

# MACEP Risk Management Course

## Module 4: Emergency Orthopedics

Matthew B. Mostofi, D.O., FACEP

### Course Objectives

- Identify the risk management issues involved in caring for patient with orthopedic complaints.
  - Recognize that **Failure to Diagnose** significant orthopedic injuries is currently the highest cause of both claims made against emergency physicians and in percentage of claims with indemnity (pay-outs).
  - Recognize that **cervical spine injuries, pelvic fractures, compartment syndrome and occult extremity fractures** are high risk orthopedic situations.
  - Identify the risk that **patients with unreliable history and physical exams** pose to identification of significant orthopedic injuries.
  - List the pertinent history, physical findings, testing, management, documentation and follow-up essential in the evaluation of patients with high risk orthopedic injuries.
- 

### Fracture Management

Fractures and other orthopedic injuries account for more than 11% of malpractice claims against emergency physicians. From 2005-2009, 42% of these claims ended with indemnity or payout. The average indemnity for these cases was \$314,285. Two missed cervical spine fractures were settled during this time frame for amounts in excess of 1 million dollars. Orthopedic claims have the highest likelihood to have indemnity when compared to any other system cases.<sup>2</sup>

There are several themes that emerge when reviewing closed claims data which can be useful in managing risk. The vast majority of claims made against emergency physicians for orthopedic injuries are based on **failure to diagnose** an existing injury. Factors involved include:

- **Failure to suspect a fracture:** There are often patient factors which render history and physical unreliable, resulting in **failure to order an x-ray** of an affected body part because history and physical do not suggest injury. This is most dramatically associated with the intoxicated trauma patient who has an unsuspected vertebral fracture, but young children, elderly, patients with mental disorders and distracting injuries are also high risk patients. Care should be given to avoid over reliance on

exam in these patients and when in doubt appropriate imaging should be obtained. Failure to diagnose additional fractures when the first fracture is identified is also a pitfall.

- **Misread of radiograph or ordering wrong views/study:** Often an x-ray is interpreted as normal when in fact a fracture/injury exists. Good clinical judgment coupled with a robust and reliable radiographic follow-up system is essential to minimize this risk. Look at all films ordered, as pathology is often seen on only one view. Do not accept partial or incomplete x-ray studies. When in doubt, other imaging modalities like CT or MRI may be necessary and consultation with radiologist or orthopedist encouraged.
- **Failure to recognize or prevent complications associated with fractures:** Missed associated injuries, hemorrhage/vascular injury, nerve injury and compartment syndrome are known complications of orthopedic injuries that frequently lead to disability and may result in legal action. Documentation of neurovascular function, tendon injuries, and compartment pressure in suspected compartment syndrome is essential. Missed or delayed pelvic fractures which are associated with significant occult hemorrhage and often catastrophic disabilities have resulted in large settlements. However, the most catastrophic disabilities and largest settlements result from problems in the management of vertebral fractures and a subsequent neurologic dysfunction.
- **Poor discharge instructions:** The most common missed fractures are of extremities. Although most of these fractures are not serious injuries, significant disability can result. Giving clear after-care instructions, describing warning signs for potential complications, and providing mechanism for follow up care, are essential to mitigate risk.

## Vertebral Fractures

Fractures and subluxations of the cervical spine account for some of the highest dollar loss claims in emergency medicine. Again, “failure to diagnose” is the most frequent claim associated with malpractice. After reviewing closed claims it is clear emergency physicians can incorporate practice concepts to minimize risk. Strategies include:

- **Suspect cervical fractures in all trauma patients.** These include alert trauma patients with neck pain, all intoxicated patients, unresponsive or head injured patients, and any trauma patient with new neurologic deficit.
- **Immobilize all suspected spine fractures** and document that immobilization was performed and maintained. Significant vertebral injury may be present without cord injury. Evaluation of suspected fractures must be performed without injuring the cord or exacerbating a cord injury. Cervical immobilization requires rigid collars, tape, sand bags, back boards, or other immobilization devices in various combinations. Soft collars do not immobilize the neck. When emergent airway management is needed,

care should be used to maintain cervical immobilization and should be documented. Options include in-line immobilization, nasal intubation, and flexible fiber optic intubation. Newer “difficult airway” devices like Glidescope or optical stylets may also be helpful. While controversy exists as to the optimal technique for airway management in a patient with suspect cervical spine fracture, it is clear that documenting that care was taken to consider and immobilize the cervical spine is an effective risk management approach.

- **Image all patients that require imaging.** Not all trauma patients need cervical spine imaging. There are currently two validated clinical decision rules which may be used as a guide when considering who needs radiographs. The National Emergency X-ray Utilization Study (NEXUS) looked at 34,069 patients and identified 810/818 “clinically significant” fractures. This gives the NEXUS rules sensitivity (positive in disease) of 99.0%. The negative predictive value of rules was 99.8%.

#### **NEXUS criteria**

1. No midline tenderness
2. No focal neurological deficits
3. Normal alertness
4. No intoxication
5. No painful or distracting injury

The Canadian C-Spine Rules (CCR) has also been validated and is a useful guide as to which patients will need cervical spine imaging. This study looked at 8924 patients and identified 151/151 “important” fractures, giving it a sensitivity of 100%.

#### **CCR**

1. Are there any high risk factors (Age >65, dangerous mechanism\*, paraesthesia in extremities)?
2. Are there any low risk factors (Simple rear-end MVC\*\*, sitting positioning ED, ambulatory at any time, delayed onset of neck pain, absence of midline tenderness)?
3. Can patient rotate neck 45 degrees to the right and left?

\* Dangerous mechanisms: Fall from height >3 ft/5 stairs, axial load to head, ejection, MVC >100km/hr, rollover, motorized recreational vehicle, bicycle struck or collision

\*\*Simple rear-end MVC excludes: pushed into oncoming traffic, hit by bus/large truck, rollover, hit by high speed vehicle

While both rules are reasonable tools to decide who does and does not require imaging, no rule should take place of good clinical judgment and neither rule is perfect. The Canadian C-spine rules have some very specific definitions and exclusion criteria, so caution is advised when employing them.

Computerized tomography of the c-spine is the gold standard for blunt trauma patients that require imaging. With the increased availability of CT scan, there is decreased use of cervical plain film to evaluate for fracture. A meta-analysis of seven studies involving 3,834 blunt trauma patients with cervical spine injuries showed pooled sensitivity of 98% for CT scan vs. 52% for plain films. If plain radiographs of the cervical spine are to be used, at least 3 views should be obtained: AP, lateral and odontoid view. For adequate evaluation, all seven cervical vertebrae (including the upper part of T1) must be seen. This may require special views, such as a pull-down or swimmer's view. When unable to get a complete study, CT scan should be obtained.

- **If you can't read the study, consult someone who can.** Consult radiologist freely when reading vertebral radiographs/CT. This is a high risk injury and a mistake in an x-ray/CT read can have a bad outcome for you and your patient. In some cases, when the radiologist is unsure, further evaluation with MRI or orthopedist/neurosurgeon may be warranted. Remember to maintain c-spine immobilization throughout this often timely process.
- **Good discharge instructions.** Most spine injuries involve soft tissue rather than bone. Since certain soft tissue injuries can potentially cause disability, even with normal radiographs, always instruct patient to obtain follow-up if symptoms persist or worsen. Warning signs like numbness, weakness, and paraesthesia, with an action plan should also be discussed with patient and documented in the discharge instructions.

## Pelvic Fractures

While pelvic fractures represent a tiny percentage of all fractures, the mortality rate from severe pelvis injury is high. High risk pelvic fractures occur in multiple trauma patients and evaluation of such patients must include thorough evaluation of the pelvis.

The following factors have been reported in the literature to increase the risk of mortality:

- Pelvic ring injury-particularly with posterior injury/instability
- High injury severity score (other associated injuries)
- Hemorrhagic shock on admission (blood pressure < 90)
- Large transfusion requirement
- Any perineal laceration
- Advanced age

Think of pelvic fracture in trauma patient with a history of shock. The typical pelvic fracture malpractice suit is the result of a patient's death from unsuspected hemorrhage. Injuries to the lower GI tract (blood in rectum) or urinary system (blood at meatus or high riding prostate) are often signs of pelvic injury. Pedestrian versus auto collisions are a common cause. The critical risk management strategy is to suspect pelvic fractures in the multi-injured patient and always consider pelvic fracture as a cause of shock. Early recognition can expedite definitive care which may include transfer to trauma center or involvement of

orthopedist/interventional radiologist. Often pelvic stabilization, a commercially available pelvic stabilization/compression device, and massive fluid resuscitation may be the only treatment while arranging definitive care. Historically, bed sheets or other straps were used to provide pelvic compression and stabilization but there are now commercially available pelvic stabilization/compression devices. Good documentation of your actions will be imperative as frequently there is a poor outcome.

## Extremity Fractures

Emergency physicians see a great deal of extremity trauma and the majority of malpractice suits related to fractures arise from extremity injuries. These cases are generally decided in the physicians favor or result in small payouts. Certain injuries, such as hip fractures, slipped capital femoral epiphysis, and compartment syndromes are associated with significant disability and can result in significant judgments against the physician.

Like the rest of orthopedic claims, areas of risk when evaluating an extremity injury include:

1. Failure to suspect a fracture and therefore not ordering an x-ray of the affected part.
2. Failure to get appropriate views.
3. Misreading of radiographs.
4. Failure to identify and splint potential occult fractures.
5. Poor discharge instructions.
6. Breakdown in the follow-up system for radiographs.

Some methods to mitigate risk are as follows:

1. **Get the radiograph**, and make sure it is the right one. Take a careful history, especially to determine the mechanism of injury. Perform thorough examination with documentation of pertinent positive and negative findings. Beware of the multiple trauma patients, as other more acute injuries may take your attention away from the extremities. Any missed fracture in the ED, which results in a bad outcome for the patient, will likely be your responsibility. Listen to the patient. If your patient says it hurts, believe it. If your patient says they can not use the extremity (i.e. cannot walk), believe it. Many malpractice suits result from a patient's perception that the physician did not take the complaint seriously, and did not adequately examine (physically and with radiographs) the injured area.
2. **Never accept poor quality radiographs or inadequate views.** Repeat the study, or if needed get a study (CT or MRI) that will answer the question asked.
3. **Improved interpretation of radiographs.** ED physician leadership should have in place a system for quality control and improvement. Reviews of missed x-ray findings and a mechanism to identify an individual physician for addressing substandard quality should be in place and followed. Internet portal applications can now allow consult viewing of radiographs remotely and in real time. Advocate for these systems

to be available for all orthopedic consultants. For concerning cases, ask consultants to review the images and work together on planning next evaluation/treatment steps.

4. **Know the signs, symptoms, mechanism of injury, and radiographic findings of occult fractures.** Such occult fractures include, the carpal navicular bone, tibial plateau fractures, the radial head, calcaneal fractures, stress fractures, and Salter I growth plate fractures. Use CT or MRI on patients where there is a strong clinical suspicion of an extremity fracture with normal x-ray finding. Also, good communication with patient and family is important. Informing the patient to the possibility of an occult fracture, and treating the area with immobilization and referral for orthopedic follow up is an effective strategy. This open communication often satisfies the expectation of the patient and minimizes the surprise if there is a change in diagnosis and treatment plan.
5. **Develop an efficient follow-up system.** Timely radiology follow-up is critical to risk management in emergency orthopedics. Prompt notification of a missed fracture and initiation of appropriate therapy and referral is essential. Discharge instructions should reflect the fact that the ED x-ray read is preliminary and that a formal interpretation by radiologist will follow. Patients should be notified for any significant discrepancy. Any significant delay in this notification will be scrutinized by a patient's attorney if there is a bad outcome or significant disability.

A few complications of orthopedic injuries should also be in the forefront of the mind of any practicing emergency physician. These complications include **open fractures, neurovascular compromise and compartment syndrome**. The common factor for all of these entities is that a delayed or missed diagnosis of any complications is frequently associated with significant disability, so care in the evaluation and treatment are critical elements in mitigating legal risk.

- Ensure all patients (with extra care to multi-injured and those with unreliable history and physical exam) are undressed and examined, so as not to miss a small "open" fracture. Documentation of this exam and its findings are the protection needed if an infectious complication occurs.
- Injured extremities should be reassessed before and after splinting/casting for signs of neurovascular compromise. When splints are applied in the emergency department, careful instructions should be given to patients and caregivers regarding reevaluation of neurovascular function and warning signs warranting a return to ED. In lower extremity injury, failure to instruct the patient to remain non-weight bearing can worsen a recognized or unrecognized condition such as stress fracture, slipped capital femoral epiphysis in a child, Salter-Harris (growth-plate) fractures or others.
- Compartment syndrome is increased pressure in a confined space (with and without fracture), which interferes with proper circulation. Pain is the earliest and most reliable sign and often it is out of proportion to physical exam. Other findings include pain with passive motion, tenderness of a tense compartment, anesthesia,

weakness and paresis. Risk factors include long bone fractures, crush and significant soft tissue injuries and patients with coagulopathy or on anticoagulants. All patients with risk and findings suggestive of compartment syndrome should be evaluated emergently by an orthopedist for measurements of compartment pressures. The average award for delay in diagnosis of compartment syndrome in 1993 was \$280,000.

## Discharge Instructions

Discharge instructions are critical. This is your last chance; take advantage of it by giving thorough instructions, particularly concerning follow-up. Every patient with orthopedic injury should be referred to an orthopedist or their primary care physician. Good discharge instructions should tell the patient how to care for the injury. This should include use, care and cautions regarding immobilization devices, when and how to arrange follow-up and potential complications (neuro-vascular problems, etc.) that may result from the injury. If there is a significant injury and concern that the patient may not be able to arrange a follow-up appointment with orthopedist in a timely manner, it is advisable to call the orthopedist and make the arrangement prior to patient's departure from the ED.

---

## Summary Points

### History:

- Discover and document mechanism and circumstances of injury.
- Read all accompanying documents, including nurse notes and EMS reports.
- Document pertinent past medical history, family history, and social history.
- Carefully assess and document patient's mental status and level of consciousness, with the understanding that impaired patients have unreliable history and physical findings.

### Evaluation:

- Suspect fractures. Failure to image or choosing the wrong imaging modality is a significant factor in "failure to diagnose" claim.<sup>1</sup>
- Young children, elderly, patients with language barriers, mental disorders, distracting injuries and intoxication frequently have unreliable history and physical findings. Beware of these patients; often a more liberal use of imaging is indicated.
- Assume cervical spine fracture and pelvic fracture in any multiple trauma patients.
- Evaluate and document neurologic, vascular and tendon integrity in all areas of injury. Be sure to repeat if any manipulation was performed.
- Use your Radiology and orthopedic consultant when there is doubt about the presence of an injury or treatment plan. Consider asking orthopedic consultants not present in the ED to review images remotely if possible in order to assist in determining extent of the injury and treatment plan.
- Consider compartment syndrome in patients with risk and pain out of proportion to physical findings.

**Treatment:**

- Until cervical spine is cleared, maintain cervical immobilization.
- For those patients who walk in with traumatic neck pain, protocols should be in place for immobilization in triage.
- Immobilize injured extremities liberally.
- Know when to call a consultant or transfer to trauma center, when in doubt...consult.

**Discharge instructions:**

- Give complete instructions on the care of the injury.
- Always include warning signs for when to return to the emergency department.
- Always provide a mechanism for appropriate follow up.

**Administrative:**

- Advocate/Assist in enabling remote image viewing by orthopedic related consultants for better real time consultant input/follow up care arrangement.
- Develop a system to monitor missed x-rays and to inform patients of corrected findings.
- Develop a system to notify patient of any positive culture result, crucial in case of septic arthritis.

## Module 4: Orthopedics References

1. Medical Professional Mutual Insurance Company (“ProMutual”); Closed Case Analysis, *Emergency Medicine* 2005-2009
2. Closed Claim Studies , ProMutual 2005-2009
3. Germann C; Perron, A. Risk Management and Avoiding Legal Pitfalls in the Emergency Treatment of High-Risk Orthopedic Injuries. *Emerg Med Clin N AM* 28 (2010) 969-996.
4. Yu, K; Green, R. Critical Aspects of Emergency Department Documentation and Communication. *Emerg Med Clin N AM* 27 (2009) 641-654.
5. Gulli B, Templeman D: Compartment syndrome of the lower extremity. *Orthop Clin North Am* 25:677-684, 1994