# Orthopedic Emergencies: A Hospitalist Perspective

## Overview of Orthopedic Emergencies

Orthopedic emergencies are acute musculoskeletal conditions requiring urgent intervention to prevent long-term disability, limb loss, or systemic complications. From a hospitalist perspective, these emergencies often present in the inpatient setting as complications of trauma, infection, or underlying disease, necessitating rapid diagnosis, coordination with specialists, and medical stabilization. Common orthopedic emergencies include compartment syndrome, septic arthritis, acute fractures with neurovascular compromise, cauda equina syndrome, and necrotizing fasciitis. This guide provides a comprehensive overview of orthopedic emergencies, including causes, diagnostic approaches, management strategies, complications, hospitalist duties, and includes tables and clinical scenarios for practical application.

## Common Orthopedic Emergencies

### Compartment Syndrome:

**Definition:** Increased pressure within a muscle compartment (e.g., leg, forearm) that compromises blood flow, leading to ischemia and potential necrosis.

**Causes:** Trauma (fractures, crush injuries), tight casts, burns, prolonged limb compression (e.g., drug overdose).

**Presentation:** Severe pain (out of proportion to injury), pain with passive stretch, paresthesia, pallor, pulselessness (late), tense/swollen compartment.

**Diagnosis:** Clinical (6 Ps: Pain, Paresthesia, Pallor, Pulselessness, Poikilothermia, Paralysis), compartment pressure >30 mmHg or delta pressure (diastolic BP - compartment pressure) <30 mmHg.

### Septic Arthritis:

**Definition:** Infection of a joint, leading to rapid cartilage destruction if untreated.

**Causes:** Bacterial (e.g., Staphylococcus aureus, Streptococcus), often via hematogenous spread, direct inoculation (trauma, surgery), or contiguous spread (osteomyelitis).

**Presentation:** Acute joint pain, swelling, erythema, warmth, fever, limited range of motion (ROM).

**Diagnosis:** Joint aspiration (synovial fluid: WBC >50,000/µL, >75% neutrophils, positive culture), imaging (MRI: effusion, synovitis).

## Acute Fractures with Neurovascular Compromise:

**Definition:** Fractures causing vascular or nerve injury, risking limb loss or permanent deficit.

**Causes:** High-energy trauma (e.g., femur, tibia, humerus fractures), often open fractures.

**Presentation:** Deformity, severe pain, swelling, loss of distal pulses, sensory/motor deficits (e.g., foot drop in peroneal nerve injury).

**Diagnosis:** X-ray (fracture pattern), Doppler US (assess distal pulses), CT/MRI (if complex).

## Cauda Equina Syndrome (CES):

**Definition:** Compression of the cauda equina nerve roots, a surgical emergency due to risk of permanent paralysis.

**Causes:** Lumbar disc herniation (L4-L5, L5-S1), spinal stenosis, tumors, trauma, epidural abscess/hematoma.

**Presentation:** Severe low back pain, saddle anesthesia (perianal numbness), bowel/bladder dysfunction (incontinence, retention), lower extremity weakness, loss of reflexes.

**Diagnosis:** MRI spine (disc herniation, mass effect), urgent if red flags present.

## Necrotizing Fasciitis:

**Definition:** Rapidly progressive soft tissue infection involving the fascia, often leading to systemic toxicity.

**Causes:** Polymicrobial or monomicrobial (Streptococcus pyogenes, MRSA), often after trauma, surgery, or skin breakdown.

**Presentation:** Severe pain (out of proportion), erythema, swelling, crepitus, fever, hypotension, skin necrosis (late).

**Diagnosis:** Clinical (LRINEC score >6: WBC, Hgb, Na, glucose, Cr, CRP), imaging (CT/MRI: gas in tissues), surgical exploration (definitive).

## Diagnostic Approach (Hospitalist Perspective)

### Step 1: History and Physical Exam

- History:
  - **Trauma:** Mechanism (e.g., fall, MVA), timing (delayed presentation increases risk).
  - **Pain:** Severity, location, exacerbating factors (e.g., passive stretch in compartment syndrome).
  - **Red Flags:** Fever (infection), saddle anesthesia (CES), systemic symptoms (necrotizing fasciitis).
- Exam:
  - **Inspection:** Deformity, swelling, erythema, skin changes (necrosis, crepitus).
  - **Palpation:** Tenderness, tense compartments, warmth.
  - **Neurovascular:** Pulses (Doppler if needed), sensation, motor function, reflexes.
  - **Special Tests:** Pain with passive stretch (compartment syndrome), straight leg raise (CES).

### Step 2: Labs and Imaging

- Labs:
  - **CBC:** Leukocytosis (infection), anemia (hemorrhage in fractures).
  - **CRP/ESR:** Elevated in infection (e.g., septic arthritis, necrotizing fasciitis).
  - **Blood Cultures:** If systemic infection suspected (e.g., necrotizing fasciitis, septic arthritis).
  - **CMP:** Cr (AKI in necrotizing fasciitis), glucose (diabetes as risk factor).
  - **CK:** Elevated in compartment syndrome (>1,000 U/L), necrotizing fasciitis.
- Imaging:
  - **X-Ray:** Fractures, air in tissues (necrotizing fasciitis), joint effusion (septic arthritis).
  - **CT/MRI:** MRI for CES (disc herniation), CT for necrotizing fasciitis (gas, fascial edema), complex fractures.

    - **Ultrasound:** Doppler for vascular compromise, joint effusion in septic arthritis.
- Special Tests:
    - **Compartment Pressure:** Measure if suspected (delta pressure <30 mmHg).
    - **Joint Aspiration:** Synovial fluid analysis for septic arthritis (WBC, Gram stain, culture).
    - **Surgical Exploration:** Definitive for necrotizing fasciitis (necrotic fascia, “dishwater” pus).

## Hospital Management (Hospitalist Perspective)

### General Principles:

- **Stabilization:** Address ABCs (airway, breathing, circulation), manage shock (e.g., fluids for sepsis).
- **Pain Control:** Avoid NSAIDs (bleeding risk); use acetaminophen 650 mg PO q6h, opioids (morphine 2-4 mg IV q2-4h) for severe pain.
- **Consult Orthopedics:** Immediate for compartment syndrome, fractures, CES; urgent for septic arthritis.
- **Infection Control:** Broad-spectrum antibiotics for suspected infections, isolation if MRSA suspected.

### Specific Management:

- Compartment Syndrome:
    - **Immediate:** Remove casts/dressings, elevate limb (neutral position), consult orthopedics for urgent fasciotomy (within 6h).
    - **Supportive:** Fluids (NS 1 L bolus), pain control (morphine), monitor CK (rhabdomyolysis risk).
- Septic Arthritis:
    - **Immediate:** Joint aspiration (send for cell count, Gram stain, culture), consult orthopedics for surgical washout.
    - **Antibiotics:** Vancomycin 15 mg/kg IV q12h + ceftriaxone 1 g IV daily (cover MRSA, Gram-negatives).
    - **Supportive:** Monitor WBC, CRP q24h, repeat aspiration if no improvement.
- Acute Fractures with Neurovascular Compromise:
    - **Immediate:** Immobilize (splint), consult orthopedics for urgent reduction/fixation.

    - **Vascular:** If pulseless, emergent vascular surgery consult; Doppler US to confirm.
    - **Supportive:** Pain control, monitor distal pulses q1h, compartment pressure if tense.
- Cauda Equina Syndrome:
    - **Immediate:** MRI spine stat, consult neurosurgery for urgent decompression (within 24-48h).
    - **Supportive:** Steroids (dexamethasone 10 mg IV bolus) if tumor/abscess, catheter for urinary retention.
- Necrotizing Fasciitis:
    - **Immediate:** Consult surgery for emergent debridement, broad-spectrum antibiotics (vancomycin 15 mg/kg IV q12h + piperacillin-tazobactam 4.5 g IV q6h + clindamycin 900 mg IV q8h for toxin suppression).
    - **Supportive:** Fluids (NS 30 mL/kg), ICU admission (sepsis), monitor lactate, renal function.

## Complications:

- Compartment Syndrome:
    - Rhabdomyolysis (CK >5,000 U/L, AKI), limb loss, Volkmann's contracture.
- Septic Arthritis:
    - Joint destruction, sepsis, chronic osteomyelitis.
- Fractures:
    - Non-union, malunion, compartment syndrome, fat embolism (petechiae, hypoxia).
- CES:
    - Permanent paralysis, bowel/bladder incontinence, chronic pain.
- Necrotizing Fasciitis:
    - Sepsis, multi-organ failure, amputation, mortality (20-30% if delayed).

## Hospitalist Duties for Orthopedic Emergencies

### Rapid Assessment:

Perform focused history/exam, identify red flags (e.g., 6 Ps, saddle anesthesia).

### Stabilization:

Manage shock (fluids, vasopressors), pain (opioids), infections (antibiotics).

## Consultation:

Orthopedics, neurosurgery, vascular surgery, infectious disease as needed.

## Coordination:

Order imaging/labs, ensure timely consults (e.g., fasciotomy within 6h for compartment syndrome).

Communicate with family, document urgency (e.g., CES as surgical emergency).

## Monitoring:

Neurovascular checks q1-2h (pulses, sensation, motor function).

Labs q12-24h (WBC, CRP, CK, Cr).

Watch for systemic complications (e.g., sepsis, AKI).

## Discharge Planning:

**Rehab:** Physical therapy for fractures, CES.

**Follow-Up:** Orthopedics, PM&R within 1-2 weeks.

**Education:** Teach signs of infection, neurovascular compromise (e.g., numbness, pulselessness).

### Table: Common Orthopedic Emergencies and Key Features

| Emergency | Presentation | Diagnostic Findings | Management | Complications |
|---|---|---|---|---|
| Compartment Syndrome | Pain out of proportion, passive stretch pain, 6 Ps | Compartment pressure >30 mmHg, delta <30 mmHg | Urgent fasciotomy, fluids, pain control | Rhabdomyolysis, limb loss |
| Septic Arthritis | Acute joint pain, swelling, fever, limited ROM | Synovial fluid: WBC >50,000/µL, positive culture | Joint washout, antibiotics (vancomycin + ceftriaxone) | Joint destruction, sepsis |
| Fracture with Neurovascular Compromise | Deformity, pain, pulseless, sensory/motor loss | X-ray: Fracture, Doppler: Absent distal pulses | Urgent reduction/ fixation, vascular consult | Non-union, compartment syndrome |

| Emergency | Presentation | Diagnostic Findings | Management | Complications |
|---|---|---|---|---|
| Cauda Equina Syndrome | Low back pain, saddle anesthesia, bowel/bladder issues | MRI: Disc herniation, mass effect | Urgent decompression, steroids if tumor/abscess | Paralysis, incontinence |
| Necrotizing Fasciitis | Severe pain, erythema, crepitus, systemic toxicity | LRINEC score >6, CT: Gas in tissues | Emergent debridement, antibiotics (vanco + pip-tazo) | Sepsis, amputation |

## Clinical Scenarios

### Scenario 1: Young Male with Compartment Syndrome Post-Trauma

- Presentation: A 30-year-old male presents 6h after a motorcycle accident with a tibia fracture, now with severe leg pain, numbness, and inability to move his foot. Exam shows T 37°C, BP 130/80 mmHg, HR 90 bpm, RR 18/min, tense anterior leg compartment, pain with passive toe stretch, decreased sensation, weak dorsiflexion.
- Diagnostic Workup: **X-ray:** Displaced tibia fracture, compartment pressure 40 mmHg, delta pressure 25 mmHg (diastolic BP 65 mmHg).
- Diagnosis: Compartment syndrome → Pain out of proportion, tense compartment, pressure >30 mmHg.
- Management: **Admit to ortho unit (emergency). Consult orthopedics:** Urgent fasciotomy within 2h. Fluids (NS 1 L bolus), morphine 4 mg IV q2h. Monitor CK (2,500 U/L, risk of rhabdomyolysis), Cr q6h. Post-op, neurovascular checks q1h, wound care. After 5 days, sensation improves, discharged to rehab with ortho follow-up.

### Scenario 2: Elderly Female with Septic Arthritis

- Presentation: A 65-year-old female with RA presents with 2 days of right knee pain, swelling, and fever. Exam shows T 38.5°C, BP 110/70 mmHg, HR 100 bpm, RR 20/min, right knee erythematous, warm, tender, limited ROM.
- Diagnostic Workup: **Joint aspiration:** WBC 80,000/µL (90% neutrophils), Gram stain positive for Gram-positive cocci, culture pending, X-ray: Joint effusion, labs: WBC 14,000/µL, CRP 120 mg/L.
- Diagnosis: Septic arthritis → Acute joint pain, high synovial WBC, Gram-positive cocci.

- Management: **Admit to medicine (infection). Consult orthopedics:** Arthroscopic washout performed. Start vancomycin 15 mg/kg IV q12h + ceftriaxone 1 g IV daily. Monitor WBC, CRP q24h, repeat aspiration day 3 (WBC 20,000/μL, improving). Culture grows S. aureus. After 7 days, knee swelling reduced, discharged on IV antibiotics with ID follow-up.

## Scenario 3: Middle-Aged Male with Cauda Equina Syndrome

- Presentation: A 50-year-old male presents with 1 day of severe low back pain, urinary retention, and numbness in his buttocks. Exam shows T 37°C, BP 120/80 mmHg, HR 80 bpm, RR 16/min, saddle anesthesia, weak ankle reflexes, bladder scan: 600 mL.
- Diagnostic Workup: **MRI spine:** L4-L5 disc herniation with cauda equina compression, labs: Normal CMP, WBC.
- Diagnosis: Cauda Equina Syndrome → Back pain, saddle anesthesia, bladder dysfunction, MRI findings.
- Management: **Admit to neurosurgery unit (emergency). Consult neurosurgery:** Urgent discectomy within 12h. Dexamethasone 10 mg IV bolus (reduce edema). Foley catheter placed. Monitor neuro checks q1h. Post-op, sensation improves, bladder function returns. After 4 days, discharged to rehab with neurosurgery follow-up

**Table:** Hospitalist Management Checklist for Orthopedic Emergencies

| Task | Compartment Syndrome | Septic Arthritis | Fracture with Compromise | Cauda Equina Syndrome | Necrotizing Fasciitis |
|---|---|---|---|---|---|
| Initial Stabilization | Remove casts, elevate limb | Joint aspiration, antibiotics | Immobilize, pain control | MRI stat, steroids | Fluids, antibiotics |
| Consult | Orthopedics (urgent) | Orthopedics, ID | Orthopedics, vascular | Neurosurgery (urgent) | Surgery (emergent), ID |
| Monitoring | Compartment pressure q1h, CK | WBC, CRP q24h, repeat aspiration | Distal pulses q1h, neuro checks | Neuro checks q1h, bladder scan | Lactate, Cr q6h, wound checks |
| Supportive Care | Fluids, morphine | IV fluids, pain control | Splint, morphine | Catheter, pain control | ICU, broad-spectrum antibiotics |

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