APPENDIX

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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GXMO CLINICAL TRAINING MODULES

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.

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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 weightbearning
   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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GXMO CLINICAL TRAINING MODULES

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
   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)
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   c. Auto-recognition systems and histograms
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   e. CR Plate Fogging - CR plates especially sensitive to fogging
   f. Common errors resulting in a poor quality image

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GXMO CLINICAL TRAINING MODULES

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)

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

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GXMO CLINICAL TRAINING MODULES

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
   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.

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   b. Digital Image Acquisition Technologies: 2 basic types – Computed Radiography (CR) & Digital Radiography (DR)
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   d. Practical Considerations – Differences between CR & Film
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   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
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3. Digital Image Receptor Psychomotor Skills

   a. Processing the CR Plate
   b. Erasure control

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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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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:
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    c. Film Handling & Storage
    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.

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    b. Digital Image Acquisition Technologies: 2 basic types – Computed Radiography (CR) & Digital Radiography (DR)
    c. Display Qualities
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GXMO CLINICAL TRAINING MODULES

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

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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GXMO CLINICAL TRAINING MODULES

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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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:
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2. Film Image Receptor Psychomotor Skills - Quality Control

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e. CR Plate Fogging - CR plates especially sensitive to fogging
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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

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