stays in the analysis[1].

CHAPTER 8

VFA, TBS and other exams

VFA — vertebral fracture assessment

Vertebral fractures are the most common consequence of osteoporosis, yet only about one in four is clinically recognized: most cause no symptoms, and height loss becomes a reliable sign only beyond 4 cm[10]. An existing vertebral fracture raises the risk of a new vertebral fracture about four- to five-fold and of a hip fracture about two-fold[10].

VFA (called IVA on Hologic systems) is a lateral image of the thoracic and lumbar spine acquired on a fan-beam densitometer, usually covering T4–L4[1][4]. ISCD recommends lateral spine imaging (VFA or radiography) when the T-score is below −1.0 and at least one of the following applies: women 70+ or men 80+, height loss over 4 cm, self-reported but undocumented vertebral fracture, or glucocorticoids ≥5 mg prednisone daily for 3 months or longer[1].

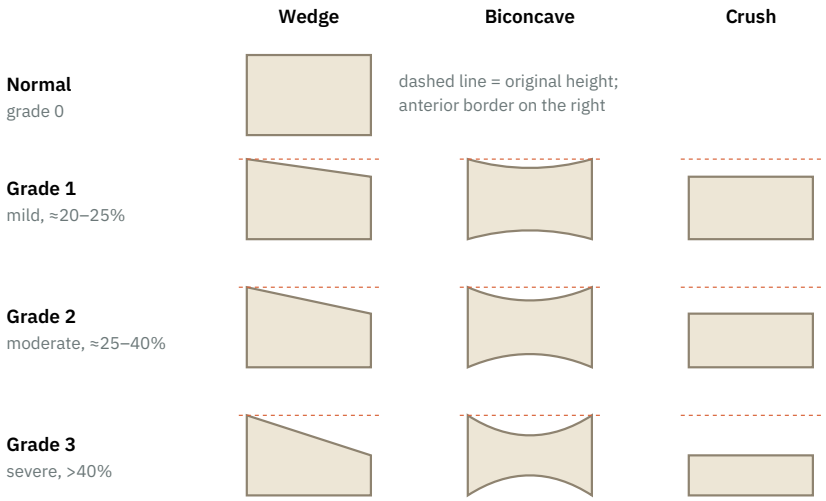


Fig. 14. Genant semiquantitative method: deformity type and grade by visual reduction of vertebral height (anterior, middle or posterior). A fracture is a reduction of about 20–25% or more[10]. Original simplified schematic.

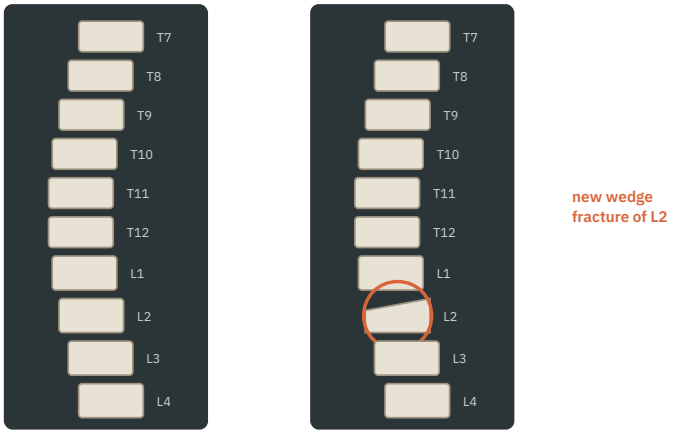


Fig. 15. Why VFA is compared over time: a wedge fracture absent at baseline appears at follow-up. Schematic after Genant et al. [10]

Parameter	Radiograph	VFA (fan-beam DXA)
Resolution	≈5 line pairs/mm	≈0.5–1 line pairs/mm
Effective dose	≈800 µSv	<10 µSv
Images to cover T4–L4	2	1
Where performed	Separate referral	During the DXA visit, in about 10 seconds

Data from a 1999 publication prepared with manufacturer involvement[10]. Radiography remains the reference standard; VFA is a convenient point-of-care screen.

In a study on the QDR 4500, VFA allowed about 95% of vertebrae to be assessed; those not seen were mostly T4–T5, where osteoporotic fractures are uncommon. For moderate and severe fractures, sensitivity was 92%, specificity 96% and negative predictive value 99.4%[10]. In other words, VFA reliably rules out significant fractures but misses mild (grade 1) ones more often.

Technologist's role: lateral positioning (arms raised out of the field, spine parallel to the table, no rotation); a fast single-energy mode with breath-hold reduces blur; coverage from T4 to L4; repeat for motion; note non-evaluable vertebrae.

Physician's role: identifying and grading fractures by Genant (morphometry alone is not reliable) and deciding on further imaging — for example, when vertebrae between T7 and L4 cannot be identified or changes do not look osteoporotic[1].

TBS — trabecular bone score

TBS is a texture index calculated by software from a standard PA lumbar spine image. It reflects microarchitecture rather than mineral amount and complements BMD in fracture-risk assessment[1].

- Used in adults aged 40 and over, and only within the manufacturer's BMI range — so accurate height and weight matter.
- Calculated over L1–L4 without exclusions, even with moderate degeneration; not reported with severe artifacts (metal, laminectomy, vertebra plana).
- Used to adjust FRAX; not a stand-alone basis for treatment; routine TBS monitoring is not recommended[1].

Full femur imaging (FFI)

For patients on bisphosphonates or denosumab for 3 years or longer (or who stopped within the past year), ISCD suggests considering bilateral full-length femur imaging to look for signs of atypical femur fracture. Focal lateral cortical thickening with a transverse lucent line indicates a high likelihood and needs urgent referral[1].

Whole body and body composition

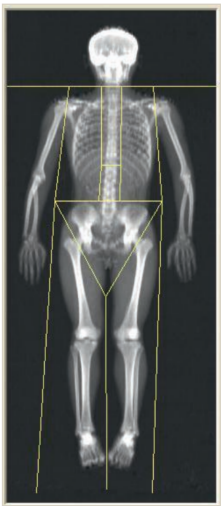


Fig. 16. Whole body: standard region lines. *Author's archive, de-identified*

A whole-body scan gives skeletal BMC and BMD plus fat mass and lean mass by region. ISCD indications include people with HIV on drugs associated with lipoatrophy, bariatric surgery or major weight loss, and muscle weakness[1].

- Pregnancy is a contraindication.
- NHANES positioning: supine, arms straight with palms down and separated from the body, feet neutral, ankles strapped[1].
- The whole body inside the field; for patients too wide for it, a validated offset scan.
- Same preparation at every visit: fasting state, clothing, time of day, empty bladder.
- Minimum technologist precision: 3% fat mass, 2% lean mass, 2% percent fat[1].

CHAPTER 9

Quality control, precision and LSC

Accurate diagnosis requires correct calibration; monitoring treatment requires good reproducibility (precision)[4].

Daily and weekly QC

- Run the manufacturer's QC program before scanning patients[4].
- If it does not include phantom scanning, add a phantom scan at least once a week and plot the results[1].
- Verify the phantom mean after any service and keep a log[1].

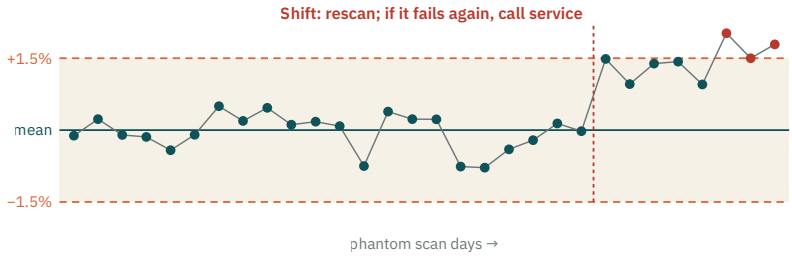


Fig. 17. Shewhart control chart. A sudden jump is a shift; a gradual trend is drift. Limits of ±1.5% are common in practice; your center sets the exact thresholds.

Precision assessment

Each technologist performs one after training and about 100 patient scans, and again when a new scanner is installed or skill level changes[1]. The manufacturer's precision value cannot be used.

1. Scan 15 patients 3 times or 30 patients 2 times, repositioning the patient each time.
2. Calculate the group RMS-SD, for example with the ISCD precision calculator.
3. Calculate the least significant change (LSC) at 95% confidence.

$$\text{LSC} = 2.77 \times \text{precision error}$$

A BMD change is significant only if it equals or exceeds the center's LSC. Results from different scanners cannot be compared without cross-calibration[1].

Site	Minimum acceptable precision	LSC
Lumbar spine	1.9%	5.3%
Total hip	1.8%	5.0%
Femoral neck	2.5%	6.9%

If a technologist's precision is worse than these values, ISCD requires retraining. A precision assessment is not research and needs no IRB approval, but patient consent is required[1].

LSC in practice: a worked example

Suppose the center's precision study gave a spine RMS-SD of 0.012 g/cm². Then LSC = 2.77 × 0.012 ≈ **0.033 g/cm²**. ISCD prefers expressing LSC in g/cm²[1]. Below are three typical situations with fictional teaching data.

Situation	Before → after	Change	Conclusion
1. Small increase	0.850 → 0.875 g/cm²	+0.025 g/cm² (+2.9%)	Below LSC: no statistically significant change. Not a proven gain.
2. Clear decrease	0.850 → 0.810 g/cm²	−0.040 g/cm² (−4.7%)	Above LSC: statistically significant. The physician interprets it clinically.
3. Different scanner	0.850 (scanner A) → 0.812 (scanner B)	—	Cannot be compared without cross-calibration. This is a new baseline.

> **Quality first, numbers second**
> Before comparing, make sure both exams are technically valid and comparable: same scanner and mode, same positioning, same ROIs and same vertebrae. Statistical significance does not replace quality review and the physician's clinical judgment.

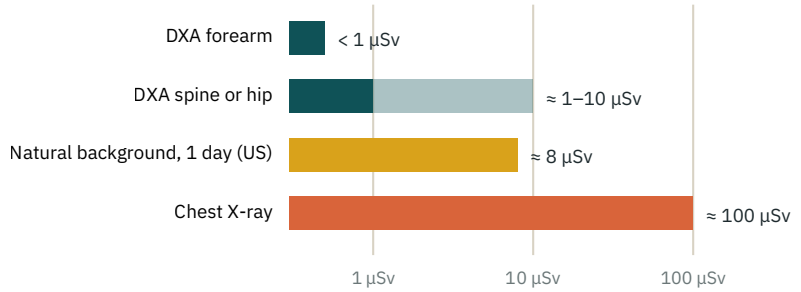
Changing scanners: a short algorithm

1. **Replacing a component or a same-model scanner:** one technologist performs 10 phantom scans with repositioning before and after. A difference in means above 1% requires service[1].
2. **New technology or another manufacturer:** 30 representative patients scanned once on the old system and twice on the new one within 60 days, then the ISCD cross-calibration calculator[1].
3. **No cross-calibration:** no quantitative comparison with the old scanner; establish a new baseline and a new LSC[1].

CHAPTER 10

Radiation safety

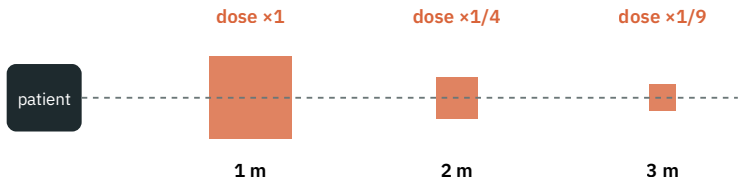
The DXA dose is very low, but the ALARA principle — as low as reasonably achievable — always applies.



Log scale, effective dose, approximate values [4][8]. Light segment = fan-beam range.

Fig. 18. Effective dose of DXA compared with other sources of exposure.

Time, distance, shielding



Scatter comes mainly from the patient. Double the distance and the dose drops to one quarter.

Fig. 19. Inverse square law — a simplified point-source model. Real scatter depends on the system geometry; the dose distribution in the room is determined by a physicist.

- The technologist's main source of exposure is scatter from the patient[4].
- IAEA recommends placing the operator at least 1 m (about 3 ft) from pencil-beam and 2 m (about 6.5 ft) from fan-beam systems; the actual distance and any need for a barrier are determined by a physicist's survey[4]. Also follow the manufacturer's data[6].
- Wear a personal dosimeter if state and facility rules require it.
- Avoid unnecessary or higher-dose modes: dose depends on mode and scan length[4].

U.S. dose limits (NRC)	Value
Occupational, per year	50 mSv (5 rem)
Member of the public, per year	1 mSv (100 mrem)
Embryo/fetus of a declared pregnant worker, entire pregnancy	5 mSv (500 mrem)

Source: 10 CFR Part 20[9]. Individual states may be stricter.

CHAPTER 11

Reporting and terminology

The physician writes the report, but the technologist is responsible for technically correct data and for noting anything that may have affected the result.

Preferred terms

Preferred	Avoid
DXA	DEXA
T-score, Z-score	T score, t-score
White	Caucasian
Hip, bilateral hips	Femur, total proximal femur

Value	Decimal places	Example
BMD	3	0.927 g/cm²
T-score, Z-score	1	−2.3
BMC, Area	2	31.76 g; 43.25 cm²
% of reference	whole number	82%

What should not appear in a report

- “Mild,” “moderate” or “marked” osteoporosis or osteopenia.
- Different diagnoses for different ROIs — there is one diagnosis, based on the lowest value.
- Phrases like “bones of an 80-year-old” when the patient is not 80.
- Statements of bone loss without a prior study.
- BMD changes smaller than the LSC, and results from technically invalid sites[1].

> **The technologist’s role**
> Document everything relevant to interpretation: excluded vertebrae and why, the hip side, metal, motion, a retracted pannus, the scan mode.

CHAPTER 12

Checklists

Print these and keep them at the console. They summarize this guide; your facility protocol takes priority.

Before the scan

- [ ] Scanner QC done and within limits
- [ ] Patient identity confirmed with two identifiers
- [ ] Order and indication checked
- [ ] Pregnancy excluded per protocol
- [ ] No recent contrast or nuclear medicine
- [ ] No calcium supplement in the last 24 hours
- [ ] Height and weight measured (needed for FRAX and TBS)
- [ ] Metal, implants, surgery in the area clarified
- [ ] Prior exam found: scanner, mode, side

During the scan

- [ ] Patient centered and straight
- [ ] Spine: block under the lower legs, crests and T12 in the field
- [ ] Hip: whole leg rotated, shaft straight
- [ ] Same scan mode as the prior visit
- [ ] Image monitored during acquisition

Before the patient leaves

- [ ] No motion, image sharp
- [ ] Vertebral labels checked from the bottom up
- [ ] Bone edges and ROIs checked manually
- [ ] Compare/copy used at follow-up
- [ ] Artifacts recognized; rescan or alternate site if needed

What to document

- [ ] Excluded vertebrae and the reason
- [ ] Hip side and why it was chosen
- [ ] Metal, contrast, motion
- [ ] Retracted pannus
- [ ] Scan mode and any deviation from protocol

> **Note**
> These lists do not replace manufacturer training or state requirements.

CHAPTER 13

The CBDT® exam and career path

CBDT® (Certified Bone Densitometry Technologist) is the ISCD certification for technologists who perform central DXA[2].

Item	Details
Questions	150 multiple-choice: 125 scored and 25 pretest; 25 of the scored questions are case-based[2]
Time	3.5 hours, closed book
Where	PSI computer-based testing centers
Renewal	Every 5 years: 35 continuing education credits (MOC program) or retesting

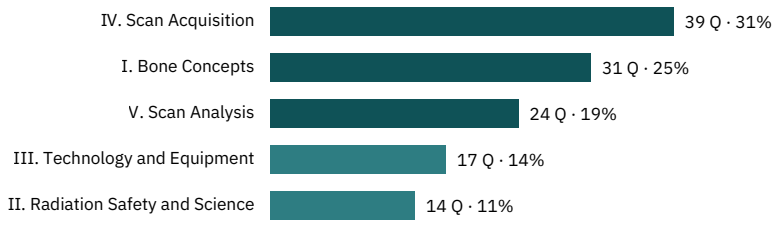


Fig. 20. Distribution of the 125 scored questions by domain[2].

Eligibility

Candidates must meet one pathway: current CBDT, CDT or ARRT(BD); or an allied health degree plus at least 100 central two-site DXA scans and 3 months of experience; or 12 bone health credits within 12 months plus the same experience. A supervisor attests to the experience[2]. Check current requirements and fees on the ISCD website before applying.

Candidate steps

1. Confirm you meet an eligibility pathway.
2. Apply online with your supervisor's attestation of experience.
3. Receive your eligibility notice from PSI and book a testing center.
4. Take the exam; a preliminary result is given immediately.
5. If unsuccessful, reapply no sooner than 30 days later[2].

Technologists with a primary ARRT credential in the U.S. can also earn the ARRT post-primary credential in bone densitometry, BD.

Eligibility for the CBDT exam and permission to operate X-ray equipment are different things: the latter is set by your state.

SELF-CHECK

Test yourself

Eight original practice questions in exam style. They are not questions from the actual CBDT exam. Answers are on the next page.

1. A 67-year-old postmenopausal woman has T-scores of −2.1 (L1–L4), −2.6 (femoral neck) and −2.2 (total hip). What is her WHO category?

A. Normal
B. Low bone mass
C. Osteoporosis
D. Z-score required

2. A patient took a calcium tablet 2 hours ago. What is the correct action?

A. Scan as usual
B. Reschedule, or confirm per protocol that the tablet is not in the ROI
C. Scan the hip only, no comment
D. Cancel the exam permanently

3. On a hip image the lesser trochanter is large and clearly visible. What does this indicate?

A. Normal positioning
B. Insufficient internal rotation
C. Excessive abduction
D. Wrong scan mode

4. The center's spine precision error is 1.5%. What is the LSC at 95% confidence?

A. 1.5%
B. 2.1%
C. 3.0%
D. 4.2%

5. L3 shows marked facet sclerosis and its T-score is 1.6 higher than L2 and L4. What should you do?

A. Keep all four vertebrae
B. Check the criteria, exclude L3 and document why
C. Exclude L1–L3
D. Analyze L4 alone

6. The prior scan was on a different manufacturer's system and no cross-calibration was done. How do you assess change?

A. Compare T-scores
B. Compare BMD in percent
C. Do not compare quantitatively; this is a new baseline
D. Use the new scanner's LSC

7. The main source of the technologist's radiation exposure during DXA is:

A. The primary beam
B. Scatter from the patient
C. The monitor
D. The phantom

8. A 45-year-old man has a Z-score of −2.3. How should this be described?

A. Osteoporosis
B. Below the expected range for age
C. Osteopenia
D. Normal

SELF-CHECK

Answers and explanations

#	Answer	Explanation
1	**C**	Diagnosis uses the lowest T-score of L1–L4, femoral neck and total hip: −2.6 ≤ −2.5 is osteoporosis.
2	**B**	An undissolved tablet in the scan field falsely raises spine BMD.
3	**B**	With correct 15–25° internal rotation the lesser trochanter is small or barely visible.
4	**D**	LSC = 2.77 × 1.5% ≈ 4.2%.
5	**B**	A difference greater than 1.0 plus structural change meets the ISCD exclusion criteria; three vertebrae remain.
6	**C**	Without cross-calibration, change between systems is not reported.
7	**B**	That is why distance, and shielding where the physicist recommends it, matter.
8	**B**	Men under 50 are classified by Z-score; osteoporosis cannot be diagnosed by BMD alone.

Key terms

Term	Meaning	Term	Meaning
BMD	Bone mineral density, g/cm²	**RMS-SD**	Root-mean-square SD of a precision study
BMC	Bone mineral content, g	**Cross-calibration**	Linking results of two scanners
Area	Projected bone area, cm²	**Phantom**	Test object for QC
T-score	SDs from the young-adult reference mean	**Shift / drift**	Sudden jump / gradual trend in QC values
Z-score	SDs from the age- and sex-matched mean	**VFA / IVA**	Vertebral fracture assessment
ROI	Region of interest used for calculation	**TBS**	Trabecular bone score
PA spine	Lumbar spine, posterior–anterior view	**FRAX®**	10-year fracture probability tool
Total hip	Combined proximal femur region	**FFI / AFF**	Full femur imaging / atypical femur fracture
33% radius	Forearm region used for diagnosis	**ALARA**	As low as reasonably achievable
Precision	Reproducibility of repeated measurements	**Fragility fracture**	Fracture from a fall from standing height or less
Accuracy	Closeness to the true value	**Offset scan**	Whole-body method for patients wider than the field
LSC	Least significant change	**ARRT(BD)**	ARRT post-primary bone densitometry credential

NEXT STEP

Check your DXA knowledge

You have learned the basics. Now apply them to practice scenarios and find the topics to review.

BoneDensity Prep

Practice across the five CBDT® exam domains

digitaltrainingprep.com

Independent educational product. Not affiliated with or endorsed by ISCD.

REFERENCE

Sources and legal information

Sources

1. International Society for Clinical Densitometry. 2023 ISCD Official Positions — Adult. iscd.org/official-positions-2023
2. ISCD. CBDT® Candidate Guide and CBDT Content Outline. iscd.org/certified-bone-densitometry-technologist-cbdt
3. LeBoff MS, et al. The clinician's guide to prevention and treatment of osteoporosis. Osteoporos Int. 2022;33:2049–2102. doi.org/10.1007/s00198-021-05900-y
4. International Atomic Energy Agency. Dual Energy X Ray Absorptiometry for Bone Mineral Density and Body Composition Assessment. IAEA Human Health Series No. 15. Vienna: IAEA; 2010. www-pub.iaea.org/MTCD/Publications/PDF/Pub1479_web.pdf
5. CDC/NCHS. National Health and Nutrition Examination Survey: Dual Energy X-ray Absorptiometry (DXA) Procedures Manual. January 2007. wwwn.cdc.gov/nchs/data/nhanes/public/2007/manuals/manual_dexa.pdf
6. Hologic, Inc. QDR™ Bone Densitometry Systems Technical Specifications Manual, MAN-11124 Rev. 001. 2024.
7. FRAX® Fracture Risk Assessment Tool. University of Sheffield. frax.shef.ac.uk/FRAX
8. RadiologyInfo.org (ACR/RSNA). Radiation Dose in X-Ray and CT Exams. radiologyinfo.org/en/info/safety-xray
9. U.S. Nuclear Regulatory Commission. 10 CFR Part 20 — Standards for Protection Against Radiation (§20.1201, §20.1208, §20.1301). nrc.gov/reading-rm/doc-collections/cfr/part020
10. Genant HK, Li J, Wu CY, Shepherd JA. Vertebral Fractures in Osteoporosis: A New Method for Clinical Assessment. Hologic white paper W148, 1999. Genant method: Genant HK, et al. J Bone Miner Res. 1993;8(9):1137–1148.

Legal information

Independence. This guide was prepared by Digital Training Courses as an independent educational resource. It is not affiliated with, sponsored by or endorsed by the International Society for Clinical Densitometry (ISCD), the Bone Health and Osteoporosis Foundation, IAEA, ARRT, Hologic, Inc. or GE HealthCare.

Trademarks. CBDT® and CDT® are certification marks of ISCD. FRAX® is a registered trademark of the University of Sheffield. ARRT® is a mark of The American Registry of Radiologic Technologists. Hologic, Horizon, QDR, IVA and Lunar are trademarks of their respective owners. Names are used for identification only.

Sources and images. The text paraphrases publicly available professional information; no passages are reproduced. Schematics were created for this guide and are not exact anatomical drawings. Images marked "CDC/NCHS" are from the NHANES DXA Procedures Manual (2007), a U.S. Government work in the public domain; their use does not imply CDC endorsement. Images marked "Author's archive" are de-identified and published by the author. Numerical teaching examples are fictional.

Not medical advice. This material is for education and does not replace manufacturer instructions, facility protocols, regulatory requirements or a physician's judgment.

License. © 2026 Digital Training Courses. Licensed under Creative Commons Attribution 4.0 International (CC BY 4.0): you may share and adapt this guide for any purpose, provided you give appropriate credit, link to the license (creativecommons.org/licenses/by/4.0) and indicate if changes were made. Images credited to CDC/NCHS are public domain; the license does not grant trademark rights.

Edition 2.2 · October 2026 · sources checked October 17, 2026 · digitaltrainingprep.com