Objectives:
- To discuss plain film and physical findings that suggest an occult fracture
- To recognize clinical scenarios that are high risk for an occult fracture
- To discuss the evidence-based approach to evaluating patients for an occult fracture in order to avoid pitfalls

High Risk!
  - 122 ED malpractice claims, 4 insurers
  - Most common “Missed Dx”
    - #1-Fracture, #2-Infxn, #3-MI
- Most common Errors:
  - Failure to order right test (58%)
    - Radiologic study (61%): #1-Xray
    - Misinterpretation of test (37%)
    - Radiologic study (66%): #1-Xray

“Occult” Fracture?
- Not readily visible on plain radiographs, using standard techniques
- Clinically important
  - Change in management
  - Significant risk of complications if missed
- Missed Fracture = most common source of malpractice lawsuits in EM
Four common radiologic pitfalls:

- Ankle and Foot
- Hip
- Elbow
- Wrist
When should I consider CT?
1) High clinical suspicion
   - Mechanism, exam
2) Persistent pain/effusion at follow up

Haapamaki, *Am J Roentgenol*, 2004:
- Retro, 344 pts with fx on Ankle/foot CT
- Pts with Fx not visualized on plain films:
  - Calcaneus (20)
  - Talus (15)
Bohler’s angle

CT scan:
- Occult fracture
- Plan surgery

Talar dome fracture
- Osteochondral lesion
- CT or MRI
- Non-wt bearing vs Arthroscopy
Fracture of the Lateral process of the Talus

- Snowboarding
- Axial load in dorsiflexion, external rotation
- Surgical repair

Avoiding Pitfalls (ankle/foot):

- CT scan of the ankle:
  - High suspicion
  - Mechanism
  - Exam
  - Poor recovery on follow up exam

THE HIP

75 year old woman has fallen and she can't get up

- Pain in left hip with attempts to bear weight
- No deformity or other injury
MRI vs CT

- Lubovsky, *Injury*, 2005:
  - 13 pts with suspected fx, negative Xrays
  - 6 had both MRI and CT (slice?)
  - CT incorrect in four (under-dx)
    - CT: Gr. Trochanteric fx
    - MR: 3 Intertroch fx, 1 subcapital fx

- Hakkarinen, *JEM*, 2012:
  - Case series, 235 hip fx
  - 211 (90%) visible on plain films
  - 24 occult fx
    - 18 identified by CT (MRI not done)
    - 4 had Neg CT, positive MRI
82 yo F
Fell on L hip
Plain films negative

Avoiding Pitfalls (hip):
- MRI still the gold standard for excluding occult hip fracture
- Is CT useful at all?
  - If positive
  - Younger trauma patients
  - Low clinical suspicion
THE ELBOW

Occult fractures
- Adult
- Radial head
- Pediatric
- Supracondylar

Adult Elbow
- 90 degree lateral
  1) Fat pads
     - Bulging anterior
     - Posterior
  2) Radio-capitellar line
Pediatric Elbow

3) Anterior Humeral Line

Avoiding Pitfalls (elbow):

- Look for fat pads
- Draw the lines
Case:
- 31 yo M struck by martial arts instructor
- c/o wrist pain
- Snuffbox tenderness

Scaphoid fracture
- Most common carpal fracture
  - 10-20% occult
- Distal blood supply
  - Proximal fx worse
- Delayed complications:
  - Non-union
  - Avascular necrosis

AVN, non-union
Frequent occult fractures
+ 
Frequent complications
=
Thumb spica splint and follow-up

MRI vs CT:
- Memarsadeghi, Radiology, 2006:
  - 29 pts, neg X-ray, had CT (4) and MRI
  - Gold std: plain films at 6 wks
  - 11 scaphoid fx
  - MR found 100%, CT found 8/11 (73%)  

MRI vs CT:
- Ilica A, Japanese Journal of Radiology, 2012:
  - 54 patients, snuffbox tenderness, X-ray neg
  - MRI and 64 slice CT within 1 week
  - MRI 22 fractures (14 scaphoid)
  - CT 19 fractures (12 scaphoid)
  - Sensitivity of CT for occult scaphoid fx~86%

Avoiding Pitfalls (scaphoid):
- Splint and follow-up, or
- Early MRI
Summary:

- Clinical situations that suggest an occult fracture
- Evidence-based approach to evaluating patients for an occult fracture, to avoid radiologic pitfalls

Thank you!