

Radiography of Pediatric & Geriatric Patients

PEDIATRIC PATIENTS

Key Characteristics

- Smaller body size → less tissue density
- Rapid cell division → more sensitive to radiation
- Limited ability to cooperate
- Fear/anxiety is common

Radiation Protection (VERY IMPORTANT)

- Use ALARA principle (As Low As Reasonably Achievable)
- Apply shielding (gonadal, thyroid when possible)
- Use lowest exposure factors
- Avoid repeats at all costs

Pediatric patients are much more radiosensitive than adults

Communication & Patient Care

- Explain in simple terms
- Involve parent/guardian
- Use calm, friendly tone
- Never lie (build trust)

Immobilization

- Movement = biggest problem

Methods:

- Pigg-O-Stat (for chest imaging)
- Sandbags, sponges, Velcro straps
- Parent assistance (with shielding)

Technical Considerations

- Lower kVp and mAs
- Short exposure time (reduces motion blur)
- Use smaller IR/image receptor
- Precise positioning is critical

Common Pediatric Conditions Seen in Imaging

- Fractures (greenstick fractures)
- Congenital abnormalities
- Respiratory conditions (e.g., pneumonia)

GERIATRIC PATIENTS

Key Characteristics

- Aging body systems
- Decreased bone density → osteoporosis
- Reduced mobility
- Possible cognitive impairment (confusion, dementia)

Radiation Protection

- Still use ALARA, but:
- Less radiosensitive than pediatrics
- Avoid unnecessary repeats

Patient Care & Communication

- Speak slowly and clearly
- Be respectful and patient
- Allow extra time for movement
- Assess for pain before positioning

Mobility & Safety

- High fall risk
- Use assistance when moving
- Support weak joints and spine
- Watch for medical devices:
 - Oxygen tanks
 - IV lines
 - Pacemakers

Technical Considerations

- May need slightly higher exposure due to:
 - Tissue changes
 - Pathology (e.g., arthritis)
- BUT:
 - Osteoporotic bones may require lower technique

Technique varies—must adjust based on patient condition

Common Geriatric Conditions Seen in Imaging

- Osteoporosis
- Arthritis
- Fractures (especially hip fractures)
- Degenerative diseases

KEY DIFFERENCES

Factor	Pediatric	Geriatric
Radiation Sensitivity	HIGH	LOWER
Cooperation	Low	Varies
Mobility	Usually good	Often limited
Main Concern	Radiation dose	Safety & mobility
Common Issue	Motion	Fragility
Technique	Lower exposure	Adjust case-by-case

MEMORY TIPS

- Pediatrics = Protect & Immobilize
- Geriatrics = Support & Be Patient
- Never hold a pediatric patient yourself → use parent or immobilizers
- Always shield pediatric patients when possible
- For elderly: slow movements prevent injury
- Communication can make or break the exam in both groups

Medical Age Groups Table

Age Group	Age Range	Description / Key Notes
Neonate (Newborn)	Birth – 28 days	Very fragile; high radiation sensitivity; requires extreme care and warmth
Infant	1 month – 1 year	Rapid growth; limited communication; needs immobilization
Toddler	1 – 3 years	Active, uncooperative; fear is common; simple instructions needed
Preschooler	3 – 6 years	Better communication; still needs reassurance; may follow basic directions
School-age Child	6 – 12 years	More cooperative; can understand instructions; modesty becomes important
Adolescent	12 – 18 years	Similar to adults physically; privacy and body image are important
Young Adult	18 – 40 years	Fully developed; typically cooperative; standard techniques apply
Middle Adult	40 – 65 years	Possible early aging changes; screen for health conditions
Geriatric (Older Adult)	65+ years	Reduced mobility; fragile bones; may have cognitive or physical limitations

Pediatric vs. Geriatric Pathologies & X-ray Effects

Comorbidities = the presence of two or more diseases or conditions in the same patient at the same time.

PEDIATRIC PATIENTS

Greenstick Fracture

- **What it is:** Incomplete fracture (bone bends and cracks)
- **Why it happens:** Bones are softer and more flexible
- **X-ray appearance:**
 - One side of bone broken, other side bent
 - Subtle—easy to miss
- **Radiographic impact:**
 - Requires careful positioning and multiple views

Growth Plate Injuries (Epiphyseal Injuries)

- **What it is:** Injury to growth plate (physis)
- **X-ray appearance:**
 - Widened or irregular growth plate
 - May look normal → compare both sides
- **Radiographic impact:**
 - Always image **joint above and below**
 - Use comparison views if needed

Pneumonia

- **What it is:** Lung infection
- **X-ray appearance:**
 - White/cloudy areas (**consolidation**)
 - Often localized
- **Radiographic impact:**
 - Lower exposure needed (less dense chest)
 - Watch for motion from breathing/crying

Respiratory Distress Syndrome (RDS)

- Common in premature infants
- **X-ray appearance:**
 - “Ground glass” appearance
 - Low lung volume
- **Radiographic impact:**
 - Requires precise technique and minimal repeats

Congenital Hip Dysplasia

- **What it is:** Improper hip joint development
- **X-ray appearance:**
 - Dislocated or shallow acetabulum
- **Radiographic impact:**
 - Special positioning (frog-leg may be contraindicated in some cases)

Foreign Body Aspiration

- **What it is:** Object stuck in airway
- **X-ray appearance:**
 - Air trapping (one lung darker)
 - Visible object (if radiopaque)
- **Radiographic impact:**
 - May require inspiratory/expiratory views

GERIATRIC PATIENTS

Osteoporosis

- **What it is:** Loss of bone density
- **X-ray appearance:**
 - Bones appear **more radiolucent (darker)**
 - Thin cortical bone
- **Radiographic impact:**
 - Lower exposure may be needed
 - High fracture risk during positioning

Osteoarthritis

- **What it is:** Degenerative joint disease
- **X-ray appearance:**
 - Joint space narrowing
 - Bone spurs (**osteophytes**)
 - Increased bone density (**sclerosis**)
- **Radiographic impact:**
 - Limited mobility → modify positioning

Hip Fractures

- Very common in elderly
- **X-ray appearance:**
 - Break in femoral neck or intertrochanteric region
- **Radiographic impact:**
 - Do NOT force movement
 - Cross-table lateral instead of frog-leg

Chronic Obstructive Pulmonary Disease (COPD)

- Includes emphysema, chronic bronchitis
- **X-ray appearance:**
 - Hyperinflated lungs (very dark)
 - Flattened diaphragm
- **Radiographic impact:**
 - Higher kVp often needed

Congestive Heart Failure (CHF)

- **What it is:** Heart cannot pump effectively
- **X-ray appearance:**
 - Enlarged heart (**cardiomegaly**)
 - Fluid in lungs (pulmonary edema → white areas)
- **Radiographic impact:**
 - May need upright position if possible

Pneumonia (Geriatric)

- **X-ray appearance:**
 - More diffuse or bilateral than in children
- **Radiographic impact:**
 - Harder to detect due to other lung diseases

KEY DIFFERENCES ON X-RAY

Feature	Pediatric	Geriatric
Bone Density	Lower but flexible	Decreased, brittle
Fractures	Greenstick, subtle	Complete, severe
Lungs	Smaller, less dense	May be hyperinflated or fluid-filled
Healing	Faster	Slower
Image Challenges	Motion	Positioning limitations

HIGH-YIELD LMRT POINTS

- **Pediatrics:**
 - Look for subtle fractures and growth plate injuries
 - Motion is the biggest imaging problem
- **Geriatrics:**
 - Expect degenerative changes (arthritis, osteoporosis)
 - Be cautious—**fractures can occur easily during positioning**

1. Which age group is MOST sensitive to radiation?
 - A. Adult
 - B. Geriatric
 - C. Pediatric
 - D. Adolescent

2. The ALARA principle stands for:
 - A. As Low As Radiation Allows
 - B. As Low As Reasonably Achievable
 - C. Always Limit All Radiation Areas
 - D. As Long As Radiation Applies

3. A greenstick fracture is best described as:
 - A. Complete bone break
 - B. Bone infection
 - C. Incomplete fracture with bending
 - D. Joint dislocation

4. The greatest challenge when imaging pediatric patients is:
 - A. Bone density
 - B. Motion
 - C. Equipment size
 - D. Radiation scatter

5. Which device is commonly used to immobilize pediatric patients?
 - A. Grid
 - B. Pigg-O-Stat
 - C. Bucky
 - D. Collimator

6. A growth plate is also known as the:
 - A. Diaphysis
 - B. Epiphysis
 - C. Physis
 - D. Metaphysis

7. When imaging a suspected growth plate injury, the technologist should:
 - A. Increase kVp
 - B. Only take one view
 - C. Compare both sides
 - D. Skip shielding

8. Pediatric chest X-rays typically require:
 - A. Higher kVp
 - B. Lower exposure factors
 - C. Longer exposure time
 - D. Grid usage

9. Which condition produces a “ground glass” appearance on X-ray in infants?
 - A. COPD
 - B. RDS
 - C. CHF
 - D. Tuberculosis

10. Which of the following is MOST important when communicating with children?
 - A. Use medical terminology
 - B. Speak quickly
 - C. Use simple language
 - D. Avoid eye contact

11. A foreign body aspiration may appear as:
 - A. Bone destruction
 - B. Air trapping
 - C. Joint narrowing
 - D. Increased bone density

12. Pediatric bones are more prone to greenstick fractures because they are:
 - A. Harder
 - B. More brittle
 - C. More flexible
 - D. Fully calcified

13. Shielding in pediatric patients should be:
 - A. Avoided
 - B. Used whenever possible
 - C. Only used for adults
 - D. Used only in emergencies

14. Which pediatric condition affects the hip joint?
 - A. Osteoporosis
 - B. Hip dysplasia
 - C. Arthritis
 - D. Scoliosis

15. Motion artifact in pediatric imaging is BEST reduced by:
 - A. Increasing time
 - B. Using immobilization
 - C. Lowering mAs
 - D. Increasing SID

16. Which age range defines an infant?
 - A. Birth–28 days
 - B. 1 month–1 year
 - C. 1–3 years
 - D. 3–6 years

17. A toddler is defined as:
- A. 0–1 year
 - B. 1–3 years
 - C. 3–6 years
 - D. 6–12 years
18. The MOST radiosensitive tissues are:
- A. Muscle
 - B. Bone
 - C. Rapidly dividing cells
 - D. Fat
19. Pediatric pneumonia appears as:
- A. Dark areas
 - B. White consolidation
 - C. Bone thickening
 - D. Air-filled cavities
20. The best way to gain cooperation from a pediatric patient is:
- A. Force positioning
 - B. Ignore the child
 - C. Build trust and explain simply
 - D. Rush the exam
21. Geriatric patients are typically defined as:
- A. 50+
 - B. 60+
 - C. 65+
 - D. 70+
22. Osteoporosis causes bones to appear:
- A. More radiopaque
 - B. More radiolucent
 - C. Larger
 - D. Shorter
23. Osteoarthritis is characterized by:
- A. Bone loss only
 - B. Joint space widening
 - C. Joint space narrowing and osteophytes
 - D. Bone infection
24. The greatest risk when positioning geriatric patients is:
- A. Radiation overdose
 - B. Motion
 - C. Fracture or injury
 - D. Equipment failure

25. COPD on X-ray typically shows:
- A. White lungs
 - B. Hyperinflated lungs
 - C. Bone lesions
 - D. Narrowed joints
26. A flattened diaphragm is associated with:
- A. CHF
 - B. COPD
 - C. Pneumonia
 - D. Fracture
27. Congestive heart failure may present as:
- A. Small heart
 - B. Enlarged heart and lung fluid
 - C. Bone loss
 - D. Air trapping
28. The term for an enlarged heart is:
- A. Cardiomegaly
 - B. Cardiopathy
 - C. Tachycardia
 - D. Bradycardia
29. When imaging a suspected hip fracture, you should:
- A. Use frog-leg position
 - B. Force movement
 - C. Use cross-table lateral
 - D. Skip lateral view
30. Geriatric patients often require:
- A. Faster exams only
 - B. More time and assistance
 - C. No communication
 - D. Higher radiation only
31. Osteophytes are:
- A. Bone fractures
 - B. Bone spurs
 - C. Soft tissue masses
 - D. Fluid collections
32. Geriatric patients are LESS sensitive to radiation than:
- A. Adults
 - B. Children
 - C. Adolescents
 - D. Infants

33. Arthritis affects:
- A. Muscles
 - B. Joints
 - C. Skin
 - D. Nerves
34. Which condition increases fracture risk in elderly patients?
- A. Pneumonia
 - B. Osteoporosis
 - C. COPD
 - D. CHF
35. Pneumonia in geriatric patients may appear:
- A. Localized only
 - B. Bilateral or diffuse
 - C. Only in bones
 - D. As fractures
36. Mobility issues in elderly patients may require:
- A. Standard positioning only
 - B. Modified positioning
 - C. No positioning
 - D. Increased SID only
37. Which is common in geriatric imaging?
- A. Growth plate injuries
 - B. Degenerative changes
 - C. Congenital disorders
 - D. Greenstick fractures
38. The main concern with elderly patients during exams is:
- A. Radiation only
 - B. Safety and comfort
 - C. Speed only
 - D. Equipment
39. Chronic bronchitis is a type of:
- A. CHF
 - B. COPD
 - C. Fracture
 - D. Arthritis
40. Geriatric bones are:
- A. Flexible
 - B. Stronger
 - C. Brittle
 - D. Growing

41. Which group heals fractures faster?
- A. Geriatric
 - B. Adult
 - C. Pediatric
 - D. Middle-aged
42. Which group is MOST likely to have motion issues?
- A. Geriatric
 - B. Pediatric
 - C. Adult
 - D. Adolescent
43. Which age group is 6–12 years?
- A. Toddler
 - B. Preschool
 - C. School-age
 - D. Adolescent
44. Adolescents are:
- A. 1–3 years
 - B. 3–6 years
 - C. 12–18 years
 - D. 18–40 years
45. The primary concern in pediatric imaging is:
- A. Comfort
 - B. Radiation dose
 - C. Equipment
 - D. Speed
46. The primary concern in geriatric imaging is:
- A. Radiation only
 - B. Motion only
 - C. Safety and mobility
 - D. Equipment
47. Pediatric bones appear:
- A. More brittle
 - B. More flexible
 - C. Fully calcified
 - D. Thicker
48. A major difference between pediatric and geriatric lungs on X-ray:
- A. No difference
 - B. Pediatric lungs are hyperinflated
 - C. Geriatric lungs may show disease changes
 - D. Pediatric lungs show osteoporosis

49. Which group often has multiple comorbidities visible on X-ray?
- A. Pediatric
 - B. Adolescent
 - C. Geriatric
 - D. Infant

50. Which statement is TRUE?
- A. Pediatrics require higher radiation
 - B. Geriatrics never fracture
 - C. Pediatrics are more radiosensitive
 - D. Elderly heal faster

51. You are performing a chest X-ray on a 2-year-old who is crying and moving. The first image is blurred due to motion. What is the BEST next step and why?

52. An 80-year-old patient with suspected hip fracture is in severe pain and cannot move their leg. How should you modify your positioning, and what must you avoid?

53. A pediatric patient comes in with a possible fracture, but the X-ray looks normal. The child still has pain and limited movement. What should you consider, and what action should be taken next?
