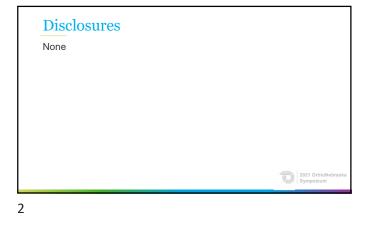


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# Learning Objectives Discuss indications and contraindications of radiographs in pediatric and adolescent patients Discuss appropriate views for radiograph exams for orthopedic injuries

#### Overview

- · When to order X-rays
- · What X-rays to order
- Potential consequences of not getting X-rays
- Normal pediatric radiographs

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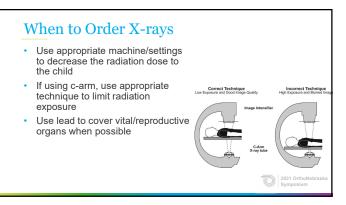
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#### When to Order X-rays

- Balancing the risk of radiographs of the pediatric patient with the risk of missing an orthopedic injury must be weighed in each patient
- Only use imaging if there is a definite benefit to the patient Generally, it is considered that the individual risk of X-ray
- imaging is small when compared to the benefit of accurate diagnosis
- Despite the potential benefits, limiting ionizing radiation exposure to the pediatric/adolescent population should be a priority

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#### When to Order X-rays

- Could the same information be obtained without the use of radiation
- . Ultrasound
- . MRI



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# When to Order X-rays

- · Obvious deformity
  - If there is obvious deformity of a ٠ limb or portion of a limb, radiographs should be ordered to determine the cause of the deformity
- Post-reduction
  - After correction of a deformity, radiographs should be obtained in order to determine appropriate correction of the deformity



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# When to Order X-rays

- Evaluation of trauma
  - High energy polytrauma
  - Lower energy trauma
- Lack of use of a limb such as lack of weight bearing in a child •
  - Clinical suspicion of bone injury or bone problem
    - Fracture Lesion
    - Infection

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# What X-rays to Order

- Radiographs should include orthogonal views of the injured extremity/bone
  - A/P and lateral recommended Oblique radiographs as indicated based •
  - on the injury
  - Quality radiographs ensure that repeat radiographs will not need to be performed
  - Repeat radiographs increase radiation dosage



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#### What X-rays to Order

- · If symptoms are of a joint, order an xray of the joint in question (hip/knee/shoulder/elbow, etc.)
- If a long bone is fractured, include . radiographs of joint above and below if possible
  - Radius/ulna fracture with forearm radiographs including wrist/elbow
  - Potential for joint injury is present and should be evaluated



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# What X-rays to Order

• In patients with night pain or other suspicion for lesion/tumor, plain radiographs may reveal a diagnosis and hasten referral to subspecialist

Bone tumors



#### Potential Consequences of X-rays

- · Pediatric patients are more radiosensitive than adults
  - Risk of adverse events is increased per dose of ionizing radiation
  - Utilization of adult setting for pediatric radiographs may lead to excessive radiation exposure to the pediatric patient
  - Age is less important than the size of the patient
    - The larger the patient, the more radiation is required to obtain a quality image
- Pediatric patients have a longer expected lifespan and therefore the effects of radiation have longer to occur
- Pediatric patients are more radiosensitive than adults with a 3-5x higher risk of radiation-induced cancer risk mortality

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#### Potential Consequences of X-rays

- Utilization of radiation dose "As Low as Reasonably Achievable" should be utilized
  - Again, the lowest dose to achieve the best image
- Utilization of shielding whenever possible
- Limited radiographs to sensitive areas
  - Groin
  - AbdomenHead/Neck
  - nead/nec

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# Potential Consequences of X-rays Utilization of pediatric protocols whenever available Utilization of equipment that has been designed for the

- pediatric patient whenever possible
- Consideration of alternative examination techniques that will provide an answer to the clinical question without ionizing radiation
  - Ultrasound
  - Magnetic Resonance Imaging

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### Normal Pediatric Radiographs

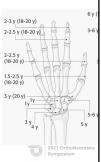
- Knowledge of normal pediatric radiographs will help to ensure adequate diagnosis/treatment of pediatric injuries
- Growth plate/ossification happens at fairly reliable intervalsKnowing when a growth plate is closed vs. open will improve
- diagnostic accuracy

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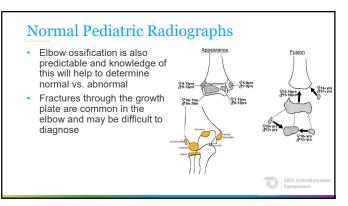
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# Normal Pediatric Radiographs

- Hand and wrist ossification may appear as fractures as opposed to normal growth
- Carpal bones may not be present (ossified) on radiographs in the very young



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## Normal Peds Radiographs

 A simple google search of the limb/body part and "ossification" will provide a general estimate of when the growth plates should be present and when they should fuse

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https://www.fda.gov/radiation-emitting-products/medicalimaging/pediatric-x-ray-imaging

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