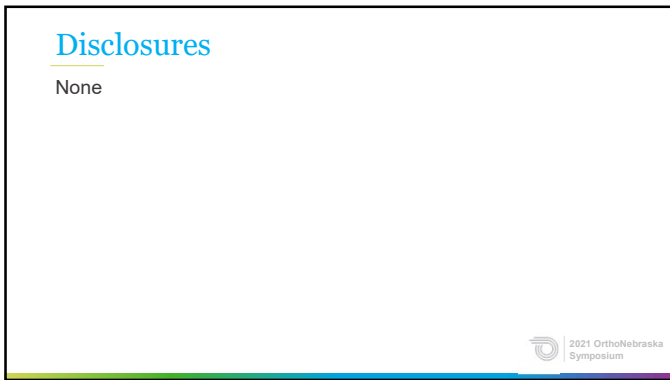
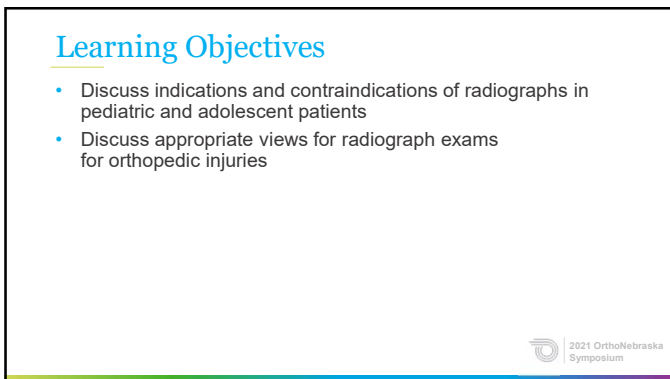


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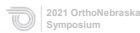
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3

Overview

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



4

When to Order X-rays

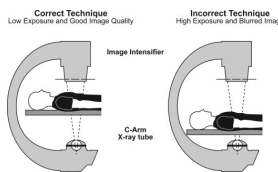
- Balancing the risk of radiographs of the pediatric patient with the risk of missing an orthopedic injury must be weighed in each patient
 - Only use imaging if there is a definite benefit to the patient
- Generally, it is considered that the individual risk of X-ray imaging is small when compared to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



5

When to Order X-rays

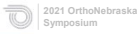
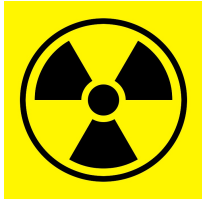
- Use appropriate machine/settings to decrease the radiation dose to the child
- If using c-arm, use appropriate technique to limit radiation exposure
- Use lead to cover vital/reproductive organs when possible



6

When to Order X-rays

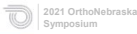

- Could the same information be obtained without the use of radiation
- Ultrasound
- MRI



7

When to Order X-rays

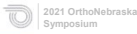
- Obvious deformity
 - If there is obvious deformity of a limb or portion of a limb, radiographs should be ordered to determine the cause of the deformity
- Post-reduction
 - After correction of a deformity, radiographs should be obtained in order to determine appropriate correction of the deformity



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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



9

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 x-ray 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

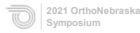


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Potential Consequences of X-rays

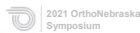
- Pediatric patients are more radiosensitive than adults
 - Risk of adverse events is increased per dose of ionizing radiation
 - Utilization of adult setting for pediatric radiographs may lead to excessive radiation exposure to the pediatric patient
- Age is less important than the size of the patient
 - 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
 - Abdomen
 - Head/Neck



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Potential Consequences of X-rays

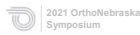
- Utilization of pediatric protocols whenever available
- Utilization of equipment that has been designed for the pediatric patient whenever possible
- Consideration of alternative examination techniques that will provide an answer to the clinical question without ionizing radiation
 - Ultrasound
 - Magnetic Resonance Imaging



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Normal Pediatric Radiographs

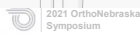
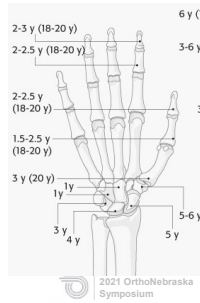
- Knowledge of normal pediatric radiographs will help to ensure adequate diagnosis/treatment of pediatric injuries
- Growth plate/ossification happens at fairly reliable intervals
- Knowing when a growth plate is closed vs. open will improve diagnostic accuracy



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Normal Pediatric Radiographs

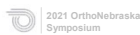
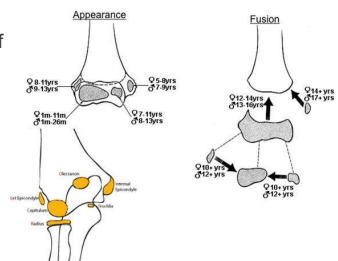
- Hand and wrist ossification may appear as fractures as opposed to normal growth
- Carpal bones may not be present (ossified) on radiographs in the very young



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Normal Pediatric Radiographs

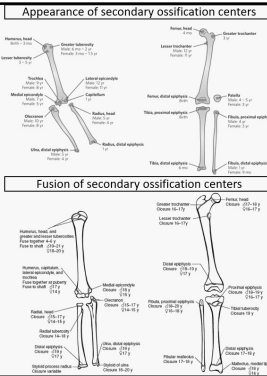
- Elbow ossification is also predictable and knowledge of this will help to determine normal vs. abnormal
- Fractures through the growth plate are common in the elbow and may be difficult to diagnose



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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

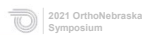


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References

Google Images

<https://www.fda.gov/radiation-emitting-products/medical-imaging/pediatric-x-ray-imaging>



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QUESTIONS

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