MUSCULOSKELETAL INFECTION PATHWAY

INPATIENT

Children's NEBRASKA

Concern for Musculoskeletal Infection (MSI)

Make NPO and place IV if needed

Inclusion Criteria:
- >6 months old

Exclusion Criteria:
- Postoperative infection or foreign bodies
- Infections from penetrating trauma
- Chronic infections (>2 weeks)
- Medically-complex children

Examples of inclusion diagnosis for pathway:
- Septic arthritis
- Osteomyelitis
- Pyomyositis

Has there been any MSI workup initiated?

No → For initial management, refer to MSI Initial Evaluation Pathway

Yes

Has US OR MRI been completed? (If neither, refer to MSI Initial Evaluation Pathway)

US → Is there an effusion?

No → Discuss case with Orthopedic Surgery to determine need for advanced imaging and/or surgical intervention → Manage off Pathway

Yes

Consult Orthopedic Surgery
Perform Joint Aspiration
Send synovial fluid for cell count, gram stain, and culture; ONLY if 6 months to <5 years, send Kingella PCR

What was synovial fluid WBC count?

< 25K →
- Manage off Pathway
- Consider discussion with Orthopedic Surgery to determine need for advanced imaging and Infectious Disease Consult

> 25K

MRI

Obtain Urgent MRI*

* Coordinate MRI time and or surgical time with Orthopedic Surgery, Radiology, and OR scheduling prior to exam being ordered

- Coordinate surgical intervention if needed*
- Begin antibiotic therapy if additional cultures are not forthcoming
- Consult Infectious Disease

- Continue post-operative care per Orthopedic Surgery (if procedure performed)
- Modify antibiotic therapy based on culture & sensitivity results (refer to table below)

While inpatient, the following labs should be obtained Q48H:
- CBC
- CRP/ESR
- Chem 8 (BMP)

Are blood cultures persistently positive?

Yes → Manage off pathway; consider evaluation for:
- Intravascular or intracardiac infection
- Infection at a distant site
- Worsening infection or abscess formation at known site

No

Is infection multifocal, involving hip joint(s), and/or caused by MRSA?

Yes →
- Prepare for PICC placement for prolonged IV antibiotic therapy
- Refer to PICC/TMC Insertion & Removal policy if needed

No

Is patient improving as expected?

No →
- Repeat labs, imaging, drainage, and/or cultures as indicated
- Consider modifying antibiotic regimen in collaboration with Infectious Disease
- Consider alternative diagnosis

Yes

Discharge patient if criteria met

Discharge Criteria:
- Clinically improving (well-appearing, weight-bearing if allowed, improved pain and range of motion)
- Tolerating oral intake
- Afebrile for at least 24 hours
- Decreasing CRP
- Bacteremia cleared (if initially present)
- Home therapy arranged:
  - Medication(s)
  - Home health (if necessary)
  - Surveillance labs
- Follow-up appointments arranged:
  - Orthopedic Surgery
  - Infectious Diseases
- Family understands illness, importance of medication adherence, and follow-up plan; family has ability to contact specialists with questions and/or concerns

MUSCULOSKELETAL INFECTION PATHWAY

INPATIENT

Intravenous Antimicrobials

	Cefazolin (First line)	Vancomycin (First line if history of MRSA or has MRSA risk factors)	Ampicillin	Ceftriaxone	Clindamycin[a]
Dosing (mg/kg/dose)	33.3 mg/kg/dose (septic joint) 50 mg/kg/dose (osteo) Q8H	15-20 mg/kg/dose Q6H	50 mg/kg/dose Q6H	75 mg/kg/day Q24H	10-13.33 mg/kg/dose Q8H
Daily maximum dosing for MSI	2,000 mg/dose Q8H *For severe cases: 2,000 mg Q6H*	2,000mg/dose Q8H *For severe cases: 2,000mg Q6H*	2,000mg Q6H	2,000mg Q24H	900 mg Q8H
Organism					
MSSA	++	+		-	+/-[a]
MRSA		++			+/-[a]
S. pyogenes (Group A strep)	+	+	+	+	+
S. pneumoniae	+	+/-	+	+	
Kingella kingae (<5yr)[b]	++		+/-	+	+/-
Labs					
Monitor for infection resolution and side effects	Q48H: CBC with diff, CRP, ESR, BUN, Creatinine Vancomycin requires monitoring, recommend AUC/MIC of 400-600mg h/L				

a. 23%of MSSA and 18%of MRSA isolates are resistant to clindamycin. Clindamycin should only be used if susceptibilities are known. If patient <5 years, clindamycin does not routinely cover *K. kingae* . Oral bioavailability for clindamycin is >90%

b. *Kingella kingae* can cause bone and joint infection in patients from 6 months to 5 years of age but is difficult to culture. PCR-based testing can increase yield for *K. kingae* identification. *K. kingae* predominantly causes septic arthritis but can also cause isolated osteomyelitis and tenosynovitis; It generally has a milder presentation than S. aureus. Unless microbial cause is known, *K. kingae* should be empirically covered in children <5 years.

Oral Antimicrobials

	Cephalexin	Clindamycin[a]	Amoxicillin
Dosing (mg/kg/dose)	33.3-50 mg/kg/dose TID	10-13.33 mg/kg/dose TID	30 mg/kg/dose TID
Daily maximum dosing for MSI	1,333 mg/dose TID	900 mg/dose TID	1,000 mg TID
Organism			
MSSA	+	+/-[a]	
MRSA		+/-[a]	
S. pyogenes (Group A strep)	+	+	+
S. pneumoniae	+	+/-	+
Kingella kingae (<5yr)[b]	+		+/-
Labs			
Monitor for infection resolution and side effects	Q48H: CBC with diff, CRP, ESR, BUN, Creatinine		

a. 23%of MSSA and 18%of MRSA isolates are resistant to clindamycin. Clindamycin should only be used if susceptibilities are known. If patient <5 years, clindamycin does not routinely cover *K. kingae* . Oral bioavailability for clindamycin is >90%

b. *Kingella kingae* can cause bone and joint infection in patients from 6 months to 5 years of age but is difficult to culture. PCR-based testing can increase yield for *K. kingae* identification. *K. kingae* predominantly causes septic arthritis but can also cause isolated osteomyelitis and tenosynovitis; It generally has a milder presentation than S. aureus. Unless microbial cause is known, *K. kingae* should be empirically covered in children <5 years.

CLINICAL EFFECTIVENESS