Clinical Pathway- **Osteoarticular Infections (Septic Arthritis and Osteomyelitis)**

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Please note: This clinical guideline is intended as an evidence-based guide for clinical care and not as a replacement for clinical decision making.

Estimated revision schedule every 3 years

Background:

Osteoarticular infections include both infections of the bone (osteomyelitis) and joints (septic arthritis). Most commonly, pathogenic organisms are hematogenously delivered though can be introduced via direct inoculation, such as trauma or surgery. Bacteria are the most common pathogens to cause infection, though viruses, fungi also need to be considered as possible sources. Osteoarticular infections are most commonly seen in the first 2 decades of life and are more common in boys than in girls.

Purpose:

To standardize the practice of Joe DiMaggio Children's Hospital physicians in the management of suspected/confirmed deep musculoskeletal infections (osteomyelitis and septic arthritis) for patients 6 months to 18 years of age.

Excluded patients: Infants <6 months of age, immunocompromised patients, post-operative infection, chronic infection/CRMO, infections from penetrating trauma, medically complex children, patients requiring PICU admission, non-hematogenous osteomyelitis – contiguous, and sickle cell patients.

This document and the accompanying flowchart serve as a guideline, final decisions about diagnostic studies and treatment choices are left to the discretion of the treating physicians.

Diagnosis: Based on clinical symptoms, physical exam findings, initial lab and imaging results.

- Initial clinical symptoms (<2 weeks duration): inability to bear weight/limited use of extremity, limp, pain, fever
- Kocher Criteria for Septic Arthritis

Non-weight bearing	No 0	Yes +1
Temp > 38.5C/101.3F	No 0	Yes +1
ESR > 40mm/hr	No 0	Yes +1
WBC > 12,000 cells/mm^3	No 0	Yes +1

- Probability for septic arthritis based on number of predictors: Zero predictors: < 0.2% risk, 1 predictor: 3.0%, 2 predictors: 40%, 3 predictors: 93.1%, 4 predictors: 99.6%.

Diagnostic Testing:

- Labs
  - CBC with differential
  - CRP
  - ESR
  - Blood culture (ideally x2)
- Initial Imaging Studies

    - Plain radiographs of affected region: 2-View plane films
        - Not sensitive for MSK infections but if diagnostic may avoid further imaging/testing
    - Hip Ultrasound if hip SA suspected (i.e. limping or will not move the leg) hip
    - If clinical suspicion of SA of a joint other than the hip, recommend aspirating joint; if necessary aspiration can be performed with US guidance
    - MRI with and without contrast of the involved extremity if concern for osteomyelitis
- Other Source Evaluation for Joint effusion
    - If obtaining joint fluid, **only send aspirates- not swabs**, send for (in order of prioritization):
        - Cell count + differential
        - Gram stain and culture (to be sent in blood culture bottle)
        - Bacterial PCR
        - If unusual case or exposures, consult ID for further testing/culturing recommendation (ie. fungal cultures)

Initial Consults:

- Both Orthopedics and Infectious Disease consults if high suspicion for septic arthritis and/or osteomyelitis (obtain consults from ED for all patients during regular work hours; obtain consults overnight if immediate concerns/clinical questions).

Antimicrobial Treatment:

- **6 months - 3 years**
    - Bacterial Targets: *Staphylococcus aureus, Streptococcus pyogenes* (GAS), *Kingella kingae***
    - Antibiotic choice:
        - Cefazolin 40 mg/kg IV q8 hours (max dose 2000 mg) and
        - Clindamycin 10 mg/kg IV q6 hours (max dose 600 mg)
    - **If patient has classic signs and symptoms of *Kingella kingae* (i.e. history of recent upper respiratory symptoms, mouth sores, stomatitis, indolent course) consider using ONLY CEFAZOLIN. Discuss with ID for antibiotic selection.
- **6 months - 3 years, not fully immunized:**
    - Bacterial Targets: *Staphylococcus aureus, Streptococcus pyogenes* (GAS), *Kingella kingae, Haemophilus influenza, Streptococcus pneumoniae*
    - Antibiotic choice:
        - Clindamycin and
        - Ceftriaxone 75 mg/kg IV q24 hr (Max dose 2000 mg)
- **>3 years old**
    - Bacterial targets: *Staphylococcus aureus* and *Streptococcus pyogenes*
    - Antibiotic choice:
        - Clindamycin
        - Consider Ceftriaxone (if not fully immunized against *H. influenza* or *S. pneumoniae* or concern for gonorrhea)
- *****If ill appearing**, consider switching Clindamycin to Linezolid or Ceftaroline- should be discussed with infectious disease
- **Sickle Cell**- start Ceftriaxone and Clindamycin
- For patients at risk for other special pathogens recommend discussing with ID to assist with antibiotic selection

Disposition:

- Patient should be admitted to the Pediatric ICU for any of the following reasons:
    - Hemodynamic instability
    - Concerns for sepsis/septic shock

Transition to oral antibiotics:

- No fever >24 hours
- Clinical improvement, including minimal pain with ambulation (if infant: minimal pain with movement/palpation of affected limb)
- CRP decreased >50% of peak value
- Blood cultures negative >36 hours
- No signs of endocarditis, pneumonia, or DVT
- ID in agreement

Suggested antibiotics for PO transition

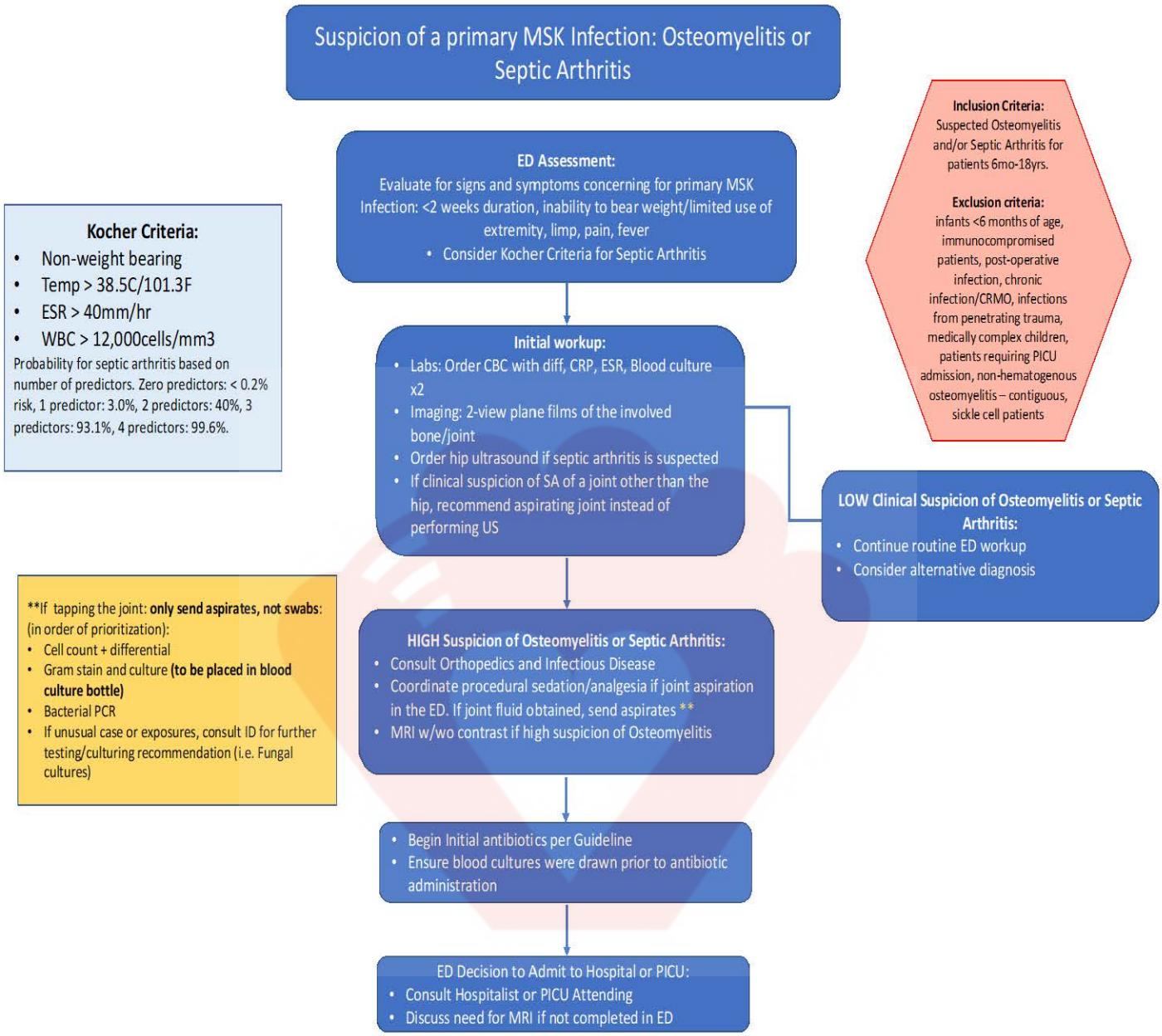
- Based on organism and susceptibilities if available

Bacterial Targets	**Drug Name**	**Dose**	**Max Single Dose**
MSSA or K. kingae	Cephalexin	100 mg/kg/day divided q8h	1000 mg
MRSA	Clindamycin	30 mg/kg/day q8h	600 mg
Group A Strep	Amoxicillin	90 mg/kg/day q8h	1000 mg

Discharge Plan:

- Consider trial of oral antibiotics for younger pediatric patients
- Antibiotic Length
    - Septic arthritis 2-3 weeks (write prescription for 3 weeks)
    - Osteomyelitis 3-6 weeks (write prescription for 4 weeks)
    - Length of treatment may depend on the organism (often longer with MRSA) and severity of infection. Discuss length of treatment and follow up with ID and orthopedics.
- Follow-up
    - PCP follow-up within 2-3 days
    - ID follow-up and outpatient labs per attending recommendations – ~1 week
    - Orthopedics follow-up per attending recommendations – ~1 week

Flowchart:


Suspicion of a primary MSK Infection: Osteomyelitis or Septic Arthritis
Inclusion Criteria:
Suspected Osteomyelitis and/or Septic Arthritis for patients 6mo-18yrs.
Exclusion criteria:
infants <6 months of age, immunocompromised patients, post-operative infection, chronic infection/CRMO, infections from penetrating trauma, medically complex children, patients requiring PICU admission, non-hematogenous osteomyelitis – contiguous, sickle cell patients
ED Assessment:
Evaluate for signs and symptoms concerning for primary MSK Infection: <2 weeks duration, inability to bear weight/limited use of extremity, limp, pain, fever
• Consider Kocher Criteria for Septic Arthritis
Kocher Criteria:
• Non-weight bearing
• Temp > 38.5C/101.3F
• ESR > 40mm/hr
• WBC > 12,000cells/mm3
Probability for septic arthritis based on number of predictors. Zero predictors: < 0.2% risk, 1 predictor: 3.0%, 2 predictors: 40%, 3 predictors: 93.1%, 4 predictors: 99.6%.
Initial workup:
• Labs: Order CBC with diff, CRP, ESR, Blood culture x2
• Imaging: 2-view plane films of the involved bone/joint
• Order hip ultrasound if septic arthritis is suspected
• If clinical suspicion of SA of a joint other than the hip, recommend aspirating joint instead of performing US
LOW Clinical Suspicion of Osteomyelitis or Septic Arthritis:
• Continue routine ED workup
• Consider alternative diagnosis
**If tapping the joint: only send aspirates, not swabs: (in order of prioritization):
• Cell count + differential
• Gram stain and culture (to be placed in blood culture bottle)
• Bacterial PCR
• If unusual case or exposures, consult ID for further testing/culturing recommendation (i.e. Fungal cultures)
HIGH Suspicion of Osteomyelitis or Septic Arthritis:
• Consult Orthopedics and Infectious Disease
• Coordinate procedural sedation/analgesia if joint aspiration in the ED. If joint fluid obtained, send aspirates **
• MRI w/wo contrast if high suspicion of Osteomyelitis
• Begin Initial antibiotics per Guideline
• Ensure blood cultures were drawn prior to antibiotic administration
ED Decision to Admit to Hospital or PICU:
• Consult Hospitalist or PICU Attending
• Discuss need for MRI if not completed in ED

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3. Peltola H, Pääkkönen M, Kallio P, Kallio MJ; Osteomyelitis-Septic Arthritis (OM-SA) Study Group. Prospective, randomized trial of 10 days versus 30 days of antimicrobial treatment, including a short-term course of parenteral therapy, for childhood septic arthritis. *Clin Infect Dis*. 2009;48(9):1201–1210
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6. Yagupsky P, Porsch E, St Geme JW 3rd. Kingella kingae: an emerging pathogen in young children. Pediatrics201; 127:557–65.

- ☑ All participants in the clinical guideline development should be listed and primary author identified
- ☑ Participants who are submitting clinical guideline should sign off and include the division chief(s) from all involved specialties (for purposes of disseminating to entire division)
- ☑ All clinical guidelines should include a disclaimer ... *"this clinical guideline is intended as an evidence-based guide for clinical care and not as a replacement for clinical decision making"*
- ☑ Clinical guideline authors should submit an estimated revision schedule, i.e. every 3 years.
- ☑ References must be included in the submission
- ☑ Authors of the guideline must identify 1-2 quality metrics that can be measured to gauge impact on care

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