The purpose of the ARRT Examination in Radiography is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of the staff technologist at entry into the profession. To identify the knowledge and skills covered by the examination, the ARRT periodically conducts practice analysis studies involving a nationwide sample of staff technologists\(^1\). The results of the most recent practice analysis are reflected in this document. The complete task inventory, which serves as the basis for these content specifications, is available from our website [www.arrt.org](http://www.arrt.org).

The table below presents the five major content categories, along with the number and percentage of test questions appearing in each category. The remaining pages provide a detailed listing of topics addressed within each major content category.

This document is not intended to serve as a curriculum guide. Although certification programs and educational programs may have related purposes, their functions are clearly different. Educational programs are generally broader in scope and address subject matter not included in these content specifications.

<table>
<thead>
<tr>
<th>CONTENT CATEGORY</th>
<th>PERCENT OF TEST</th>
<th>NUMBER OF QUESTIONS (^2)</th>
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<tbody>
<tr>
<td>A. Radiation Protection</td>
<td>22.5%</td>
<td>45</td>
</tr>
<tr>
<td>B. Equipment Operation and Quality Control</td>
<td>11.0%</td>
<td>22</td>
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<tr>
<td>C. Image Acquisition and Evaluation</td>
<td>22.5%</td>
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<tr>
<td>D. Imaging Procedures</td>
<td>29.0%</td>
<td>58</td>
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<tr>
<td>E. Patient Care and Education</td>
<td>15.0%</td>
<td>30</td>
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</table>

1. A special debt of gratitude is due to the hundreds of professionals participating in this project as committee members, survey respondents, and reviewers.

2. Each exam includes up to an additional 20 unscored (pilot) questions. On the pages that follow, the approximate number of test questions allocated to each content category appears in parentheses.
A. RADIATION PROTECTION (45)

1. Biological Aspects of Radiation (10)
   A. Radiosensitivity
      1. dose-response relationships
      2. relative tissue radiosensitivities (e.g., LET, RBE)
      3. cell survival and recovery (LD_{50})
      4. oxygen effect
   B. Somatic Effects
      1. short-term versus long-term effects
      2. acute versus chronic effects
      3. carcinogenesis
      4. organ and tissue response (e.g., eye, thyroid, breast, bone marrow, skin, gonadal)
   C. Acute Radiation Syndromes
      1. CNS
      2. hemopoietic
      3. GI
   D. Embryonic and Fetal Risks
   E. Genetic Impact
      1. genetic significant dose
      2. goals of gonadal shielding
   F. Photon Interactions with Matter
      1. Compton effect
      2. photoelectric absorption
      3. coherent (classical) scatter
      4. attenuation by various tissues
         a. thickness of body part (density)
         b. type of tissue (atomic number)

2. Minimizing Patient Exposure (15)
   A. Exposure Factors
      1. kVp
      2. mAs
   B. Shielding
      1. rationale for use
      2. types
      3. placement
   C. Beam Restriction
      1. purpose of primary beam restriction
      2. types (e.g., collimators)
   D. Filtration
      1. effect on skin and organ exposure
      2. effect on average beam energy
      3. NCRP recommendations (NCRP #102, minimum filtration in useful beam)
   E. Exposure Reduction
      1. patient positioning
      2. automatic exposure control (AEC)
      3. patient communication
      4. digital imaging
      5. pediatric dose reduction
      6. ALARA
   F. Image Receptors (e.g., types, relative speed, digital versus film)
   G. Grids
   H. Fluoroscopy
      1. pulsed
      2. exposure factors
      3. grids
      4. positioning
      5. fluoroscopy time

(Section A continues on the following page)
3. Personnel Protection (11)
   A. Sources of Radiation Exposure
      1. primary x-ray beam
      2. secondary radiation
         a. scatter
         b. leakage
      3. patient as source
   B. Basic Methods of Protection
      1. time
      2. distance
      3. shielding
   C. Protective Devices
      1. types
      2. attenuation properties
      3. minimum lead equivalent (NCRP #102)
   D. Special Considerations
      1. portable (mobile) units
      2. fluoroscopy
         a. protective drapes
         b. protective Bucky slot cover
         c. cumulative timer
      3. guidelines for fluoroscopy and portable units (NCRP #102, CFR-21)
         a. fluoroscopy exposure rates
         b. exposure switch guidelines

4. Radiation Exposure and Monitoring (9)
   A. Units of Measurement*
      1. absorbed dose
      2. dose equivalent
      3. exposure
   B. Dosimeters
      1. types
      2. proper use
   C. NCRP Recommendations for Personnel Monitoring (NCRP #116)
      1. occupational exposure
      2. public exposure
      3. embryo/fetus exposure
      4. ALARA and dose equivalent limits
      5. evaluation and maintenance of personnel dosimetry records
   D. Medical Exposure of Patients (NCRP #160)
      1. typical effective dose per exam
      2. comparison of typical doses by modality

*Conventional units are generally used. However, questions referenced to specific reports (e.g., NCRP) will use SI units to be consistent with such reports.
B. EQUIPMENT OPERATION AND QUALITY CONTROL (22)

1. Principles of Radiation Physics (9)
   A. X-Ray Production
      1. source of free electrons (e.g., thermionic emission)
      2. acceleration of electrons
      3. focusing of electrons
      4. deceleration of electrons
   B. Target Interactions
      1. bremsstrahlung
      2. characteristic
   C. X-Ray Beam
      1. frequency and wavelength
      2. beam characteristics
         a. quality
         b. quantity
         c. primary versus remnant (exit)
      3. inverse square law
      4. fundamental properties (e.g., travel in straight lines, ionize matter)

2. Imaging Equipment (9)
   A. Components of Radiographic Unit (fixed or mobile)
      1. operating console
      2. x-ray tube construction
         a. electron sources
         b. target materials
         c. induction motor
      3. automatic exposure control (AEC)
         a. radiation detectors
         b. back-up timer
         c. density adjustment (e.g., +1 or −1)
      4. manual exposure controls
      5. beam restriction devices
   B. X-Ray Generator, Transformers, and Rectification System
      1. basic principles
      2. phase, pulse, and frequency
   C. Components of Fluoroscopic Unit (fixed or mobile)
      1. image intensifier
      2. viewing systems
      3. recording systems
      4. automatic brightness control (ABC)
   D. Components of Digital Imaging (CR and DR)
      1. PSP - photo-stimulable phosphor
      2. flat panel detectors - direct and indirect
      3. start up and shut down
      4. CR plate erasure
      5. equipment cleanliness (imaging plates, CR plates)
   E. Types of Units
      1. dedicated chest unit
      2. tomography unit
   F. Accessories
      1. stationary grids
      2. Bucky assembly
      3. image receptors

3. Quality Control of Imaging Equipment and Accessories (4)
   A. Beam Restriction
      1. light field to radiation field alignment
      2. central ray alignment
   B. Recognition and Reporting of Malfunctions
   C. Digital Imaging Receptor Systems
      1. artifacts (e.g., non-uniformity, erasure)
      2. maintenance (e.g., detector fog)
      3. display monitor quality assurance
   D. Shielding Accessories (e.g., lead apron and glove testing)
C. IMAGE ACQUISITION AND EVALUATION (45)

1. Selection of Technical Factors (20)

A. Factors Affecting Radiographic Quality. Refer to Attachment C to clarify terms that may occur on the exam. (X indicates topics covered on the examination)

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<tr>
<td>a. mAs</td>
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<td>b. kVp</td>
<td>X</td>
<td>X</td>
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<tr>
<td>c. OID</td>
<td>X (air gap)</td>
<td>X</td>
<td>X</td>
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<td>d. SID</td>
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<td>e. focal spot size</td>
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<td>f. grids*</td>
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<td>g. filtration</td>
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<td>h. film-screen</td>
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<td>i. beam restriction</td>
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<td>j. motion</td>
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<td>k. anode heel effect</td>
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<td>l. patient factors (size, pathology)</td>
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<tr>
<td>m. angle (tube, part, or receptor)</td>
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* Includes conversion factors for grids

B. Technique Charts

1. pre-programmed techniques – anatomically programmed radiography (APR)
2. caliper measurement
3. fixed versus variable kVp
4. special considerations
   a. casts
   b. anatomic and pathologic factors
   c. pediatrics
   d. contrast media

C. Automatic Exposure Control (AEC)

1. effects of changing exposure factors on radiographic quality
2. detector selection
3. anatomic alignment
4. density control (+1 or −1)

D. Digital Imaging Characteristics

1. spatial resolution
   a. sampling frequency
   b. DEL (detector element size)
   c. receptor size and matrix size
2. image signal (exposure related)
   a. quantum mottle (noise)
   b. SNR (signal to noise ratio) or CNR (contrast to noise ratio)

(Section C continues on the following page)
C. IMAGE ACQUISITION AND EVALUATION (cont.)

2. Image Processing and Quality Assurance (12)
   A. Image Identification
      1. methods (e.g., photographic, radiographic, electronic)
      2. legal considerations (e.g., patient data, examination data)
   B. Film Screen Processing
      1. film storage
      2. components* 
         a. developer
         b. fixer
      3. maintenance/malfunction
         a. start up and shut down procedure
         b. possible causes of malfunction (e.g., improper temperature, contamination, replenishment, water flow)
   C. Digital Imaging Processing
      1. electronic collimation (masking)
      2. grayscale rendition (look-up table (LUT), histogram)
      3. edge enhancement/noise suppression
      4. contrast enhancement
      5. system malfunctions (e.g., ghost image, banding, erasure, dead pixels, readout problems)
      6. CR reader components
   D. Image Display
      1. viewing conditions (i.e., luminance, ambient lighting
      2. spatial resolution
      3. contrast resolution/dynamic range
      4. DICOM gray scale function
      5. window level and width function
   E. Digital Image Display Informatics
      1. PACS
      2. HIS
      3. RIS (modality work list)
      4. Networking (e.g., HL7, DICOM)
      5. Workflow (inappropriate documentation, lost images, mismatched images, corrupt data)

3. Criteria for Image Evaluation (13)
   A. Brightness/Density (e.g., mAs, distance)
   B. Contrast/Gray Scale (e.g., kVp, filtration, grids)
   C. Recorded Detail (e.g., motion, poor film-screen contact)
   D. Distortion (e.g., magnification, OID, SID)
   E. Demonstration of Anatomical Structures (e.g., positioning, tube-part-image receptor alignment)
   F. Identification Markers (e.g., anatomical, patient, date)
   G. Patient Considerations (e.g., pathologic conditions)
   H. Image artifacts (e.g., film handling, static, pressure, grid lines, Moiré effect or aliasing)
   I. Fog (e.g., age, chemical, radiation, temperature, safelight)
   J. Noise
   K. Acceptable Range of Exposure
   L. Exposure Indicator Determination
   M. Gross Exposure Error (e.g., mottle, light or dark, low contrast)

* Specific chemicals in the processing solutions will not be covered (e.g., glutaraldehyde).
This section addresses imaging procedures for the anatomic regions listed below (1 through 7). Questions will cover the following topics:

1. Positioning (e.g., topographic landmarks, body positions, path of central ray, immobilization devices).
2. Anatomy (e.g., including physiology, basic pathology, and related medical terminology).
3. Technical factors (e.g., including adjustments for circumstances such as body habitus, trauma, pathology, breathing techniques).

The specific radiographic positions and projections within each anatomic region that may be covered on the examination are listed in Attachment A. A guide to positioning terminology appears in Attachment B.

1. Thorax (10)
   A. Chest
   B. Ribs
   C. Sternum
   D. Soft Tissue Neck

2. Abdomen and GI Studies (8)
   A. Abdomen
   B. Esophagus
   C. Swallowing Dysfunction Study
   D. Upper GI Series, Single or Double Contrast
   E. Small Bowel Series
   F. Barium Enema, Single or Double Contrast
   G. Surgical Cholangiography
   H. ERCP

3. Urological Studies (3)
   A. Cystography
   B. Cystourethrography
   C. Intravenous Urography
   D. Retrograde Pyelography

4. Spine and Pelvis (10)
   A. Cervical Spine
   B. Thoracic Spine
   C. Scoliosis Series
   D. Lumbar Spine
   E. Sacrum and Coccyx
   F. Sacroiliac Joints
   G. Pelvis and Hip

5. Head (5)
   A. Skull
   B. Facial Bones
   C. Mandible
   D. Zygomatic Arch
   E. Temporomandibular Joints
   F. Nasal Bones
   G. Orbits
   H. Paranasal Sinuses

6. Extremities (cont.)
   S. Bone Survey
   T. Long Bone Measurement
   U. Bone Age
   V. Soft Tissue/Foreign Bodies

7. Other (2)
   A. Arthrography
   B. Myelography
E. PATIENT CARE AND EDUCATION (30)

1. Ethical and Legal Aspects (4)
   A. Patient’s Rights
      1. informed consent (e.g., written, oral, implied)
      2. confidentiality (HIPAA)
      3. additional rights (e.g., Patient’s Bill of Rights)
         a. privacy
         b. extent of care (e.g., DNR)
         c. access to information
         d. living will; health care proxy
         e. research participation
   B. Legal Issues
      1. examination documentation (e.g., patient history, clinical diagnosis)
      2. common terminology (e.g., battery, negligence, malpractice)
      3. legal doctrines (e.g., respondeat superior, res ipsa loquitur)
      4. restraints versus immobilization
   C. ARRT Standards of Ethics

2. Interpersonal Communication (5)
   A. Modes of Communication
      1. verbal/written
      2. nonverbal (e.g., eye contact, touching)
   B. Challenges in Communication
      1. patient characteristics
      2. explanation of medical terms
      3. strategies to improve understanding
      4. cultural diversity
   C. Patient Education
      1. explanation of current procedure
      2. respond to inquiries about other imaging modalities (e.g., CT, MRI, mammography, sonography, nuclear medicine, bone densitometry regarding dose differences, types of radiation, and patient preps)

3. Infection Control (5)
   A. Terminology and Basic Concepts
      1. asepsis
         a. medical
         b. surgical
         c. sterile technique
      2. pathogens
         a. fomites, vehicles, vectors
         b. nosocomial infections
   B. Cycle of Infection
      1. pathogen
      2. source or reservoir of infection
      3. susceptible host
      4. method of transmission
         a. contact (direct, indirect)
         b. droplet
         c. airborne/suspended
         d. common vehicle
         e. vector borne
   C. Standard Precautions
      1. handwashing
      2. gloves, gowns
      3. masks
      4. medical asepsis (e.g., equipment disinfection)
   D. Additional or Transmission-Based Precautions
      1. airborne (e.g., respiratory protection, negative ventilation)
      2. droplet (e.g., particulate mask, restricted patient placement)
      3. contact (e.g., gloves, gown, restricted patient placement)
   E. Disposal of Contaminated Materials
      1. linens
      2. needles
      3. patient supplies (e.g., tubes, emesis basin)

(Section E continues on the following page)
E. PATIENT CARE AND EDUCATION (cont.)

4. Physical Assistance and Transfer (4)
   A. Patient Transfer and Movement
      1. body mechanics (balance, alignment, movement)
      2. patient transfer
   B. Assisting Patients with Medical Equipment
      1. infusion catheters and pumps
      2. oxygen delivery systems
      3. other (e.g., nasogastric tubes, urinary catheters, tracheostomy tubes)
   C. Routine Monitoring
      1. equipment (e.g., stethoscope, sphygmomanometer)
      2. vital signs (e.g., blood pressure, pulse, respiration)
      3. physical signs and symptoms (e.g., motor control, severity of injury)
      4. documentation

5. Medical Emergencies (5)
   A. Allergic Reactions (e.g., contrast media, latex)
   B. Cardiac or Respiratory Arrest (e.g., CPR)
   C. Physical Injury or Trauma
   D. Other Medical Disorders (e.g., seizures, diabetic reactions)

6. Pharmacology (3)
   A. Patient History
      1. medication reconciliation (current medications)
      2. premedications
      3. contraindications
      4. scheduling and sequencing examinations
   B. Complications/Reactions
      1. local effects (e.g., extravasation/ infiltration, phlebitis)
      2. systemic effects
         a. mild
         b. moderate
         c. severe
      3. emergency medications
      4. radiographer's response and documentation

7. Contrast Media (4)
   A. Types and Properties (e.g., iodinated, water soluble, barium, ionic versus non-ionic)
   B. Appropriateness of Contrast Media to Exam
      1. patient condition (e.g., perforated bowel)
      2. patient age and weight
      3. laboratory values (e.g., BUN creatinine, GFR)
   C. Patient Education
      1. verify informed consent
      2. instructions regarding preparation, diet, and medications
      3. pre- and post-examination instructions (e.g., discharge instructions)
   D. Venipuncture
      1. venous anatomy
      2. supplies
      3. procedural technique
   E. Administration
      1. routes (e.g., IV, oral)
      2. supplies (e.g., enema kits, needles)
Attachment A
Radiographic Positions and Projections

1. Thorax
A. Chest
1. PA upright
2. lateral upright
3. AP Lordotic
4. AP supine
5. lateral decubitus
6. anterior and posterior obliques
B. Ribs
1. AP and PA, above and below diaphragm
2. anterior and posterior oblique
C. Sternum
1. lateral
2. RAO breathing technique
3. RAO expiration
4. LAO
5. PA sternoclavicular joints
6. anterior oblique sternoclavicular joints
D. Soft Tissue Neck
1. AP upper airway
2. lateral upper airway

2. Abdomen and GI studies
A. Abdomen
1. AP supine
2. AP upright
3. lateral decubitus
4. dorsal decubitus
B. Esophagus
1. RAO
2. left lateral
3. AP
4. PA
5. LAO
C. Swallowing Dysfunction Study
D. Upper GI series*
1. AP scout
2. RAO
3. PA
4. right lateral
5. LPO
6. AP
E. Small Bowel Series
1. PA scout
2. PA (follow through)
3. ileocecal spots
4. enteroclysis procedure
F. Barium Enema*
1. left lateral rectum
2. left lateral decubitus
3. right lateral decubitus
4. LPO and RPO
5. PA
6. RAO and LAO
7. AP axial (butterfly)
8. PA axial (butterfly)
9. PA post-evacuation
G. Surgical Cholangiography
1. AP
H. ERCP
1. AP

*single or double contrast

3. Urological Studies
A. Cystography
1. AP
2. LPO and RPO 60°
3. lateral
4. AP 10-15° caudal
B. Cystourethrography
1. AP voiding cystourethrogram female
2. RPO 30°, voiding cystogram male
C. Intravenous Urography
1. AP, scout, and series
2. RPO and LPO 30°
3. PA post-void
4. AP post-void, upright
5. nephrotomography
6. AP ureteric compression
D. Retrograde Pyelography
1. AP scout
2. AP pyelogram
3. AP ureterogram

4. Spine and Pelvis
A. Cervical Spine
1. AP angle cephalad
2. AP open mouth
3. lateral
4. cross table lateral
5. anterior oblique
6. posterior oblique
7. lateral swimmers
8. lateral flexion and extension
9. AP dens (Fuchs)
10. PA dens (Judd)
B. Thoracic Spine
1. AP
2. lateral, breathing
3. lateral, expiration
C. Scoliosis Series
1. AP/PA scoliosis series (Ferguson)
D. Lumbar Spine
1. AP
2. PA
3. lateral
4. LS-S1 lateral spot
5. posterior oblique 45°
6. anterior oblique 45°
7. AP LS-S1, 30-35° cephalad
8. AP right and left bending
9. lateral flexion and extension
E. Sacrum and Coccyx
1. AP sacrum, 15-25° cephalad
2. AP coccyx, 10-20° caudal
3. lateral sacrum and coccyx, combined
4. lateral sacrum or coccyx, separate

5. Head
A. Skull
1. AP axial (Towne)
2. lateral
3. PA (Caldwell)
4. PA no angle
5. submentovertical (full basilar)
6. PA 25-30° angle (Haas)
7. trauma cross table lateral
8. trauma AP, 15° cephalad
9. trauma AP, no angle
10. trauma AP, axial (Towne)
B. Facial Bones
1. lateral
2. parietoacanthial (Waters)
3. PA (Caldwell)
4. PA (modified Waters)
C. Mandible
1. axiolateral oblique
2. PA no angle
3. AP axial (Towne)
4. PA semi-axial, 20-25°
5. PA (modified Waters)
6. submentovertical (full basilar)
D. Zygomatic Arch
1. submentovertical (full basilar)
2. parietoacanthial (Waters)
3. AP axial (Towne)
4. axial oblique
5. lateral
E. Temporomandibular Joints
1. lateral (Law)
2. lateral (Schuller)
3. AP (Towne)
F. Nasal Bones
1. parietoacanthial (Waters)
2. lateral
3. PA (Caldwell)
G. Orbits
1. parietoacanthial (Waters)
2. lateral
3. PA (Caldwell)
H. Paranasal Sinuses
1. lateral
2. PA (Caldwell)
3. parietoacanthial (Waters)
4. submentovertical (full basilar)
5. open mouth parietoacanthial (Waters)
6. Extremities

A. Toes
1. AP, entire foot
2. oblique toe
3. lateral toe

B. Foot
1. AP angle toward heel
2. medial oblique
3. lateral oblique
4. mediolateral
5. lateromedial
6. sesamoids, tangential
7. AP weight bearing
8. lateral weight bearing

C. Calcaneus (Os Calcis)
1. lateral
2. plantodorsal, axial
3. dorsoplantar, axial

D. Ankle
1. AP
2. AP mortise
3. mediolateral
4. oblique, 45° internal
5. lateromedial
6. AP stress views

E. Tibia, Fibula
1. AP
2. lateral
3. oblique

F. Knee
1. AP
2. lateral
3. AP weight bearing
4. lateral oblique 45°
5. medial oblique 45°
6. PA
7. PA axial – intercondylar fossa (tunnel)

G. Patella
1. lateral
2. supine flexion 45° (Merchant)
3. PA
4. prone flexion 90° (Settegast)
5. prone flexion 55° (Hughston)

H. Femur
1. AP
2. mediolateral

I. Fingers
1. PA entire hand
2. PA finger only
3. lateral
4. oblique
5. AP thumb
6. oblique thumb
7. lateral thumb

J. Hand
1. PA
2. lateral
3. oblique

K. Wrist
1. PA
2. oblique 45°
3. lateral
4. PA for scaphoid
5. scaphoid (Stecher)
6. carpal canal

L. Forearm
1. AP
2. lateral

M. Elbow
1. AP
2. lateral
3. external oblique
4. internal oblique
5. AP partial flexion
6. axial trauma (Coyle)

N. Humerus
1. AP non-trauma
2. lateral non-trauma
3. AP neutral trauma
4. scapular Y trauma
5. transthoracic lateral trauma
6. lateral, mid and distal, trauma

O. Shoulder
1. AP internal and external rotation
2. inferosuperior axial, non-trauma
3. posterior oblique (Grashey)
4. tangential non-trauma
5. AP neutral trauma
6. transthoracic lateral trauma
7. scapular Y trauma

P. Scapula
1. AP
2. lateral, anterior oblique
3. lateral, posterior oblique

Q. Clavicle
1. AP
2. AP angle, 15-30° cephalad
3. PA angle, 15-30° caudad

R. Acromioclavicular Joints – AP Bilateral With and Without Weights

S. Bone Survey
T. Long Bone Measurement
U. Bone Age
V. Soft Tissue/Foreign Body

7. Other Procedures

A. Arthrography
B. Myelography
Attachment B
Standard Terminology for Positioning and Projection

Radiographic View: Describes the body part as seen by the image receptor or other recording medium, such as a fluoroscopic screen. Restricted to the discussion of a radiograph or image.

Radiographic Position: Refers to a specific body position, such as supine, prone, recumbent, erect, or Trendelenburg. Restricted to the discussion of the patient’s physical position.

Radiographic Projection: Restricted to the discussion of the path of the central ray.

POSITIONING TERMINOLOGY

A. Lying Down
1. supine – lying on the back
2. prone – lying face downward
3. decubitus – lying down with a horizontal x-ray beam
4. recumbent – lying down in any position

B. Erect or Upright
1. anterior position – facing the image receptor
2. posterior position – facing the radiographic tube
3. oblique position – erect or lying down
   a. anterior (facing the image receptor)
      i. left anterior oblique  body rotated with the left anterior portion closest to the image receptor
      ii. right anterior oblique body rotated with the right anterior portion closest to the image receptor
   b. posterior (facing the radiographic tube)
      i. left posterior oblique body rotated with the left posterior portion closest to the image receptor
      ii. right posterior oblique body rotated with the right posterior portion closest to the image receptor
<table>
<thead>
<tr>
<th>Term</th>
<th>Recorded Detail</th>
<th>Spatial Resolution</th>
<th>Brightness</th>
<th>Contrast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Film-Screen Radiography</td>
<td>The sharpness of the structural lines as recorded in the radiographic image.</td>
<td>Density</td>
<td>Radiographic density is the degree of blackening or opacity of an area in a radiograph due to the accumulation of black metallic silver following exposure and processing of a film.</td>
<td></td>
</tr>
<tr>
<td>Digital Radiography</td>
<td>The sharpness of the structural edges recorded in the image.</td>
<td>Spatial Resolution</td>
<td>Spatial Resolution is the sharpness of the structural edges recorded in the image.</td>
<td></td>
</tr>
<tr>
<td>Brightness</td>
<td>Brightness is the measurement of the luminescence of a monitor calibrated in units of candela (cd) per square meter on a monitor or soft copy. Density on a hard copy is the same as film.</td>
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</tr>
<tr>
<td>Recorded Detail</td>
<td>The sharpness of the structural lines as recorded in the image.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>Image contrast is defined as the visible differences between any two selected areas of density levels within the radiographic image.</td>
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<td></td>
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<tr>
<td>Scale of Contrast</td>
<td>The number of shades of gray.</td>
<td></td>
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</tr>
<tr>
<td>Long Scale</td>
<td>The inherent ability of the film to record a long range of density levels on the radiograph.</td>
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<tr>
<td>Short Scale</td>
<td>The inherent ability of the film to record a short range of density levels on the radiograph.</td>
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<td></td>
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<tr>
<td>Film Contrast</td>
<td>The inherent ability of the film emulsion to react to radiation and record a range of densities.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Film Latitude</td>
<td>The range of exposure factors which will produce a diagnostic radiograph.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Exposure Latitude</td>
<td>The range of the signal difference in the remnant beam.</td>
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</tr>
<tr>
<td>Subject Contrast</td>
<td>The difference in the quantity of radiation transmitted by a particular part as a result of the different absorption characteristics of the tissues and structures making up that part.</td>
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<td></td>
</tr>
</tbody>
</table>

Density = Log(\frac{\text{transmitting intensity}}{\text{incident intensity}})

Contrast = \frac{\text{density maximum} - \text{density minimum}}{\text{density maximum} + \text{density minimum}}