Musculoskeletal (MSK) Infection Clinical Practice Guideline

Emergency Department Management

Final 11/2/18
Updated 8/2023

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

→ **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 <u>at least one</u> of the following predictors?**
- WBC > 12,000
- CRP > 2mg/dl
- ESR > 40

Yes → **| High Risk for MSK infection |**
Consult Ortho on all patients

→ **Concern for joint effusion?**

- **No** → Admit to Hospitalist (see below)
- **Yes** → **Hip** / **Other Joints**
  - **Hip** → **Proceed to *Hip Aspiration Procedural Algorithm* or Proceed to OR after approval by Ortho Attending**
  - **Other Joints** → **Consider US**
    Especially for shoulder or if radiographically equivocal
    → **Effusion amenable to aspiration?**
    - **No** → Admit to Hospitalist
    - **Yes** → **Aspirate in the ED [2,3]** → Admit to Hospitalist

Admit to Hospitalist
Start antibiotics
(See table, page 3)
NPO
If at SR, ask Sedation MD to assess Sedation vs. Anesthesia for MRI

→ **Proceed to Inpatient Guideline**
(Continue to page 2)

No → **| Low Risk for MSK infection |**
→ **Trial NSAIDs**
→ **Does patient meet the following criteria?**
- **Clinical improvement (Afebrile, able to ambulate)**
  <u>AND</u>
- **Patient has reliable follow-up**

- **Yes** → **Discharge home with PCP follow-up within 48 hours**
- **No** → **Consult Ortho Admit to Hospitalist Scheduled NSAIDs** → **Proceed to Inpatient Guideline**
  (Continue to page 2)

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

→ **Continue usual ED management**

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

[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)
4. Lyme testing if clinically indicated. Order Lyme serology from blood (Code:BBPEPA) and 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 the "PED IP MSK Infection Specimen Collection" order set for specific order information.

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Inpatient Management

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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**
- Inpatient team or Ortho to place MRI order for ***Fast/Rapid Osteomyelitis MRI*** as appropriate. **(see criteria and decision tree 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?**
- No → **Stop antibiotics**; **Continue alternative mgmt**
- Yes → **Consult ID** → **Drainable abscess or septic joint?**
  - Yes → **Go to OR or IR**; **Send specimen** [5] → Continue antibiotics (see below)
  - 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

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

→ **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**

| 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 and on planned discharge day
- 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:

- No fever >24H
- Minimal pain
- CRP decreased by >50% of initial value
- Blood cultures negative for 36H
- No signs of endocarditis, pneumonia, or DVT

[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)
4. Lyme testing if clinically indicated. Order Lyme serology from blood (Code:BBPEPA) and 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).

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

Patient Characteristics	Bacterial Targets	Drug	Dose	Max Single Dose
6 months - ≤ 4 years and medically stable	*S. aureus* , *S. pyogenes* (GAS), *K. kingae*	Clindamycin AND	13mg/kg IV q8h	900mg
		Cefazolin	40mg/kg IV q8h	2000mg
6 months - ≤ 4 years and not fully immunized against H. influenzae or S. pneumoniae	*S. aureus* , *S. pyogenes* (GAS), *K. kingae* , *H. influenzae* , *S. pneumoniae*	Clindamycin AND	13mg/kg IV q8h	900mg
		Ceftriaxone	75mg/kg IV q24h	2000mg
> 6 months and ill appearing (Hemodynamically instability OR anticipated/existing need for intensive care)	*S. aureus* , *S. pyogenes* (GAS), *K. kingae* , *H. influenzae* , *S. pneumoniae*	Vancomycin [1] AND	15mg/kg IV q6h	1000 mg
		Ceftriaxone	75mg/kg IV q24h	2000mg
		Consider Clindamycin [2]	13mg/kg IV q8h	900mg
> 4 years old and medically stable	*S. aureus* , *S. pyogenes* (GAS)	Clindamycin	13mg/kg IV q8h	900mg
		Consider Ceftriaxone [3]	75mg/kg IV q24h	2000mg

[1] Recommended vancomycin starting dose. Goal trough 10-15µg/mL. Pharmokinetic service will monitor trough levels and adjust accordingly.

[2] Consider adding clindamycin empirically in critically ill patients while waiting for confirmation of therapeutic vancomycin level.

[3] If not fully immunized against *H. influenzae* or *S. pneumoniae* OR concern for Lyme disease or Gonorrhea, add ceftriaxone.

Suggested Antibiotics for PO Transition

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

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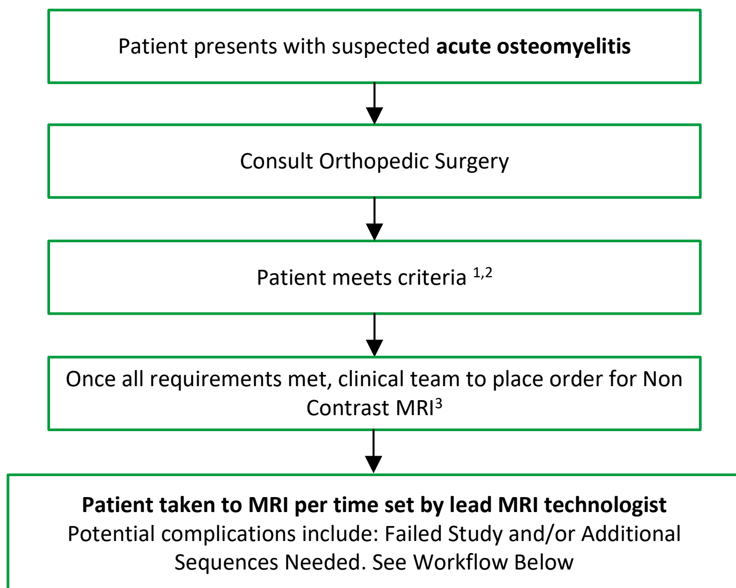
Fast/Rapid Osteomyelitis MRI



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 non-contrast MRI 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 in the upper or lower extremity who can easily perform a 15 minute non-sedated MRI.

[2]Exclusion Criteria

- Patient age <2 years
- Outpatients
- Chronic symptoms (>2 weeks)
- Exclusion sites: spine, chest, pelvis (hips are okay)
- History of sickle cell disease
- History of immunodeficiency
- History of JIA or other rheumatologic condition
- History of prior osteomyelitis in same location
- History of prior surgery in same location
- Personal history of cancer, cancer predisposition syndromes, chemotherapy, radiation, bone marrow, or any other prior transplant
- History of vascular anomaly in area of concern
- Aggressive bone lesion/changes by plain film (incidental lesion like NOF is okay)

[3]Non Contrast MRI- Requirements to Order

- Past medical history (PMH) available in Epic to confirm patient's PMH would not preclude modified protocol
- Plain film of site has been performed within 24 hours & available on PACS
- CBC within past 24 hours
- Specific site must be included in order (Ex: tibia – not lower extremity)

[4]EPIC Order

- Site (femur, tibia, foot/ankle)
- Plain films available

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