Musculoskeletal (MSK) Infection Pathway: ED Management

November 2025

Children's Healthcare of Atlanta

Suspicion of MSK Infection [1]

| High Suspicion for MSK Infection |
Fever AND refusal to bear weight, focal pain, limited use and/or immobility of extremity

| Low Suspicion for MSK Infection |
Afebrile, history of trauma

Continue usual ED management

Initial Diagnostic Management
- Make patient NPO
- Imaging: Radiograph of affected region
- Labs: CBC with diff, CRP, ESR, blood culture *
  Consider BMP given potential for nephrotoxic drugs

**Obtain maximum allowable blood culture volume, See Policy 4.26*

Refusal to bear weight and fever present.
Is radiograph consistent with infectious process OR does patient have at least one of the following predictors?
- WBC > 12,000
- CRP > 2mg/dl
- ESR > 40

Yes / No

| High Risk for MSK infection |
Consult Ortho on all patients

Concern for joint effusion?

Yes: **Hip** / **Other Joints**

Hip → **Proceed to *Hip Aspiration Procedural Algorithm on page 5* or Proceed to OR after approval by Ortho Attending**

Other Joints → **Consider US** *Especially for shoulder or if radiographically equivocal*

Effusion amenable to aspiration?

Yes → **Aspirate in the ED [2,3]**

No / Yes → **Admit to Hospitalist**
- Start antibiotics (See page 3)
- NPO
- Place MRI order for **Fast/Rapid Non Contrast Osteomyelitis MRI if criteria met** (see page 4). Patient may be scanned as soon as MRI available, either through the ED or from the floor.
- *If ineligible for Rapid Osteomyelitis MRI: PHM to contact Radiology MD and Sedation MD.*

Proceed to Inpatient Pathway
(Continue to page 2)

No → **Proceed to Inpatient Guideline**
(Continue to page 2)

| Low Risk for MSK infection |

Trial NSAIDs

Does patient meet the following criteria?
- **Clinical improvement (Afebrile, able to ambulate)**
  AND
- **Patient has reliable follow-up**

Yes → **Discharge home with PCP follow-up within 48 hours**

No → **Consult Ortho Admit to Hospitalist Scheduled NSAIDs**

Inclusion Criteria

- 6 months to 21 years
- Suspicion of acute musculoskeletal infection (Symptoms less than 2 weeks): osteomyelitis, septic arthritis, pyomyositis

Exclusion Criteria

- Infants less than 6 months
- Chronic and subacute musculoskeletal infection (Symptoms greater than 2 weeks)
- Postoperative infection
- Penetrating trauma
- Patient with hardware
- Myelomeningocele
- Chronic recurrent multifocal osteomyelitis (CRMO)
- Immunocompromised
- Sickle Cell Disease

[1] Suspicion of MSK Infection

Obtain the following:

History
Pain, fever, inability to bear weight, gait disturbance/limp, limited use or immobility of extremity or spine, travel to endemic Lyme areas

Physical Exam
Limited range of motion, swelling, tenderness, warmth at site, fever, erythema, psoas sign

[2] Aspiration Results

For reference only

>50,000 WBC: Proceed to OR

25,000-50,000 WBC: Consider OR, close observation

<25,000 WBC: Close observation and consider auto-immune and/or post-infectious diagnoses

[3] Specimen Collection

Lab Order Prioritization of Joint Fluid Depends on Volume Obtained (4-5 mL)

1. Culture Fluid (Code:CUFLD)
2. Cell Count (Code:FLCT)
3. For patients ≤ 48 months order Kingella PCR from synovial fluid, tissue or bone (Code:KINPCR)

How to submit specimens: For all tests listed above, use a needleless capped syringe or sterile container.

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If patient is direct admit from Urgent Care, consult Orthopedics upon arrival to the inpatient unit

| High Risk for MSK Infection |

Continue Antibiotics

MRI Imaging

- Place MRI order for ***Fast/Rapid Non Contrast Osteomyelitis MRI*** if not already done (see criteria on page 4).
- If patient does not meet criteria for rapid non-contrast MRI, place order for MRI with and without contrast
- Contact Radiology MD **AND** Sedation MD (contact Radiology attending to discuss coordinating MRI sedation with aspiration) if same day MRI needed

MSK Infection?

Yes → **Consult ID**

Drainable abscess or septic joint?

Yes → **Go to OR or IR**
Send specimen [5]

No → **Continue antibiotics** (See table, page 3)
Provide medical management [1]

Blood culture results after 24H?

Positive → **Continue antibiotics** (See table, page 3)
Provide medical management [1]
Consult PT

Negative → **Consult IR for bone biopsy**
Make patient NPO before desired procedure
Clears: 2 hours
Breastmilk: 4 hours
Formula: 6 hours
Solids: 8 hours

Meets criteria to transition to PO antibiotics? [2]

No → **Continue antibiotics** (See table, page 3)
Provide medical management [1]
Consult/continue PT

Yes → **Meets discharge criteria? [4]**

Yes → **Discharge home**
Follow-up with Ortho in 2-4 weeks if surgical intervention required. Otherwise per Ortho discretion.
Follow-up with ID in 2-4 weeks

No → **If patient requires continued medical management, [3] then consider the following:**
Reimaging
Echo

No → **Stop antibiotics**
Continue alternative mgmt

| Low Risk for MSK Infection |

Scheduled Toradol Observation NPO overnight

Improved after 12-24H?

Yes → **D/C home**
PCP follow-up within 48H

No → **Repeat labs: ↑ CRP or WBC?**

Yes → **Consider managing as high risk**

No → **Continue observation**

Clinical improvement after 24H scheduled Toradol?

Yes → **D/C home**
PCP follow-up within 48H

No → **Consider managing as high risk**

[1] Medical Management

- Aggressive hydration (given risk of bacteremia/potentially nephrotoxic drugs)
- CBC and CRP 36-48H from surgical procedure or admission labs
- Additional labs every 48H PRN until patient labs are improving
- PICC lines not routinely recommended
- Mechanical VTE prophylaxis may be considered at the discretion of the treating physician for patients with any of the following risk factors:
  - Age > 8 years
  - Infection where offending agent is MRSA
  - Surgical treatment for osteomyelitis
  - Elevated CRP >6 mg/dl
- Consider imaging with Doppler Ultrasound if prolonged swelling or pain out of proportion to infection or exam.

[2] Criteria to Transition to PO Antibiotics

Must meet ALL of the following criteria:

- Afebrile for at least 24 hours or significantly improved fever curve
- Improved pain
- Decreased CRP
- Source Control
- Cleared bacteremia: >36 hours no growth
- Oral option available
- Patient able to take/tolerate PO

[3] Criteria for Continued Medical Management

- Fever >72H
- Persistent bacteremia (≥ 3 cultures)
- Worsening pain
- CRP not improving

[4] Discharge Criteria

- Pain controlled by PO meds
- Tolerating PO antibiotics

[5] Specimen Collection

Lab Order Prioritization of Joint Fluid Depends on Volume Obtained (4-5 ml)
1. Culture Fluid (Code:CUFLD)
2. Cell Count (Code:FLCT)
3. For patients ≤ 48 months order Kingella PCR from synovial fluid, tissue, or bone (Code:KINPCR)

- **How to submit specimens:** For all tests listed above, use a needleless capped syringe or sterile container.
- If tissue and/or bone is collected in the OR, submit in a sterile container and place orders for tissue culture (Code:CUTISS) and bone culture (Code:CUBONE).

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IV Antibiotic Table

For treatment of Acute Hematogenous Osteomyelitis and Septic Arthritis

These recommendations are the same for all patients, regardless of vaccination status

Diagnosis	Common Pathogens	Preferred Drug(s)	Alternative Drug(s) for B-lactam allergy	Minimal Duration	Comments
Acute Osteomyelitis	MSSA, MRSA, *S. Pyogenes, K. kingae* (age <4 years)	**Well-Appearing:** <u><4 years:</u> • Cefazolin 50 mg/kg IV every 8 hours (max 2000 mg/dose) ***OR*** • Cephalexin 50 mg/kg/dose PO every 8 hours (max 1000 mg/dose) <u>≥4 years:</u> • Clindamycin 13 mg/kg/dose PO/IV three times daily (max 600 mg/dose) **Ill-Appearing:** <u>All ages:</u> • Cefazolin 50 mg/kg IV every 8 hours (max 2000 mg/dose) ***PLUS*** • Vancomycin with Pharmacokinetic Consult (See **Pharmacokinetic Policy** for dosing recommendations)	**Cephalosporin Allergy:** • Clindamycin* 13 mg/kg/dose PO/IV every 8 hours (max 600 mg/dose) **PO Clindamycin is preferred due to high bioavailability for patients able to tolerate PO*	• **Uncomplicated**: <u>3 weeks</u> • **Complicated** *(bacteremia, slow resolution, operative drainage procedure)*: <u>4 weeks</u> • **Severe Infection** *(persistent bactermia (>72 hours after appropriate antibiotics), multiple drainage/debridement procedures*: <u>4 weeks from negative cultures, up to 6 weeks</u>	• **ID consult is recommended** • In clinically stable patients, consider delaying antibiotics if bone biopsy is planned. • Cefazolin is recommended in almost all patients with penicillin or amoxicillin allergies, due to low risk of cross-reactivitiy. Avoid Cefazolin in patients with cephalosporin allergies.
Septic Arthritis	MSSA, MRSA, *S. Pyogenes, S. pneumoniae, K. kingae* (age <4 years)	**Well-Appearing:** <u><4 years:</u> • Cefazolin 50 mg/kg IV every 8 hours (max 2000 mg/dose) <u>≥4 years:</u> • Clindamycin 13 mg/kg/dose PO/IV every 8 hours (max 600 mg/dose) **Ill-Appearing:** <u>All ages:</u> • Cefazolin 50 mg/kg IV every 8 hours (max 2000 mg/dose) ***PLUS*** • Vancomycin with Pharmacokinetic Consult (See **Pharmacokinetic Policy** for dosing recommendations)	**Cephalosporin Allergy:** • Clindamycin* 13 mg/kg/dose PO/IV every 8 hours (max 600 mg/dose) **PO Clindamycin is preferred due to high bioavailability for patients able to tolerate PO*	• **Uncomplicated**: <u>2 weeks</u> • **Complicated** *(bacteremia, slow resolution, multiple joint washout procedures, concern for adjacent osteomyelitis)*: <u>3 weeks</u>	• **ID consult is recommended**

Suggested Drugs for PO Transition

Pathogen	Drug	Dose	Max Single Dose
MSSA or *K. kingae*	Cephalexin	40 mg/kg/dose qh8	1000 mg
MRSA	Clindamycin	13 mg/kg/dose q8h	600 mg
S. pyogenes (GAS)	Amoxicillin	30 mg/kg/dose q8h	1000 mg

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Musculoskeletal (MSK) Infection pathway: ED and Inpatient Management

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Fast/Rapid Non Contrast Osteomyelitis MRI

Patient presents with suspected **acute osteomyelitis**

↓

Place order for Rapid Osteomyelitis MRI[3] (see inclusion/exclusion crieria [1,2])

↓

Patient taken to MRI per time set by lead MRI technologist

- Potential complications include: Failed Study and/or Additional Sequences Needed. See Workflow Below
- ***If patient is between the ages of 2-5 years, consideration should be taken to schedule patient in the next sedation/GA slot***

Failed Study:

If patient fails study because of need for sedation (or non-diagnostic images) or found not to meet criteria while in MRI, patient will be rescheduled by MRI technologist for standard osteomyelitis protocol as soon as possible.

- Timetable determined by lead MR technologist.
- Whether patient stays in MRI or returns to room in the interim determined by lead MR technologist.
- Order changed in Epic by MR techs to MRI without/with contrast
- Sedation team notified
- All failed studies documented on spreadsheet for age of patient, reasons for fail, ordering attending, attending name if not on orthopedic service, time of day, location, and lead MRI tech

Additional Sequences Needed:

If for treatment decisions, patient requires post contrast sequences after initial study, additional sequences will be performed as soon as possible.

- Timetable determined by lead MR technologist.
- Whether patient stays in MRI or returns to room in the interim determined by lead MR technologist.
- Second MRI order to be placed by Orthopedic Physician **or** clinical team after consultation with Orthopedics.
- If additional sequences needed, initial MRI Rapid Osteo will be dictated and completed separately.
- All studies requiring additional sequences will be documented on spreadsheet for age of patient, reasons for fail, ordering attending, attending name if not on orthopedic service, time of day, location, and lead MRI tech

[1]Inclusion Criteria

- Healthy inpatient age ≥ 2 years with high clinical suspicion for acute osteomyelitis.

Rapid Osteomyelitis non contrast MRI may be performed in children younger than 2 at the request of the orthopedic surgeon.

[2]Exclusion Criteria

- Patient age <2 years
- Outpatients
- Chronic symptoms (>2 weeks)
- Exclusion sites: spine, chest, hands, feet

[3]EPIC Order

- Site (femur, tibia, ankle)
- Plain radiograph

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Hip Aspiration Procedural Algorithm

Focus: Ultrasound suspected infections in and around the hip, confirm effusion, then aspirate hip using c-arm
Patient clinical management – follow the Musculoskeletal (MSK) Infections Clinical Practice Guideline (ED and Inpatient Algorithms)

Hip Effusion on Ultrasound or MRI

- **Consult ED Physician to set up for sedation**
- **ED set up C-Arm at bedside**

1. **Confirm consent completed for Sedation and Procedure**
2. **Confirm the skin site for aspiration has been marked**
3. **Perform Timeout with ED RN and Orthopedic Provider**
4. **Perform C-Arm assisted Hip Aspiration in the Emergency Department**

Specimen Collection

Lab Order Prioritization of Joint Fluid Depends on Volume Obtained (4-5ml)(Send the aspirated fluid to the lab)

1. Culture Fluid (Code: CUFLD)
2. Cell Count (Code: FLCT)
3. For patients <5 years old – order Kingella PCR from synovial fluid only (Code: KINPCR)
4. Lyme testing if clinically indicated:
   * Order Lyme serology from blood (Code: BBPEPA)
   * Lyme PCR from synovial fluid only (Code: LYMPCR)

How to submit specimens: For all tests listed above except Lyme serology, use a needleless capped syringe or sterile container. For Lyme serology, use a serum separator (red top).

See MSK Infection Pathway For further management and disposition

Inclusion Criteria for Hip Aspiration

- Clinical suspicion of infection
- Effusion on US or MRI

Exclusion Criteria for Hip Aspiration

- Fracture or lesion on x-ray
- Consider underlying disease/ condition (i.e. Sickle Cell Disease)
- Overlying skin lesion/cellulitis (could contaminate needle path)
- Any contraindication to sedation