

GXMO CLINICAL TRAINING MODULES**I. CHEST/ABDOMEN MODULE**

For the Chest / Abdomen category, given a radiograph or a diagram, the student will correctly label key radiographic anatomic landmarks.

On a simulated patient, the student will demonstrate their working knowledge of standard terminology for patient positioning and projection.

A. ANATOMIC TRAINING

1. Chest
 - a. PA upright
 - b. lateral upright (left)
 - c. AP Lordotic
 - d. AP supine
 - e. lateral decubitus
 - f. posterior oblique
 - g. anterior oblique
2. Ribs
 - a. AP
 - b. Oblique
3. Abdomen
 - a. AP – erect
 - b. AP – supine

Except for bone densitometry, if multiple clinical modules are taken together or as a sequence, the film and digital image receptor training only has to be provided and assessed on

B. FILM IMAGE RECEPTORS

The student will become familiar with automatic film processing, film handling & storage, and luminescent screen inspection & care.

1. Film Image Receptor - Demonstration
 - a. Steps in Film Processing:
 - b. Automatic Processors - Review of Components
 - c. Film Handling & Storage

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- d. Intensifying screens
 - 2. Film Image Receptor Psychomotor Skills - Quality Control
- C. DIGITAL IMAGE RECEPTORS
- 1. Didactic Fundamentals: The student will be familiar with basic digital terms & concepts, basic differences in digital image acquisition methods, the effects of “windowing” on image contrast and density, and functional considerations between film & digital image receptors.
 - a. Digital Basics:
 - b. Digital Image Acquisition Technologies: 2 basic types – Computed Radiography (CR) & Digital Radiography (DR)
 - c. Display Qualities
 - d. Practical Considerations – Differences between CR & Film
 - e. Practical Considerations – Differences between CR & DR
 - 2. Clinical Essentials Lab – CR & Digital Image Receptor (IR)
 - a. Introductory concepts to digital IRs
 - b. CR Essentials
 - c. Auto-recognition systems and histograms
 - d. Optimal Technique Considerations
 - e. CR Plate Fogging - CR plates especially sensitive to fogging
 - f. Common errors resulting in a poor quality image
 - 3. Digital Image Receptor Psychomotor Skills
 - a. Processing the CR Plate
 - b. Erasure control
 - c. Electronic image management
 - d. Basic Artifact analysis
 - e. Edge enhancement algorithms

II. EXTREMITY MODULE

For the Extremity category, given a radiograph or a diagram, the student will correctly label key radiographic anatomic landmarks.

On a simulated patient, the student will demonstrate their working knowledge of standard terminology for patient positioning and projection.

APPENDIX**GXMO CLINICAL TRAINING MODULES****A. ANATOMIC TRAINING**

1. Toes
 - a. AP
 - b. oblique
 - c. lateral

2. Foot
 - a. AP axial
 - b. medial oblique
 - c. lateral oblique
 - d. mediolateral
 - e. AP weightbearing
 - f. Lateral weightbearing

3. Ankle
 - a. AP
 - b. AP 15° internal oblique (mortise)
 - c. Lateral
 - d. Oblique 45° internal
 - e. Oblique 45° external

4. Calcaneus (Os Calcis)
 - a. calcaneal axial

5. Tibia, Fibula
 - a. AP
 - b. lateral

6. Knee
 - a. AP
 - b. lateral
 - c. AP weight bearing
 - d. lateral oblique 45°
 - e. medial oblique 45°
 - f. PA
 - g. PA axial – intercondylar fossa (tunnel)

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7. Patella
 - a. lateral
 - b. supine flexion 45° (Merchant)
 - c. PA
 - d. prone flexion 90° (Settegast)
 - e. prone flexion 55° (Hughston)

8. Femur (Distal)
 - a. AP
 - b. mediolateral
 - c. cross-table lateral

9. Pelvis
 - a. AP

10. Hip
 - a. AP
 - b. lateral
 - c. cross-table lateral

11. Fingers
 - a. PA finger
 - b. mediolateral lateral
 - c. oblique
 - d. AP thumb
 - e. oblique thumb
 - f. lateral thumb

12. Hand
 - a. PA
 - b. lateral
 - c. oblique

13. Wrist
 - a. PA
 - b. oblique 45°

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- c. lateral
 - d. PA for scaphoid
14. Forearm
- a. AP
 - b. lateral
15. Elbow
- a. AP
 - b. lateral
 - c. external oblique
 - d. internal oblique
 - e. AP partial flexion
16. Humerus
- a. AP
 - b. lateral
17. Shoulder
- a. AP internal and external rotation
 - b. inferosuperior axial
 - c. posterior oblique (Grashey)
 - d. AP neutral
 - e. transthoracic lateral
 - f. scapular Y
18. Scapula
- a. AP
 - b. lateral
19. Clavicle
- a. AP
 - b. AP axial 15-30° cephalad
 - c. PA axial 15-30° caudad
20. Acromioclavicular joints
- a. AP bilateral with and without weights

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C. DIGITAL IMAGE RECEPTORS

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3. Digital Image Receptor Psychomotor Skills
 - a. Processing the CR Plate
 - b. Erasure control
 - c. Electronic image management
 - d. Basic Artifact analysis
 - e. Edge enhancement algorithms

III. SKULL – SINUSES MODULE

For the Skull / Sinuses category, given a radiograph or a diagram, the student will correctly label key radiographic anatomic landmarks.

On a simulated patient, the student will demonstrate their working knowledge of standard terminology for patient positioning and projection.

A. ANATOMIC TRAINING

1. Skull
 - a. AP axial (Towne)
 - b. lateral
 - c. PA (Caldwell)
 - d. PA
 - e. Facial Bones
 - i. lateral
 - ii. parietoacanthial (37° Waters)
 - iii. PA (Caldwell)
 - iv. parietoacanthial (55° Waters)
 - v. lateral nasal bones
 - vi. lateral orbits
 - f. Paranasal Sinuses
 - i. lateral
 - ii. PA (Caldwell)
 - iii. parietoacanthial (Waters)
 - iv. submentovertical (full basal)
 - v. open mouth parietoacanthial (Waters)

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- c. Electronic image management
- d. Basic Artifact analysis
- e. Edge enhancement algorithms

IV. SPINE MODULE

For the Spine, given a radiograph or a diagram, the student will correctly label key radiographic anatomic landmarks.

On a simulated patient, the student will demonstrate their working knowledge of standard terminology for patient positioning and projection.

A. ANATOMIC TRAINING

1. Cervical spine
 - a. AP axial cephalad
 - b. PA axial caudad
 - c. AP open mouth
 - d. lateral
 - e. 45° oblique
 - f. lateral swimmers
 - g. lateral flexion and extension
 - h. cross-table lateral
2. Thoracic Spine
 - a. AP
 - b. lateral
3. Lumbar Spine
 - a. AP
 - b. lateral
 - c. L5-S1 lateral spot
 - d. oblique 45°
 - e. AP L5-S1 spot, 30-35° cephalad
4. Sacrum and Coccyx
 - a. AP sacrum, 15-25° cephalad
 - b. AP coccyx, 10-20° caudad
 - c. lateral sacrum
 - d. lateral coccyx

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5. Sacroiliac Joints
 - a. AP
 - b. 25-30° posterior oblique
 - c. 25-30° anterior oblique
6. Scoliosis Series
 - a. AP/PA scoliosis series

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 - d. Optimal Technique Considerations
 - e. CR Plate Fogging - CR plates especially sensitive to fogging
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V. PODIATRIC MODULE

For the Podiatric (weight-bearing) category, given a radiograph or a diagram, the student will correctly label key radiographic anatomic landmarks.

On a simulated patient, the student will demonstrate their working knowledge of standard terminology for patient positioning and projection.

A. ANATOMIC TRAINING

1. Toes – “collimated” studies
 - a. AP w.b.
 - b. lateral oblique
 - c. medial oblique
 - d. elevated lateral digit w.b.
 - e. hallux lateral w.b.

2. Foot
 - a. AP (DP) angle & base w.b.
 - b. medial oblique
 - c. lateral oblique
 - d. weight-bearing oblique projections (medial & lateral) w.b.
 - e. lateral (angle & base) w.b.

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- f. forefoot (FF)/sesamoid axial (using standard w.b. orthoposer)
3. Ankle
 - a. AP w.b
 - b. mortise w.b.
 - c. medial oblique w.b.
 - d. lateral oblique w.b.
 - e. lateral w.b.
 4. Calcaneus (Os Calcis)
 - a. calcaneal axial w.b.
 - b. Harris-Beath (ski-jump) w.b.
 5. Basic Wheelchair views – non-weightbearing
 - a. Foot projections – lateral, medial, AP
 - b. Ankle projections – AP, mortise, internal & external oblique

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C. DIGITAL IMAGE RECEPTORS

1. Didactic Fundamentals: The student will be familiar with basic digital terms & concepts, basic differences in digital image

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acquisition methods, the effects of “windowing” on image contrast and density, and functional considerations between film & digital image receptors.

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 - b. Digital Image Acquisition Technologies: 2 basic types – Computed Radiography (CR) & Digital Radiography (DR)
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VI. BONE DENSITOMETRY MODULE

For the Bone Densitometry category the student will correctly label key radiographic anatomic landmarks.

On a simulated patient, the student will demonstrate their working knowledge of standard terminology for patient positioning and projection.

- A. DXA scanning of P/A lumbar spine, lateral spine, hip, forearm and total body
 1. Anatomy
 - a. ROI
 - b. Bony landmarks

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- c. Adjacent structures
2. Scan acquisition
 - a. Patient instructions
 - b. Patient positioning
 - c. Selection of appropriate scan parameters
3. Scan analysis and print out
 - a. ROI placement
 - b. BMC, area and BMD
 - c. T-score, Z-score
4. Common problems
 - a. Poor bone edge detection
 - b. Nonremovable artifacts
 - c. Variant anatomy
 - d. Fractures and other pathology
5. Follow- up scans
 - a. Unit of Comparison
 - i. BMD
 - ii. T-score
 - b. Reproduce baseline study

B. BONE DENSITOMETRY EQUIPMENT**1. Basic Concepts**

The student will become familiar with the fundamental aspects of osteoporosis and the non-invasive assessment methods of bone.

- a. Osteoporosis
 - i. WHO definition
 - ii. Types of Osteoporosis: Primary vs. Secondary
 - iii. Type I osteoporosis (post menopausal) vs. Type II osteoporosis (senile)
 - iv. Risk factors
- b. Introduction to various methods commonly used
 - i. Quantitative Ultrasound (QUS)
 - ii. Dual Energy X-ray Absorptiometry (DXA)

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- c. Measuring BMD
 - i. Basic Statistical concepts
 - a. Mean
 - b. Standard deviation
 - c. Coefficient of variation
 - ii. Interpreting patient results
 - a. BMD
 - b. Z-score
 - c. T-score

2. Equipment Operation & Quality Assurance

The student will become familiar with the basic components of a dual-x-ray absorptiometry device (DXA) and with the quality assurance concept.

- a. Computer console and switches
- b. Data base maintenance
- c. Quality assurance
 - i. Use of phantoms and/or calibration
 - ii. Troubleshooting
 - iii. Identify possible shift or drift
- d. QA pass or fail
- e. Quality of BMD
 - i. Define precision
 - ii. Define accuracy
- f. Factors that affect both accuracy and precision
 - i. Scanner
 - ii. Operator
 - iii. Patient
- g. Least significant change (LSC)
 - i. Definition of LSC
 - ii. Measurement of LSC
- h. Radiation dose
 - i. Dose of various procedures
 - ii. Minimizing patient exposure
 - a. Patient instruction
 - b. Performing correct exam