



Children's Mercy
KANSAS CITY

Outpatient Antimicrobial Handbook

CM Antimicrobial Stewardship Program



“Super Bottle” by Delilah, Age 8

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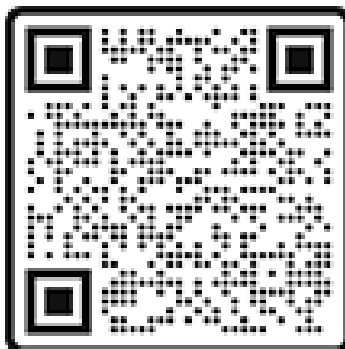
Online version of this handbook is available on the [Children's Mercy Antimicrobial Stewardship website](#).



The most updated Children's Mercy clinical pathways may be accessed on the Evidence Based Practice section of [childrensmercy.org](#). The pathways included in this handbook may not reflect the most recent edits.



The American Academy of Pediatrics' table listing common pathogens, empiric antibiotic therapy, and antibiotic duration for various infections can be access in the Redbook.



Acute Otitis Media (AOM) - Diagnosis (AAP Guideline 2013)¹

Refer to [Children’s Mercy Clinical Pathway](#) for more information on diagnosis and management.



Exclusion Criteria

- Less than 60 days of age with fever (Febrile Infant CPG)

Special Considerations:

- Anatomic abnormalities (including cleft palate)
- Genetic conditions with craniofacial abnormalities (such as Down Syndrome)
- Presence of cochlear implants
- Immune deficiencies

Criteria for diagnosis for Acute Suppurative Otitis Media (AOM)
Middle ear effusion **PLUS one** of the following:

- **Moderate/severe bulging of TM (image)**
- Mild bulging of TM and 48 hours of otalgia
- **Mild bulging of TM (image)** and intense erythema of the TM
- New onset otorrhea **NOT** caused by otitis externa

Non-Severe Symptoms

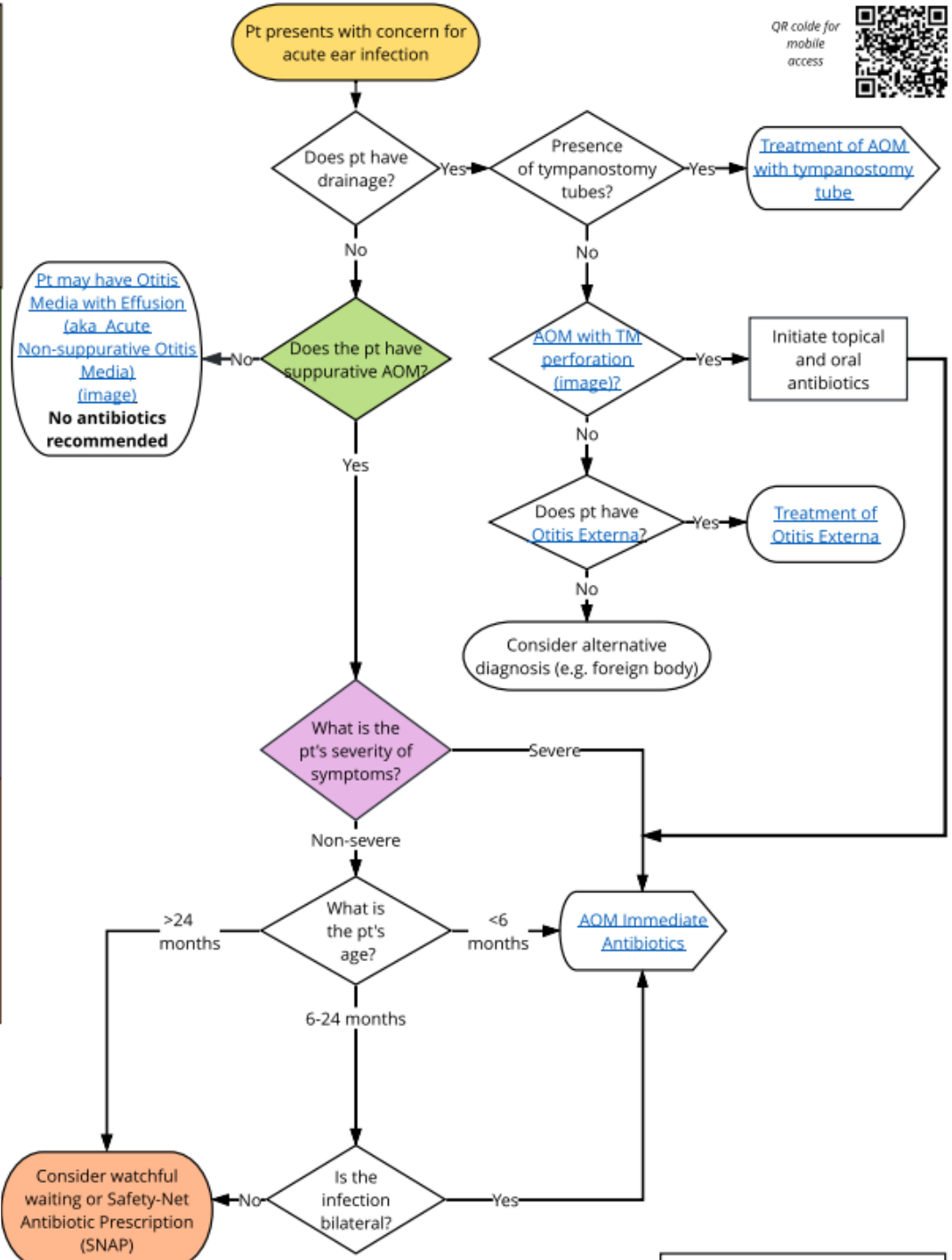
- Mild otalgia <48 hours **AND**
- Temperature < 39°C (102.2°F)

Severe Symptoms

- TM perforation
- Moderate/severe otalgia **OR**
- Otalgia ≥ 48 hours **OR**
- Temperature ≥ 39°C (102.2°F)

Watchful waiting/Safety-Net Antibiotic Prescription (SNAP)

- Joint decision between provider and caregiver
- Emphasize appropriate pain control
- Must have close follow-up (within 48-72 hours) if SNAP not given
- Must be able to fill prescription if signs/symptoms worsen or fail to improve in 48-72 hours



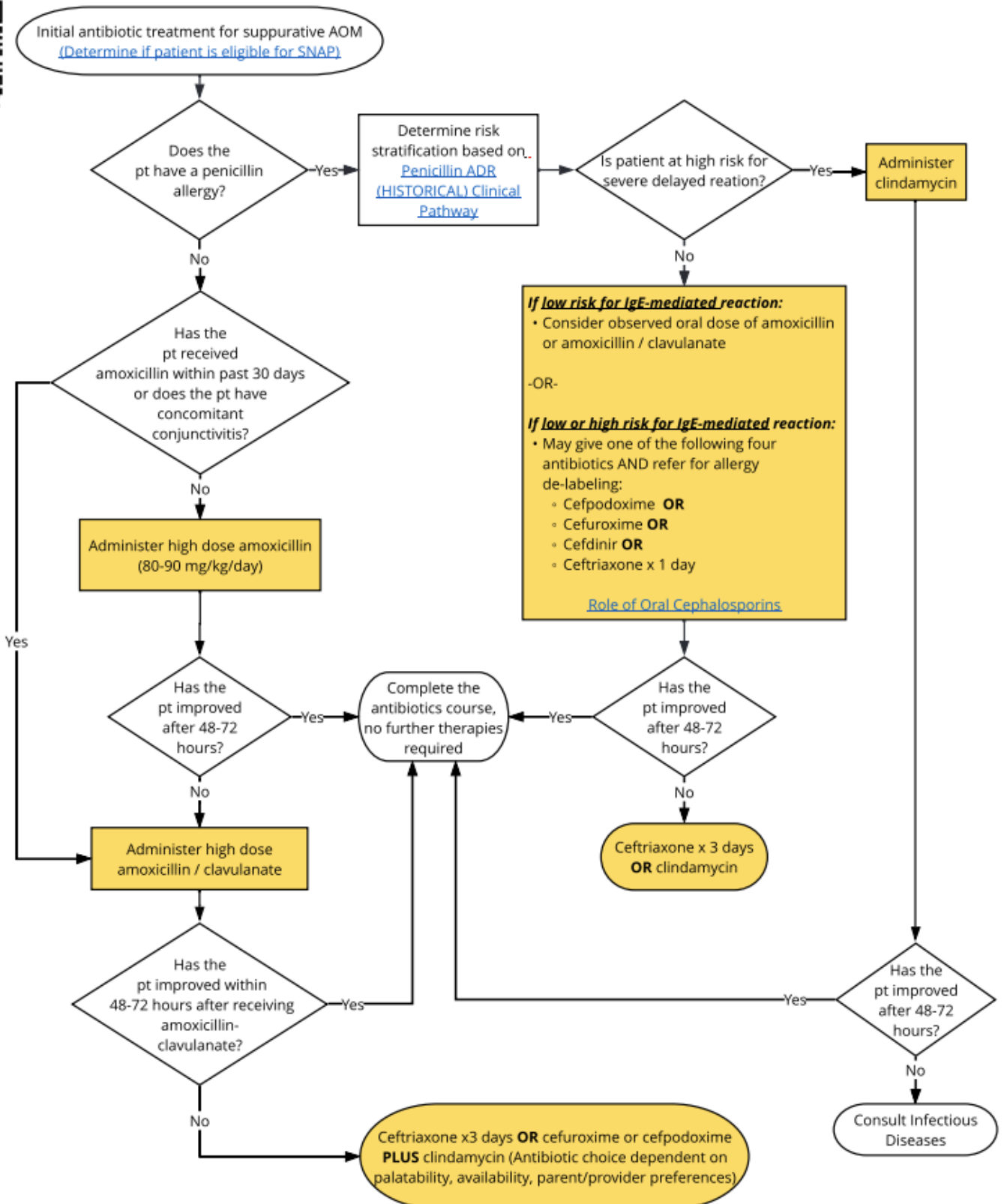
Abbreviations/Acronyms (lab, radiology excluded):
 pt = patient
 AOM = Acute Otitis Media
 TM = Tympanic membrane

Acute Otitis Media (AOM) - Treatment (AAP Guideline 2013)¹

Refer to [Children's Mercy Clinical Pathway](#) for more information on diagnosis and management.



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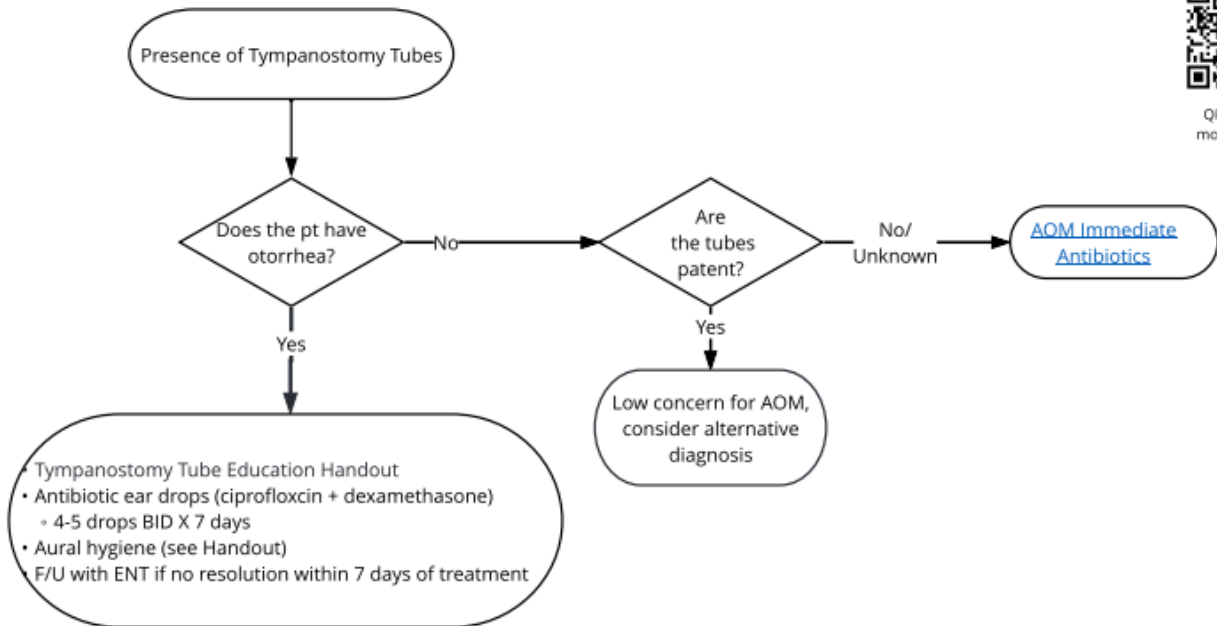


Acute Otitis Media (AOM) – Treatment (AAP Guideline 2013)¹

Refer to [Children’s Mercy Clinical Pathway](#) for more information on diagnosis and management.



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Abbreviations/Acronyms (lab, radiology excluded):

pt = patient
ENT = Ears, Nose, and Throat
BID = Twice per day

Watchful waiting (WW)/ Safety-Net Antibiotic Prescription (SNAP)

- Joint decision between prescriber and caregiver
 - Must have close follow-up within 48-72 hours if SNAP not provided
 - Must be able to fill antibiotic prescription if signs/symptoms worsen or fail to improve in 48-72 hours from onset of symptoms.
- If using WW/SNAP, please place a comment in prescription instructions to “fill only upon patient/caregiver request”

Antimicrobial Recommendations

- Antimicrobial Duration
 - Guideline recommended
 - < 2 years OR severe disease = 10 days
 - 2 – 5 years of age = 7 days
 - ≥ 6 years = 5 – 7 days
 - Recent data suggest 5 days of antibiotics is likely sufficient for children ≥ 2 years old with AOM of any severity ([El Feghaly et al. JPIDS. 2024; 13\(6\):238-333](#))

Acute Otitis Media Antimicrobial Recommendations		
Place in Therapy	Recommended Antimicrobial	Additional Considerations
Initial Treatment		
First-line	Amoxicillin 40 – 50 mg/kg/dose PO q12h (max 2000 mg/dose)	
Amoxicillin use in previous 30 days	Amoxicillin/clavulanate 40 – 50 mg/kg/dose PO q12h (max 2000 mg/dose)	Dosed on amoxicillin component. Refer to amoxicillin/clavulanate dosing guide (page 31) for which formulation to use.
Concomitant conjunctivitis		
Penicillin allergy - Low or high risk of IgE mediated reaction	Cefpodoxime 5 mg/kg/dose PO q12h (max 200 mg/dose)	For low risk of IgE mediated reaction, consider observed oral dose of amoxicillin (Refer to Penicillin Adverse Drug Reaction Section for more info) Cefuroxime is only available as tablets; do not crush. Weight based dosing is not recommended with tablets. Listed cephalosporins have no shared side chains with penicillin thus have low risk of cross-reactivity. Consider referral for penicillin allergy testing.
	Cefuroxime 250 mg PO q12h	
	Cefdinir 7 mg/kg/dose PO q12h (max 300 mg/dose)	
	Ceftriaxone 50 mg/kg IM/IV q24h x 1 dose (max 1000 mg/dose)	
Penicillin allergy - High risk for severe delayed reaction	Clindamycin 10 mg/kg/dose PO q8h (max 600 mg/dose)	Refer to Penicillin Adverse Drug Reaction Section for more info
Failure to improve after 48 – 72 hours of initial antibiotic therapy		
Receiving Amoxicillin	Amoxicillin/clavulanate 40-50 mg/kg/dose PO q12h (max 2000mg/dose)	Dosed on amoxicillin component. Refer to amoxicillin/clavulanate dosing guide (page 31) for which formulation to use
Receiving Amoxicillin-clavulanate	Ceftriaxone 50 mg/kg IM/IV q24h x 3 days (max 1000 mg/dose)	
	Clindamycin 10 mg/kg/dose PO q8h (max 600 mg/dose) PLUS one of the following: <ul style="list-style-type: none"> • Cefuroxime 250 mg PO q12h • Cefpodoxime 5 mg/kg/dose PO q12h (max 200 mg/dose) 	Cefuroxime is only available as a tablet and should not be crushed. Weight based dosing is not recommended with tablets. Monotherapy with an oral cephalosporin should NOT be used due to inferior pneumococcal coverage compared to amoxicillin or amoxicillin/clavulanate.

Otorrhea

- Topical antibiotics may be considered in the following instances:
 - AOM with perforated tympanic membrane – given with systemic antibiotics
 - AOM with presence of patent tympanostomy tubes
 - Otitis externa with intact tympanic membrane

- Recommended topical antibiotics
 - Ciprodex® (Ciprofloxacin 0.3% - Dexamethasone 0.1%) otic suspension 4 drops instilled into affected ear twice daily x 7 days
 - Only for use in patient greater than 6 months old
 - If otic suspension is on shortage or cost-prohibitive, may use ciprofloxacin ophthalmic drops (2 drops in affected ear twice daily x 7 days) instead.
 - Ofloxacin otic solution 5 drops into affected ear twice daily for 7 days
 - Only for use in patients greater than 6 months old
 - Cortisporin® otic (neomycin-polymyxin B-hydrocortisone otic) 3 drops to affected ear three times per day x 7 days
 - Only for otitis externa with intact tympanic membrane

Group A Streptococcal Pharyngitis (IDSA guidelines 2012)²

Refer to [Children's Mercy Clinical Pathway](#) for more information on diagnosis and management.



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Inclusion Criteria:

- Suspected pharyngitis caused by Group A Streptococcus (GAS, *Streptococcus pyogenes*)

Exclusion Criteria:

- [Peritonsillar Abscess Clinical Pathway](#)
- Lymphadenitis
- Viral stomatitis
- Retropharyngeal abscess
- Ludwig's angina

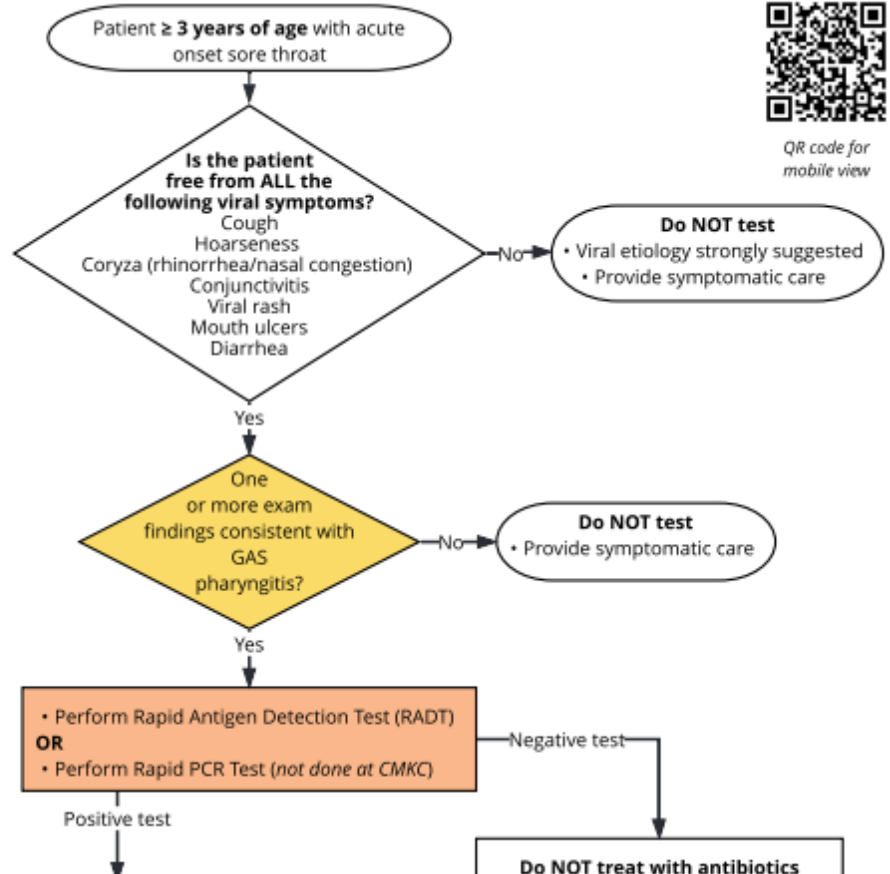
Clinical exam findings consistent with but not specific to GAS pharyngitis:

- Tonsillopharyngeal erythema
- Tender anterior cervical nodes
- Scarlatiniform rash (*specific to GAS*)
- Tonsillar exudate
- Palatal petechiae
- Swollen red uvula
- Strawberry tongue

Considerations before testing:

- In children < 3 years old, testing is not indicated unless they are symptomatic and have a household contact with positive GAS test
- GAS pharyngitis typically presents in the winter/spring
- Fever alone without sore throat makes GAS pharyngitis unlikely

Manifestations of GAS Other Than Pharyngitis



Given that complications of GAS pharyngitis are rare, the benefit of antibiotic use may not outweigh the risks of therapy in all patients.

Antibiotic Treatment		
Drug	Dose link to evidence	Duration link to evidence
Amoxicillin (Preferred)	50 mg/kg/dose PO once daily Max dose: 1 gm/day	10 days
Penicillin V Potassium (Alternative)	≤ 27 kg: 250 mg PO TID > 27 kg: 500 mg PO TID	10 days
Penicillin G Benzthine (Alternative)	≤ 27 kg: 600,000 units IM > 27 kg: 1.2 million units IM	1 dose

Alternative Treatments for Penicillin Allergy

1. Determine risk stratification based on the [Penicillin ADR \(HISTORICAL\) Clinical Pathway](#).
2. Consider observed oral dose of amoxicillin for patients at low risk for IgE-mediated reaction

<i>If low risk for IgE-mediated reaction to penicillin: Cephalexin*</i>	25 mg/kg/dose PO BID Maximum: 500 mg/dose	10 days
<i>If high risk for IgE-mediated reaction or severe delayed reaction to penicillin: Clindamycin**</i>	10 mg/kg/dose PO TID Maximum: 300 mg/dose	10 days
<i>If high risk for IgE-mediated reaction or severe delayed reaction to penicillin: Azithromycin**</i>	12 mg/kg/dose PO once daily Maximum: 500 mg/dose	5 days

*Consider referral for antibiotic de-labeling assessment

**Resistance is high and may lead to treatment failure

Therapies NOT recommended:

- Aspirin
- Glucocorticoids
- Fluoroquinolones
 - Levofloxacin, ciprofloxacin, moxifloxacin
- Tetracyclines
 - Minocycline, doxycycline, tetracycline
- Sulfa drugs
 - Sulfamethoxazole/trimethoprim
- 2nd and 3rd generation cephalosporins
 - Cefuroxime, cefdinir, ceftriaxone
- Macrolides (unless severe allergy to penicillin and cephalosporin)

Group A Streptococcal Pharyngitis (IDSA guidelines 2012)²

Refer to [Children’s Mercy Clinical Pathway](#) for more information on diagnosis and management.

Streptococcal pharyngitis is uncommon in children less than 3 years old and children of any age with viral symptoms, thus testing is not routinely recommended. Recurrence is often secondary to re-exposure, poor adherence, or an alternative diagnosis rather than failure of initial antibiotic.

Group A Streptococcal Pharyngitis Antimicrobial Recommendations			
Place in Therapy	Recommended Antimicrobial	Duration	Additional Considerations
First-line	Amoxicillin 50 mg/kg/dose PO q24h (max 1000 mg/dose)	10 days	
	Penicillin VK <ul style="list-style-type: none"> • < 27 kg: 250 mg PO q8 -12h • ≥ 27 kg: 500 mg PO q8 – 12h 	10 days	
	Penicillin G benzathine <ul style="list-style-type: none"> • < 27 kg: 600,000 units IM • ≥ 27 kg: 1,200,000 units IM 	One time only	In the setting of a national shortage, this should be reserved for other indications with limited alternatives (e.g. syphilis).
Penicillin allergy - <u>Low risk for IgE-mediated</u> reaction	Cephalexin 25 mg/kg/dose PO q12h (max 500 mg/dose)	10 days	Consider observed oral dose of amoxicillin (Refer to Penicillin Adverse Drug Reaction Section for more info) Consider referral for penicillin allergy testing.
Penicillin allergy – <u>high risk for IgE-mediated</u> reaction or <u>severe delayed</u> reaction	Clindamycin 7 mg/kg/dose PO q8h (max 300 mg/dose)	10 days	Azithromycin and clindamycin resistance is known to exist, and treatment failure may occur. May consider a cephalosporins with different side chains in select cases. Refer to Penicillin Adverse Drug Reaction Section for more information.
	Azithromycin 12 mg/kg/dose PO q24h (max 500 mg/dose)	5 days	

Community-Acquired Pneumonia (IDSA guidelines 2011)³

Refer to the [Children’s Mercy Clinical Pathway](#) for more information on diagnosis and management.



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Exclusion criteria:

- Patients < 2 months of age
- Immunocompromised pts
- Patients receiving home mechanical ventilation
- Patients with underlying lung disease (e.g., cystic fibrosis), immunodeficiency, technology dependence, or other chronic conditions that may impact antibiotic selection

Imaging

- Chest X-ray is not routinely recommended for uncomplicated pneumonia.
- Consider chest X-ray in cases of diagnostic uncertainty, documented hypoxemia and respiratory distress, or failed initial antibiotic therapy to assess for complications of pneumonia

Labs

- Blood cultures may be obtained for hospitalized pts meeting the following criteria:
 - < 6 months of age with fever
 - Not fully immunized
 - Central venous catheter
 - Admission to ICU
 - Effusion or empyema on chest radiograph
- Additional labs, including CBC and inflammatory markers, are not routinely recommended for pts with uncomplicated CAP

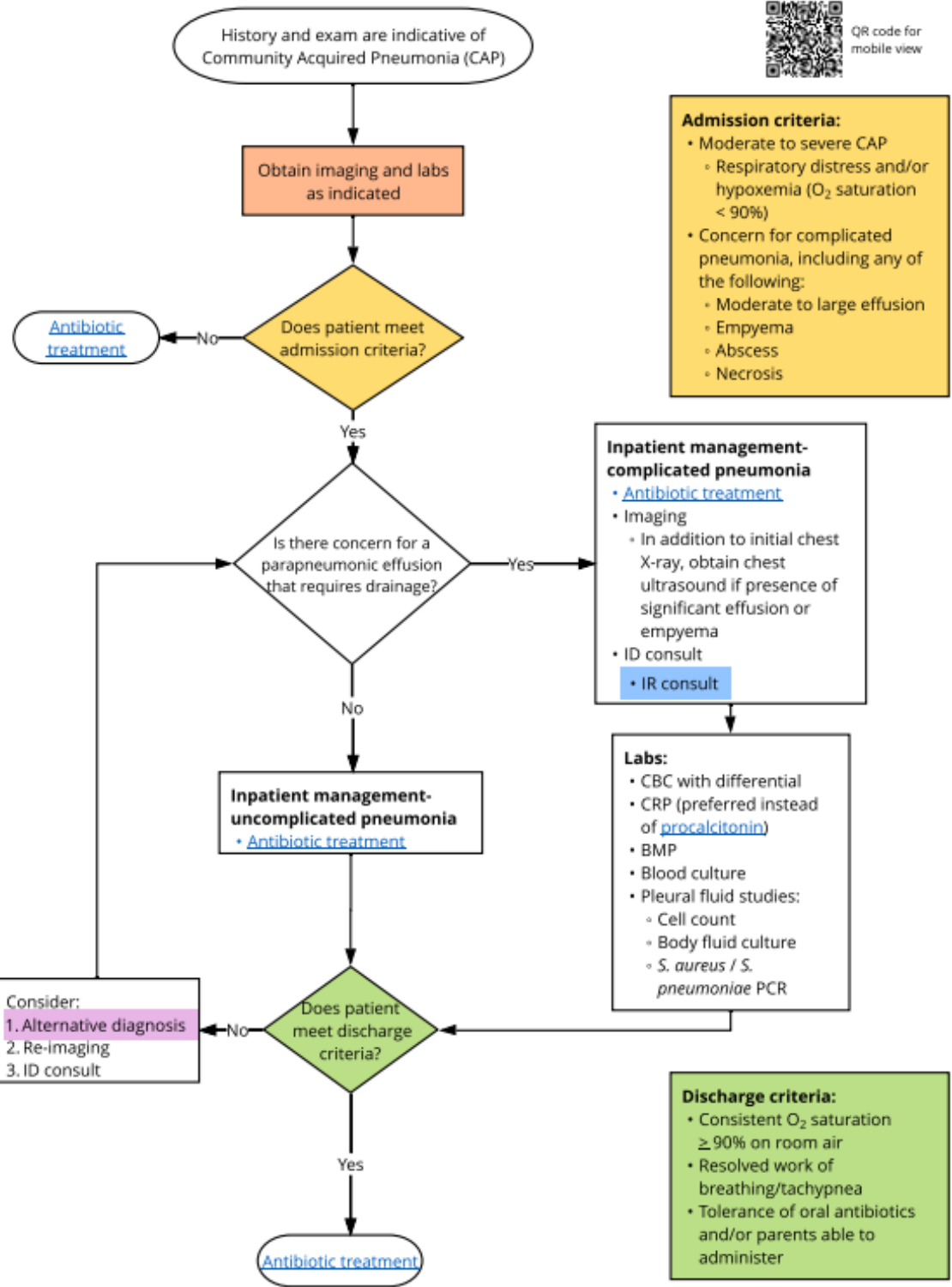
IR

- Consult IR for moderate to large parapneumonic effusions or empyema

Alternative diagnoses:

- Foreign body aspiration
- Aspiration pneumonia
- Tuberculosis or histoplasmosis*
- Other uncommon infections of the lungs*
- Tumor
- Anatomic malformation

**ID consult recommended*



Admission criteria:

- Moderate to severe CAP
 - Respiratory distress and/or hypoxemia (O₂ saturation < 90%)
- Concern for complicated pneumonia, including any of the following:
 - Moderate to large effusion
 - Empyema
 - Abscess
 - Necrosis

Inpatient management-complicated pneumonia

- [Antibiotic treatment](#)
- Imaging
 - In addition to initial chest X-ray, obtain chest ultrasound if presence of significant effusion or empyema
- ID consult
- [IR consult](#)

Labs:

- CBC with differential
- CRP (preferred instead of [procalcitonin](#))
- BMP
- Blood culture
- Pleural fluid studies:
 - Cell count
 - Body fluid culture
 - *S. aureus* / *S. pneumoniae* PCR

Consider:

1. Alternative diagnosis
2. Re-imaging
3. ID consult

Discharge criteria:

- Consistent O₂ saturation ≥ 90% on room air
- Resolved work of breathing/tachypnea
- Tolerance of oral antibiotics and/or parents able to administer

Abbreviations (laboratory & radiology excluded):

IR = Interventional Radiology
ID = Infectious Diseases

Community-Acquired Pneumonia (IDSA guidelines 2011)³

Refer to the [Children’s Mercy Clinical Pathway](#) for more information on diagnosis and management.

- Duration of antimicrobial therapy: 3 – 5 days

Community Acquired Pneumonia Antimicrobial Recommendations		
Place in Therapy	Recommended Antimicrobial	Additional Considerations
First-line	Amoxicillin <ul style="list-style-type: none"> • 40 – 50 mg/kg/dose PO q12h (max 2000 mg/dose) • 30 mg/kg/dose PO q8h (max 1000 mg/dose) 	Dosing every 8 hours may be preferred for patients > 25 kg. Amoxicillin/clavulanate is <u>not</u> a first-line agent as it has <u>no</u> additional coverage of <i>Streptococcus pneumoniae</i> .
Penicillin allergy – low or high risk for IgE mediated reaction	For low risk of IgE mediated reaction, consider observed oral dose of amoxicillin and continuing therapy if tolerated.	Refer to Penicillin Adverse Drug Reaction Section for more info Consider referral for penicillin allergy testing.
	Cefuroxime 250 – 500 mg PO q12h	Cefuroxime is only available as tablets and should not be crushed. Weight based dosing is not recommended for tabs.
	Cefpodoxime 5 mg/kg/dose PO q12h (max 200 mg/dose)	Cefdinir is less effective against <i>Streptococcus pneumoniae</i> and NOT recommended for empiric treatment of pneumonia.
Penicillin allergy – high risk for severe delayed reaction	Clindamycin 10 mg/kg/dose PO q8h (max 600 mg/dose)	May also be considered for patients with low or high risk for IgE mediated reaction to penicillin.
Atypical coverage	Azithromycin <ul style="list-style-type: none"> • Day 1: 10 mg/kg/dose PO q24h (max 500 mg/dose) • Day 2-5: 5 mg/kg/dose PO q24h (max 250 mg/dose) 	Azithromycin monotherapy is not recommended as resistance is common among typical bacterial pathogens (e.g. <i>S. pneumoniae</i>).
	Doxycycline 2.2 mg/kg/dose PO q12h (max 100 mg/dose)	
	Levofloxacin <ul style="list-style-type: none"> • < 5 years old: 8 – 10 mg/kg/dose PO q12h • ≥ 5 years old: 8 – 10 mg/kg/dose PO q24h (max 750 mg/dose) 	Alternative for monotherapy in patients with severe beta-lactam allergy unable to tolerate clindamycin.

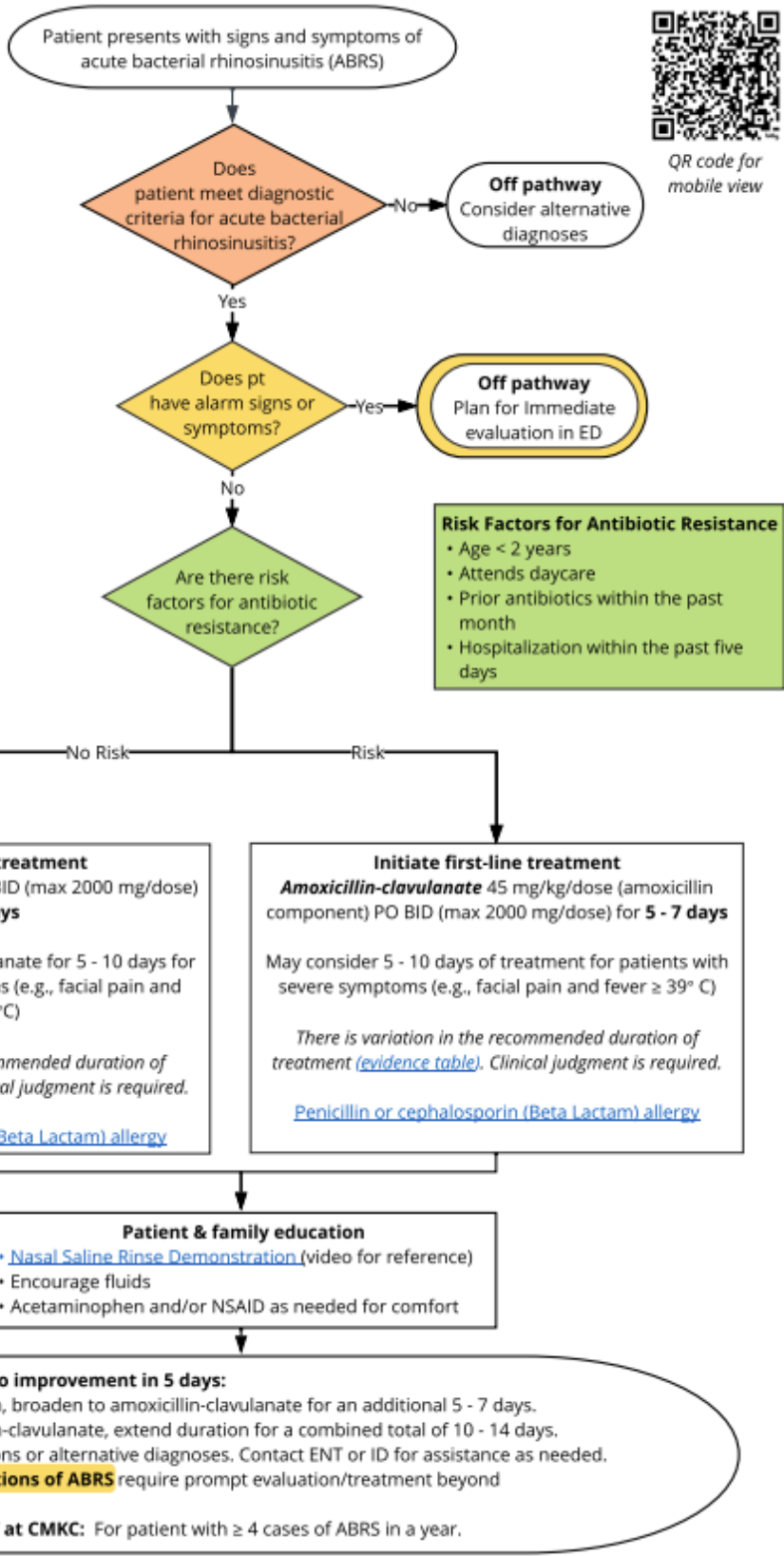
Acute Bacterial Rhinosinusitis (ABRS) (AAP Guidelines 2013)⁴

Refer to the [Children’s Mercy Clinical Pathway](#) for more information on diagnosis and management.



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<p>Inclusion criteria:</p> <ul style="list-style-type: none"> • Patient 1 - 18 years of age
<p>Exclusion criteria:</p> <ul style="list-style-type: none"> • Complicated sinusitis at presentation • Chronic sinusitis (90 or more uninterrupted days of respiratory symptoms, such as cough, nasal discharge, or nasal obstruction) • Viral sinusitis • Immunocompromised
<p>Diagnostic Criteria</p> <ul style="list-style-type: none"> • Persistent illness: Nasal discharge, daytime cough or both lasting ≥ 10 days without improvement <p>OR</p> <ul style="list-style-type: none"> • Worsening course: Worsening nasal discharge, daytime cough or fever after initial improvement <p>OR</p> <ul style="list-style-type: none"> • Severe onset: Fever $\geq 39^{\circ}$ C AND purulent nasal discharge for at least 3 days
<p>Alarm Signs & Symptoms for Complications of ABRS</p> <ul style="list-style-type: none"> • Periorbital edema/erythema • Displaced globe • Double vision • Ophthalmoplegia • Reduced visual acuity • Severe headache • Frontal swelling • Signs of sepsis • Signs of meningitis • Neurological signs <p>IMMEDIATE EVALUATION IN ED</p>



Acute Bacterial Rhinosinusitis (ABRS) (AAP Guidelines 2013)⁴

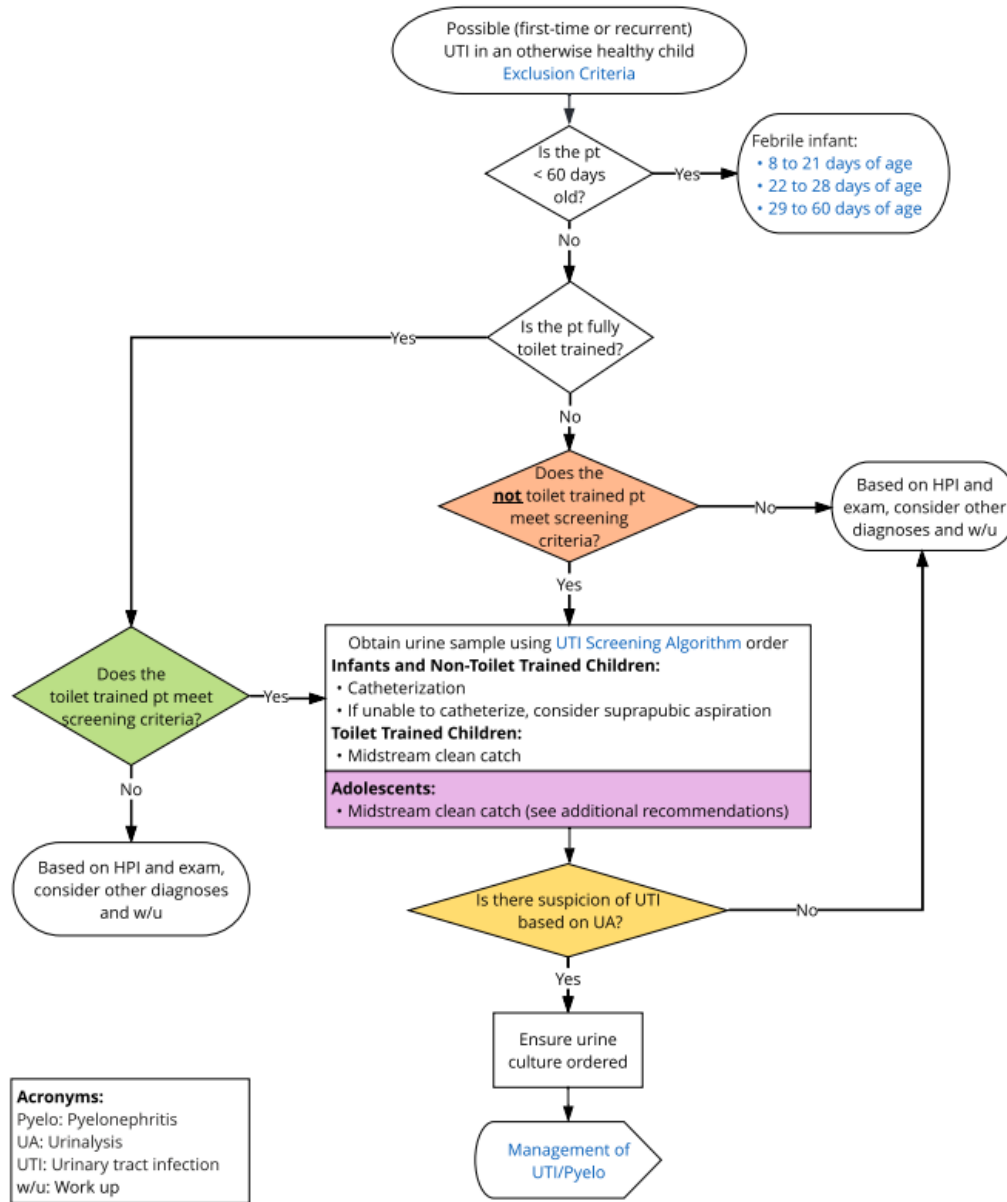
Refer to the [Children’s Mercy Clinical Pathway](#) for more information on diagnosis and management.

- Antimicrobial Duration: 5 – 7 days
 - May consider 5 – 10 days if severe symptoms (e.g. facial pain and fever $\geq 39^{\circ}\text{C}$)

Acute Bacterial Rhinosinusitis Antimicrobial Recommendations		
Place in Therapy	Recommended Antimicrobial	Additional Considerations
First-line	Amoxicillin 45 mg/kg/dose PO q12h (max 2000 mg/dose)	Preferred if < 2 years old, attends daycare, prior antibiotics within previous 30 days, hospitalization within previous 5 days, or severe symptoms. Dosed on amoxicillin component. Refer to amoxicillin/clavulanate dosing guide (page 31) for which formulation to use.
	Amoxicillin-clavulanate 45 mg/kg/dose PO q12h (max 2000 mg/dose)	
Penicillin Allergy – Low or High risk for IgE-mediated reaction	Cefpodoxime 5 mg/kg/dose PO q12h (max 200 mg/dose)	For low risk of IgE mediated reaction, consider observed oral dose of amoxicillin. Refer to Penicillin Adverse Drug Reaction Section for more info Risk of penicillin/ cephalosporin cross-reactivity is low. Consider referral for penicillin allergy testing.
	Cefuroxime 250 mg PO q12h	
	Cefixime 4 mg/kg/dose PO q12h (max 200 mg/dose) PLUS Clindamycin 10 mg/kg/dose PO q8h (max 600 mg/dose)	
Cephalosporin Allergy – Low risk for IgE-mediated reaction	Amoxicillin OR amoxicillin-clavulanate	Penicillin can be given without testing or additional precautions Refer to first-line section for dosing and selection guidance.
Penicillin Allergy – High risk for severe delayed reaction OR Cephalosporin allergy – High risk for IgE-mediated or severe delayed reaction	Levofloxacin <ul style="list-style-type: none"> • < 5 years old: 8 – 10 mg/kg/dose PO q12h • ≥ 5 years old: 8 – 10 mg/kg/dose PO q24h (max 750 mg/dose) 	Avoid cephalosporins unless testing/challenge is completed and determined to be safe. Consider consulting Infectious Diseases physician

Urinary Tract Infections – Diagnosis

Refer to the [Children’s Mercy Clinical Pathway](#) for more information on diagnosis and management.



Acronyms:
 Pyelo: Pyelonephritis
 UA: Urinalysis
 UTI: Urinary tract infection
 w/u: Work up

Screening Criteria: Pts. Not Toilet Trained	
Female Risk Factors <ul style="list-style-type: none"> Temp ≥ 39°C Fever ≥ 2 days No alternative source ≤ 12 months of age If 2 factors present: <ul style="list-style-type: none"> Consider screening If 3 or more factors present <ul style="list-style-type: none"> Recommend screening 	Male Risk Factors <ul style="list-style-type: none"> Temp ≥ 39°C Fever ≥ 2 days No alternative source ≤ 6 months of age If 1 factor present: <ul style="list-style-type: none"> If uncircumcised, consider screening If 2 factors present: <ul style="list-style-type: none"> If circumcised, consider screening If uncircumcised, recommend screening If 3 or more factors present <ul style="list-style-type: none"> If circumcised, recommend screening
Screening Criteria: Pts that are fully Toilet Trained with ANY of the following:	
<ul style="list-style-type: none"> Referable urinary tract symptoms <ul style="list-style-type: none"> Urinary frequency or urgency Dysuria Nausea/vomiting Urinary incontinence Abdominal/flank pain Hematuria Fever ≥ 2 days without a source in pts with prior UTI history Fever ≥ 5 days without a source 	
Additional Recommendations for Adolescents	
<ul style="list-style-type: none"> Collect 'dirty' urine (not a clean catch specimen) for Gonococcus (GC) / Chlamydia (Chl) screening <ul style="list-style-type: none"> If GC/Chl positive: Recommend Syphilis Screen HSV testing: Culture visible lesions, or cervical culture as indicated Recommend HIV testing For females: Consider pregnancy testing 	
Suspected UTI or Pyelonephritis	
<ul style="list-style-type: none"> Clinical signs and symptoms AND Urinalysis positive for: <ul style="list-style-type: none"> WBC ≥ 5 per HPF, OR Positive leukocyte esterase, OR Positive nitrite (link to evidence) 	

[Antibiogram link](#)

[Renal Imaging for UTI/Pyelo Algorithm](#)



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Urinary Tract Infections – Management

Refer to the [Children’s Mercy Clinical Pathway](#) for more information on diagnosis and management.

UTI Diagnostic Criteria:

- Urinalysis with >5 WBC per HPF **OR** + leukocyte esterase **OR** + nitrite [\(link to evidence\)](#)
- AND**
- Urine culture results, if resultd. Growth of a uropathgen:
 - Clean catch: ≥100,000 cfu/ml
 - Cath specimen: ≥50,000 cfu/ml [\(new data suggests 10,000 may be appropriate\)](#)

Admission Criteria

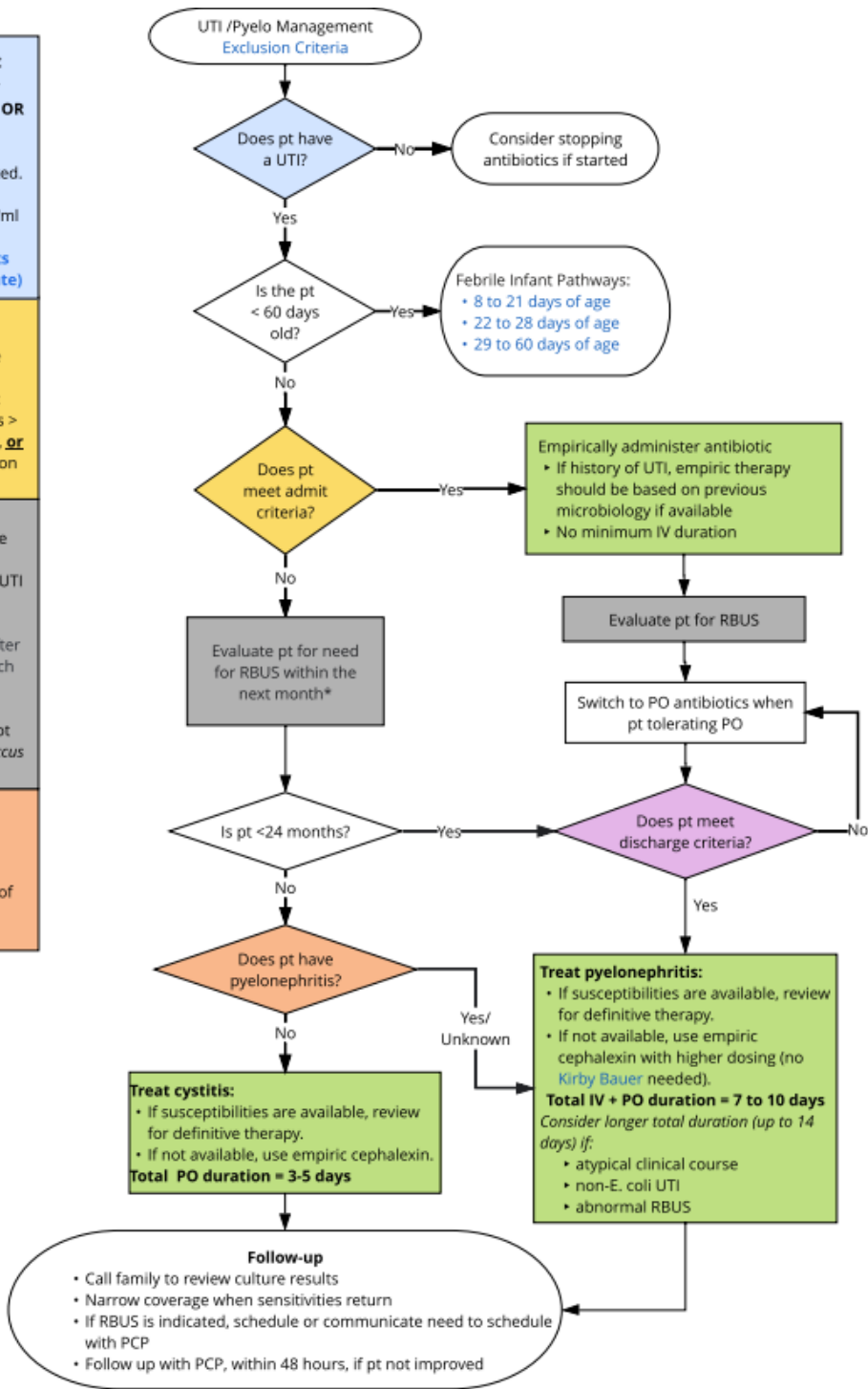
- Requiring IV fluids
- Outpatient follow up cannot be arranged
- Failed outpt therapy defined by:
 - Persistent clinical symptoms > 48h on appropriate therapy, **or**
 - Inability to maintain hydration status

RBUS Indications

- ≤ 24 months of age with febrile UTI
- Recurrent (more than 1) febrile UTI
- Male with febrile UTI
- *Concern for renal abscess:
 - if no clinical improvement after 48 hours of antibiotic to which the organism is susceptible obtain RBUS within 24
- UTI due to atypical organism (not *E.coli*, *Klebsiella spp.*, or *Enterococcus spp.*)

Pyelonephritis

- CVA tenderness
- Vomiting
- Fever ≥ 39 C
- If RBUS performed, evidence of pyelo



• Diagnosing UTI/Pyelo Algorithm
 • Renal Imaging for UTI/Pyelo Algorithm

Antibiogram link

Empiric Therapy

Pyelonephritis or unknown:

Oral:
Cephalexin (high dose) 75 to 100 mg/kg/day divided q8h (max: 1000 mg/dose)

IV:
Cefazolin (high dose) 100 mg/kg/day divided q8h (max: 6g/day)

IM:
Ceftriaxone 50 mg/kg/dose IM q24h (max: 2000 mg/dose)

Cystitis:

Oral:
Cephalexin 25 - 50 mg/kg/day divided q8h (max: 500 mg/dose)

For severe cephalosporin allergy
 For severe penicillin allergy

Discharge Criteria

- Clinical response to therapy (i.e. tolerating PO)
- Modifyable risk factors for UTI (e.g. voiding dysfunction) addressed
- Family education provided
- If indicated, RBUS completed or scheduled

Acronyms:

CVA: Costovertebral angle
 Pyelo: Pyelonephritis
 RBUS: Renal bladder ultrasound
 UTI: Urinary tract infection
 w/u: Work up



QR Code for mobile access

Uncomplicated Urinary Tract Infections (e.g. cystitis) in Children > 2 years old

Refer to the [Children’s Mercy Clinical Pathway](#) for more information on diagnosis and management.

General Considerations

- If history of UTIs, empiric therapy should be based on previous microbiology results, if available.
- Cefdinir has lower urinary excretion in children than adults, thus is not recommended using for pediatric UTIs unless can confirm the isolated pathogen is susceptible to cefdinir.

Antimicrobial Recommendations

- Antimicrobial Duration: 3 – 5 days

Uncomplicated Urinary Tract Infections (e.g. cystitis) Antimicrobial Recommendations		
Place in Therapy	Recommended Antimicrobial	Additional Considerations
First-line	Cephalexin 17 mg/kg/dose PO q8h (max 500 mg/dose)	Cephalexin can be used in patients with penicillin allergies at a low risk for IgE mediated reactions . Refer to Penicillin Adverse Drug Reaction Section for more info.
Penicillin allergy - high risk for IgE-mediated reaction	Cefixime 8 mg/kg/dose PO q24h (max 400 mg/dose)	
Cephalosporin allergy OR penicillin allergy – high risk for severe delayed reaction	Trimethoprim/sulfamethoxazole 3 – 6 mg/kg/dose PO BID (max 160 mg/dose)	Dosed based on trimethoprim component. At Children’s Mercy, there are increasing rates of <i>E coli</i> resistance to TMP/SMX.
	Nitrofurantoin <ul style="list-style-type: none"> • Macrocrystals (Macrochantin or Furdantin) <ul style="list-style-type: none"> ○ 1.25 – 1.75 mg/kg/dose PO q6h (max 100 mg/dose) • Macrocrystal/monohydrate (Macrobid) <ul style="list-style-type: none"> ○ 100 mg PO q12h 	Only use for cystitis alone Use with caution in patients with significant renal dysfunction. Macrocrystal/monohydrate (Macrobid) should only be used in adolescents or adults.

Pyelonephritis/Febrile UTI in Children ≥ 2 months old (AAP Guideline 2011)⁵

Refer to the [Children’s Mercy Clinical Pathway](#) for more information on diagnosis and management.

General Considerations

- If history of UTIs, empiric therapy should be based on previous microbiology results, if available.
- Cefdinir has lower urinary excretion in children than adults, thus is not recommended using for pediatric UTIs unless can confirm the isolated pathogen is susceptible to cefdinir.
- Evaluate need for admission; General indications for admission include age < 2 months, ill appearance, poor intake, unable to tolerate oral antibiotic, vomiting, immune compromise, urinary tract obstruction and/or culture-positivity for bacteria known to be resistant to oral antibiotics

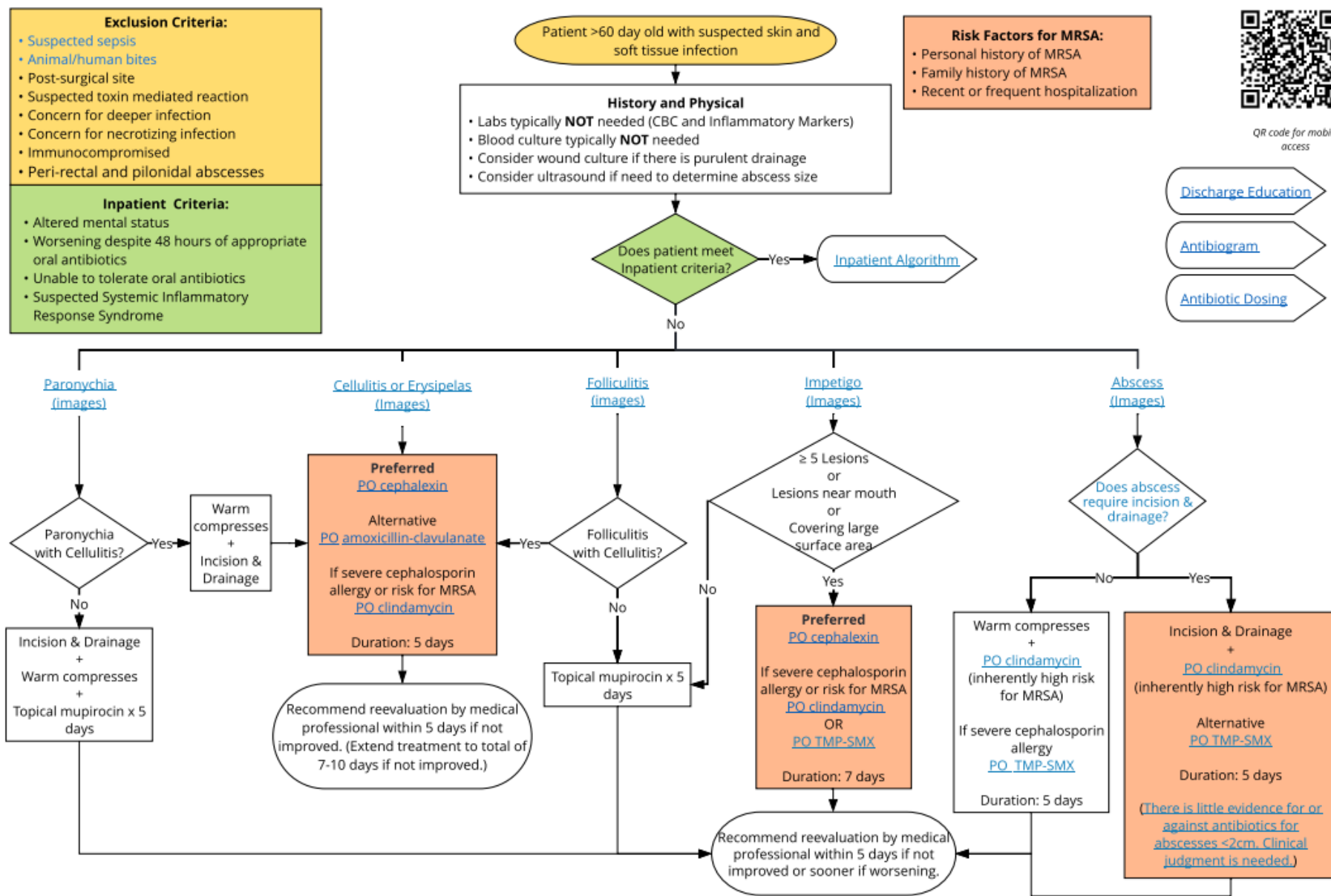
Antimicrobial Recommendations

- Antimicrobial Duration: 7 - 10 days
 - Shorter duration of 5 days is likely sufficient based on recent data for patients > 2 months old who rapidly respond to therapy
 - [Zaoutis et al. JAMA Pediatr. 2023 Aug 1;177\(8\):782-789](#)
 - [Montini et al. Pediatrics. 2024 Jan 1;153\(1\):e2023062598](#)

Pyelonephritis/Febrile UTI Antimicrobial Recommendations		
Place in Therapy	Recommended Antimicrobial	Additional Considerations
First-line	Cephalexin 25 - 33 mg/kg/dose PO q8h (max 1000 mg/dose)	Cephalexin can be used in patients with penicillin allergies at a low risk for IgE mediated reactions . Refer to Penicillin Adverse Drug Reaction Section for more info.
Penicillin allergy - <u>High risk for IgE-mediated</u> reaction	Cefixime 8 mg/kg/dose PO q24h (max 400 mg/dose)	
Cephalosporin allergy OR penicillin allergy – high risk for severe delayed reaction	Trimethoprim/sulfamethoxazole 3 – 6 mg/kg/dose PO BID (max 160 mg/dose)	Dosed based on trimethoprim component. At Children’s Mercy, there are increasing rates of <i>E coli</i> resistance to TMP/SMX.
	Ciprofloxacin 10 - 20 mg/kg/dose PO q12h (max 750 mg/dose)	

Skin and Soft Tissue Infections (IDSA Guidelines 2014)⁶

Refer to the [Children's Mercy Clinical Pathway](#) for more information on diagnosis and management



Skin and Soft Tissue Infections (IDSA Guidelines 2014)⁶

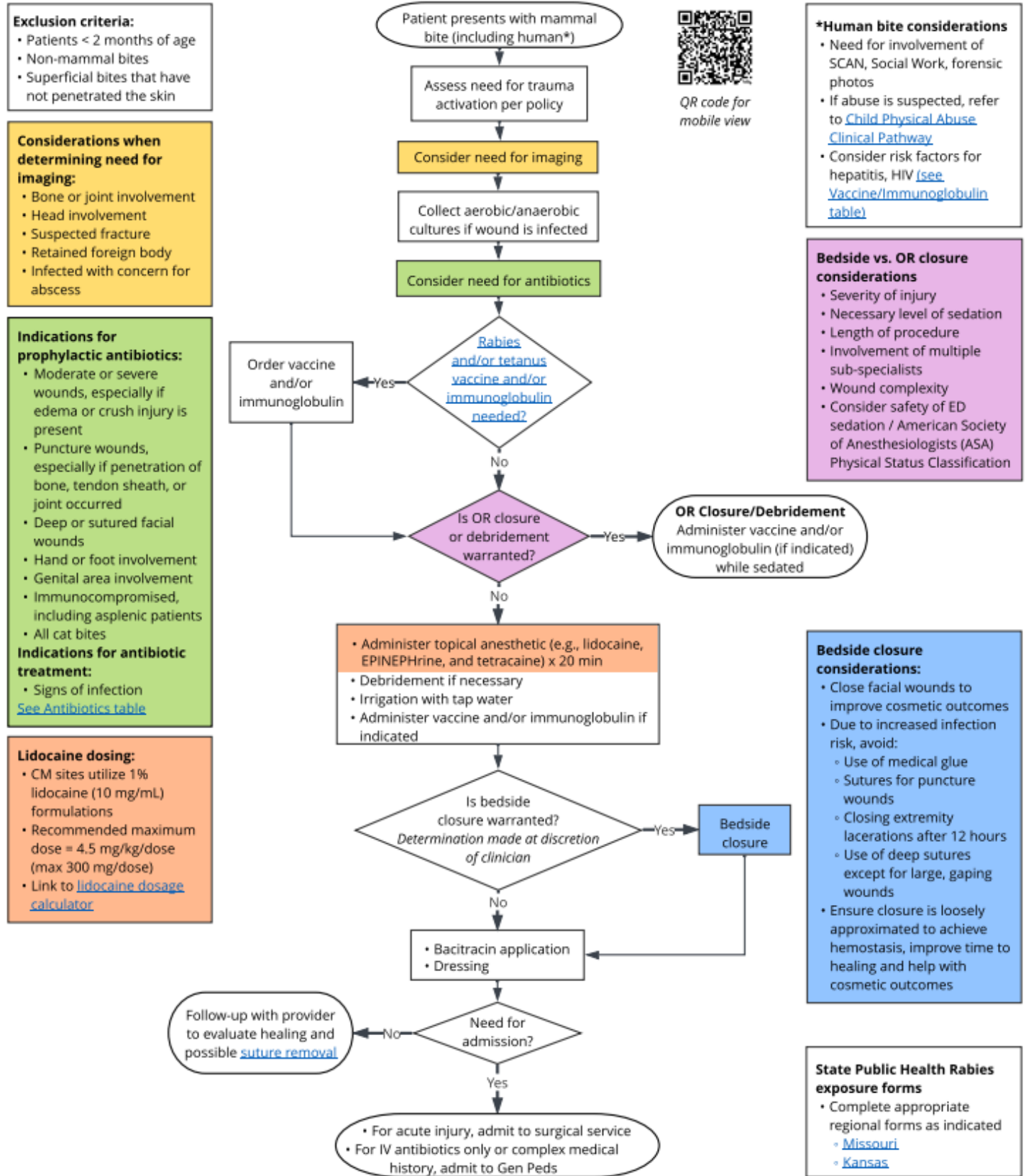
Refer to the [Children’s Mercy Clinical Pathway](#) for more information on diagnosis and management

Skin and Soft Tissue Infections Antimicrobial Recommendations		
Place in Therapy	Recommended Treatment	Additional Considerations
Paronychia		
First-line	Incision and drainage + warm compresses PLUS Topical mupirocin three times daily x 5 days	If concurrent cellulitis, refer to cellulitis or erysipelas management
Folliculitis		
First-line	Topical mupirocin x 5 days	If concurrent cellulitis, refer to cellulitis or erysipelas management
Mild Impetigo		
First-line	Topical mupirocin x 5 days	
Extensive Impetigo (i.e. ≥ 5 lesions, covering large areas of the body, or near the mouth)		
First-line	Cephalexin 17 mg/kg/dose PO q8h x 7 days (max 500 mg/dose)	Cephalexin can be used in patients with penicillin allergies at a low risk for IgE mediated reactions . Refer to Penicillin Adverse Drug Reaction Section for more info.
MRSA Risk Factor OR Penicillin allergy – high risk for IgE-mediated reaction or high-risk for severe delayed reaction	Clindamycin 10 mg/kg/dose PO q8h x 7 days (max 450 mg/dose)	
	Trimethoprim-sulfamethoxazole 4 – 6 mg/kg/dose PO q12h x 7 days (max 160 mg/dose)	Dosed on trimethoprim component. Controversial coverage of <i>S. pyogenes</i> .
Cellulitis or Erysipelas		
First-line	Cephalexin 17 mg/kg/dose PO q8h x 5 days (max 500 mg/dose)	Cephalexin can be used in patients with penicillin allergies at a low risk for IgE mediated reactions . Refer to Penicillin Adverse Drug Reaction Section for more info..
Alternative	Amoxicillin-clavulanate 22.5 mg/kg/dose PO q12h x 5 days (max 875 mg/dose)	Dosed on amoxicillin component. Refer to amoxicillin/clavulanate dosing guide (page 31) for which formulation to use.
MRSA Risk Factor OR Penicillin allergy – high risk for IgE-mediated reaction or high-risk for severe delayed reaction	Clindamycin 10 mg/kg/dose PO q8h x 5 days (max 450 mg/dose)	Clindamycin resistance for <i>S. aureus</i> and <i>S. pyogenes</i> has been increasing. Consider selecting an alternative if patient has a history of clindamycin-resistant <i>S. aureus</i> or changing to a narrow spectrum antibiotic if culture results show MSSA or <i>S. pyogenes</i> .

Skin and Soft Tissue Infections Antimicrobial Recommendations (continued)		
Place in Therapy	Recommended Treatment	Additional Considerations
Abscess		
General considerations	Incision and drainage with culture recommended for abscesses. Systemic antibiotics may not be needed for abscesses < 2 cm when incision and drainage is performed.	
First line	Clindamycin 10 mg/kg/dose PO q8h x 5 days (max 450 mg/dose)	Clindamycin resistance for <i>S. aureus</i> and <i>S. pyogenes</i> has been increasing. Consider selecting an alternative if patient has a history of clindamycin-resistant <i>S. aureus</i> or changing to a narrow spectrum antibiotic if culture results show MSSA or <i>S. pyogenes</i> .
	Trimethoprim-sulfamethoxazole 4 – 6 mg/kg/dose PO q12h x 5 days (max 160 mg/dose)	Dosed on trimethoprim component.
Periorbital Cellulitis		
General Consideration	Due to difference in management of orbital cellulitis/post-septal infections, consider more extensive work-up to assess for orbital cellulitis in patients with any of the following: proptosis, decreased visual acuity, painful/tender and/or restricted eye movement, severe persistent headache or lethargy or fever, < 1 year old, or unable to perform adequate eye exam	
First Line with no MRSA concern	Cephalexin 17 mg/kg/dose PO q8h x 5 – 7 days (max 500 mg/dose)	
	Amoxicillin-clavulanate 22.5 mg/kg/dose PO q12h x 5-7 days (max 875 mg/dose)	Dosed on amoxicillin component. Refer to amoxicillin/clavulanate dosing guide (page 31).
Penicillin Allergy – Low or High risk for IgE-mediated reaction	Cefuroxime 250 – 500 mg PO q12h x 5-7 days	For low risk of IgE-mediated reaction, consider observed oral dose of amoxicillin or cephalexin. Refer to Penicillin Adverse Drug Reaction Section for more info
	Cefpodoxime 5 mg/kg/dose PO q12h x 5 -7 days (max 400 mg/dose)	
MRSA Risk Factor OR Cephalosporin Allergy OR Penicillin allergy – high risk for IgE-mediated reaction or high-risk for severe delayed reaction	Clindamycin 10 mg/kg/dose PO q8h x 5 – 7 days (max 450 mg/dose)	Refer to Penicillin Adverse Drug Reaction Section for more info

Animal Bites (Mammal)

Refer to the [Children's Mercy Clinical Pathway](#) for more information on diagnosis and management



Animal Bites (Mammal)

Refer to the [Children’s Mercy Clinical Pathway](#) for more information on diagnosis and management

General Considerations

- Evaluate patient for need of tetanus vaccine and rabies immunoglobulin/vaccine (discussion with infectious diseases)

Antimicrobial Recommendations

- Antimicrobial Duration
 - Prophylaxis = 3 days
 - Recommended for moderate to severe wounds with edema or crush injury, puncture wounds, or facial bite wounds
 - Treatment of infected wound = 5 – 7 days

Animal Bites (Mammal) Antimicrobial Recommendations		
Place in Therapy	Recommended Antimicrobial	Additional Considerations
First-line	Amoxicillin-clavulanate 22.5 mg/kg/dose PO q12h (max 875 mg/dose)	Dosed on amoxicillin component. Refer to amoxicillin/clavulanate dosing guide (page 31) for which formulation. May consider high dose (80 – 100 mg/kg/day) in cases where <i>S. pneumoniae</i> may be involved (e.g. facial bite with entry into the sinus cavity).
Penicillin Allergy	Choose one of the following combos (2 Drugs) (1) Trimethoprim-sulfamethoxazole 5 mg/kg PO q12h (max 160 mg/dose) OR Doxycycline 2.2. mg/kg/dose PO q12h (max 100 mg/dose) PLUS (2) Clindamycin 10 mg/kg/dose PO q8h OR metronidazole 10 mg/kg/dose PO q8h (max 500 mg/dose)	For any patient with a low risk for IgE-mediated reaction to penicillin, consider administering an observed oral dose of the first-line therapy and continuing if tolerated. Refer to Penicillin Adverse Drug Reaction Section for more info. Refer for penicillin allergy de-labeling. Trimethoprim-sulfamethoxazole is dosed on the trimethoprim component.

Dental Abscesses

- General Considerations
 - Assess for complicated infection (i.e. ill-appearing, signs of deep neck space infection, osteomyelitis of the mandible) as management may differ from what is listed below (e.g. hospital admission, longer duration of antibiotics, etc).
- Antimicrobial Recommendations
 - Antimicrobial Duration = 10 days

Dental Infections Antimicrobial Recommendations		
Place in Therapy	Recommended Antimicrobial	Additional Considerations
First-line	Amoxicillin 17 mg/kg/dose PO q8h (max 500 mg/dose)	
Complicated Infections OR Amoxicillin Failure	Amoxicillin-clavulanate 22.5 mg/kg/dose PO q12h (max 875 mg/dose)	Dosed on amoxicillin component. Refer to amoxicillin/clavulanate dosing guide (page 31) for which formulation.
Buccal Involvement and/or Penicillin Allergy	Clindamycin 10 mg/kg/dose PO q8h (max 450 mg/dose)	For any patient with a low risk for IgE-mediated reaction to penicillin, consider administering an observed oral dose of the first-line therapy and continuing if tolerated. Refer to Penicillin Adverse Drug Reaction Section for more info. Refer for penicillin allergy de-labeling.

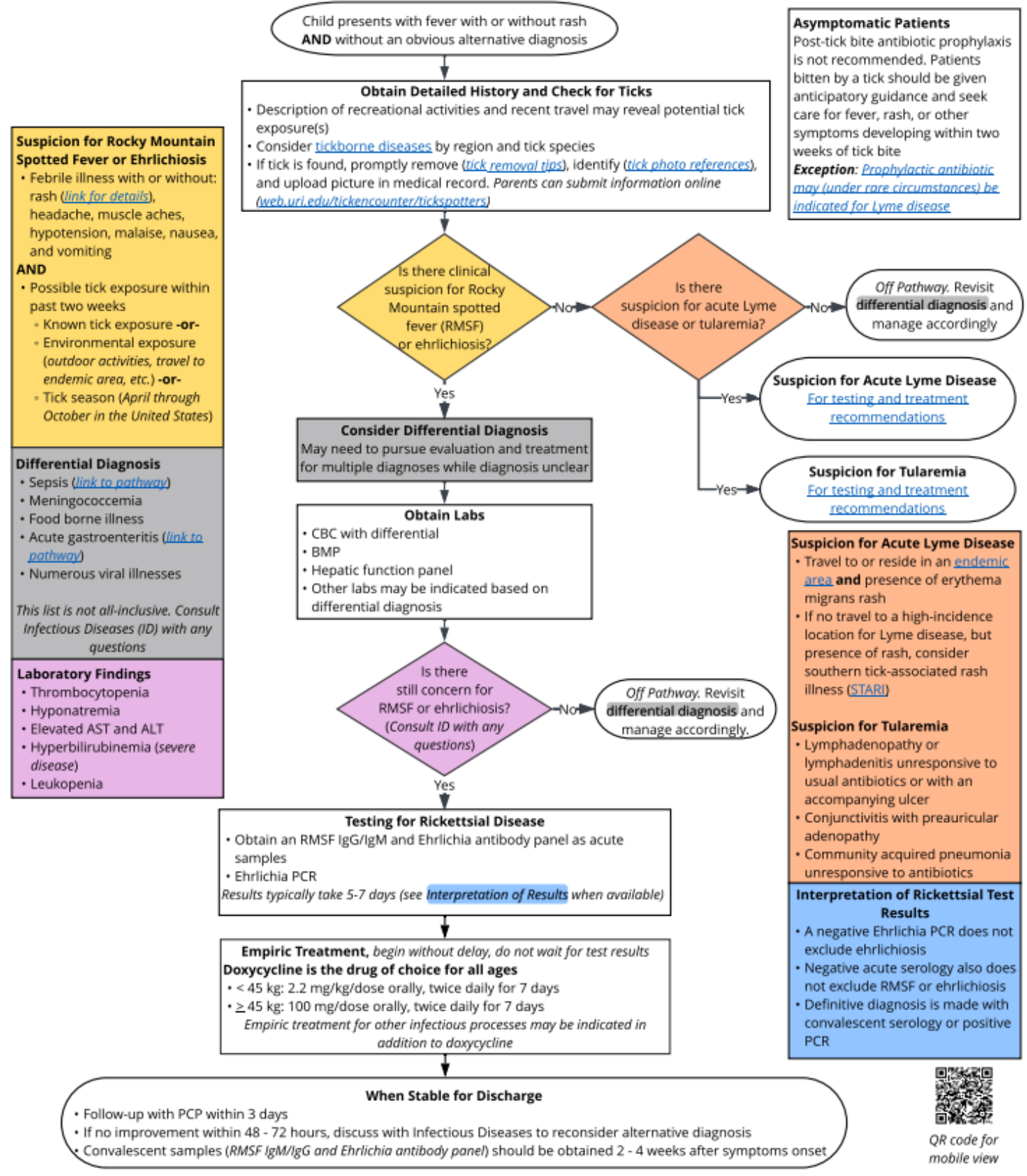
Acute Lymphadenitis

- Antimicrobial duration: 7 – 10 days

Acute Lymphadenitis Antimicrobial Recommendations		
Place in Therapy	Recommended Antimicrobial	Additional Considerations
First-line	Cephalexin 17 – 25 mg/kg/dose PO q8h (max 1000 mg/dose)	Cephalexin can be used in patients with penicillin allergies at a low risk for IgE mediated reactions . Refer to Penicillin Adverse Drug Reaction Section for more info.
	Amoxicillin-clavulanate 22.5 mg/kg/dose PO q12h (max 875 mg/dose)	Dosed on amoxicillin component. Refer to amoxicillin/clavulanate dosing guide (page 31) for which formulation. Consider in cases where oral anaerobes may be involved (e.g. unilateral cervical lymphadenitis in child with poor oral hygiene).
MRSA risk factor OR Penicillin allergy – high risk for IgE-mediated reaction or high-risk for severe delayed reaction	Clindamycin 10 mg/kg/dose PO q8h (max 450 mg/dose)	
Concern for <i>Bartonella henselae</i>	Azithromycin 10 mg/kg/dose PO q24h x5 days (max 500 mg/dose)	Treatment may shorten duration of adenopathy.

Tickborne Illness

Refer to the [Children's Mercy Clinical Pathway](#) for more information on diagnosis and management.



Acute Bacterial Conjunctivitis (AAO 2018)⁷

For conjunctivitis in neonates, refer to the [Children’s Mercy Neonatal Conjunctivitis Clinical Pathway](#).

- **General Considerations**

- Most cases of conjunctivitis, both viral and bacterial, are self-limiting and resolve without specific treatment; national guidelines recommend **avoiding** use of topical antibiotics in most cases of infectious conjunctivitis.
- For moderate to severe bacterial conjunctivitis (i.e. copious purulent discharge, pain, and marked inflammation of the eye), systemic antimicrobial therapy and conjunctival cultures may be indicated. Possible etiologies may include gonococcal, chlamydial, or *Staphylococcus aureus* infections.

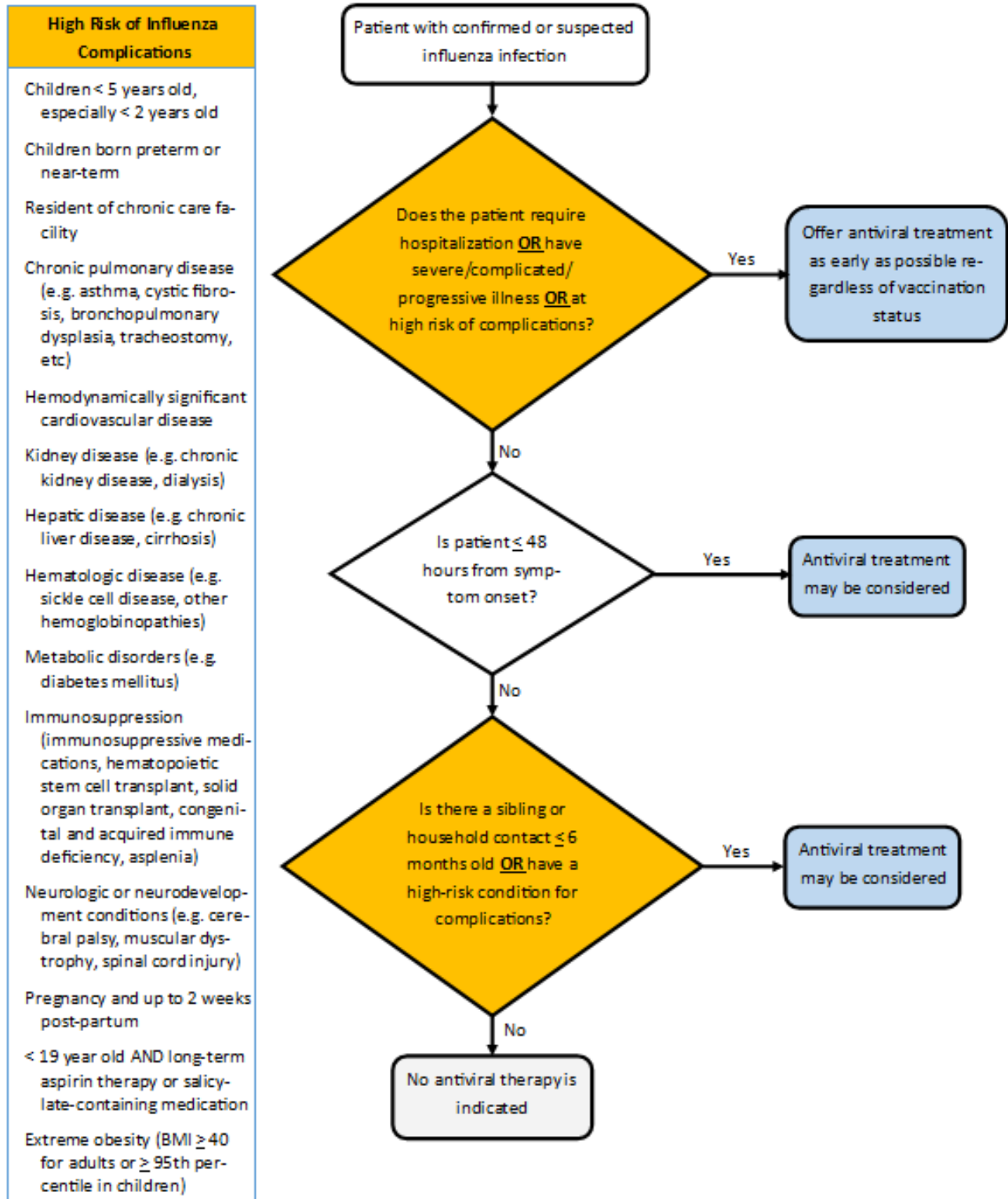
- **Antimicrobial Recommendations**

- Antimicrobial duration = 5 days

Acute Bacterial Conjunctivitis Topical Antimicrobial Recommendations		
Place in Therapy	Recommended Antimicrobial	Additional Considerations
Broad-spectrum, non-toxic, inexpensive topical antibiotics		
Infants, especially < 2 months old	Erythromycin 5mg/gm ophthalmic ointment <ul style="list-style-type: none"> • Apply 1 cm ribbon into the affected eye 4 times daily 	Routine use in most cases of infectious conjunctivitis is not indicated. See above general considerations.
	Polymyxin B-bacitracin ophthalmic ointment <ul style="list-style-type: none"> • Apply 1.25 cm ribbon to affected eye 4 times daily 	
Children and adolescents	Polymyxin B-trimethoprim ophthalmic solution <ul style="list-style-type: none"> • Instill 1 drop into affected eye 4 times daily 	
Alternative Topical Therapies		
Alternative	Tobramycin 3% ophthalmic solution <ul style="list-style-type: none"> • Instill 1-2 drops into the affected eye 4 times daily 	Risk of toxicity to the corneal epithelium and reactive keratoconjunctivitis, especially when used ≥7 days.
Corneal involvement OR contact lenses wearer	Ciprofloxacin 0.3% ophthalmic drops <ul style="list-style-type: none"> • Instill 1-2 drops in affected eye 4 times daily 	Providers broader gram-negative bacterial coverage.
	Ofloxacin 0.3% ophthalmic drops <ul style="list-style-type: none"> • Instill 1-2 drops in affected eye 4 times daily 	

Influenza Treatment (AAP 2025 – 2026 Recommendations)⁸

Influenza treatment recommendations are updated annually. Refer to the [AAP recommendations](#) for the most updated information.



Influenza Treatment (AAP 2025 – 2026 Recommendations)⁸

Influenza treatment recommendations are updated annually. Refer to the [AAP recommendations](#) for the most updated information.

Influenza Infection Antimicrobial Recommendations		
Place in Therapy	Recommended Antimicrobial	Additional Considerations
Preferred Antiviral	<p>Oseltamivir</p> <ul style="list-style-type: none"> • Term infant 0 – 8 months: 3 mg/kg/dose PO BID x 5 days • Infants 9-11 months: 3.5 mg/kg/dose PO BID x 5 days • Children ≤15 kg: 30 mg PO BID x 5 days • Children > 15 to 23 kg: 45 mg PO BID x 5 days • Children > 23 to 40 kg: 60 mg PO BID x 5 days • Children > 40 kg and adults: 75 mg PO BID x 5 days 	
Alternatives	<p>Baloxivir marboxil</p> <ul style="list-style-type: none"> • < 20 kg: 2 mg/kg PO one time only • 20 – < 80 kg: 40 mg PO one time only • ≥ 80 kg: 80 mg PO one time only 	<p>Only for ≥ 5 years of age</p> <p>NOT recommended as monotherapy for treatment of influenza in patients who are severely immunocompromised, pregnant, or breastfeeding.</p> <p>Refer to Children’s Mercy criteria for use</p>
	<p>Zanamivir</p> <ul style="list-style-type: none"> • 10 mg (two 5mg inhalations) twice daily x 5 days 	<p>Only for ≥ 7 years of age AND mild-to-moderate disease</p> <p>Inhalations on first day should be separated by ≥ 2 hours. Doses spaced by ~12 hours on subsequent days.</p> <p>Not recommended in patients with chronic respiratory diseases (e.g. asthma, chronic lung disease, etc) due to risk of bronchospasm.</p>

Influenza Chemoprophylaxis (AAP 2025 – 2026 Recommendations)⁸

Influenza chemoprophylaxis recommendations are updated annually. Refer to the [AAP recommendations](#) for the most updated information.

- **General Considerations**

- Recommended if antiviral can be initiated within 48 hours of exposure
- Chemoprophylaxis is recommended after known or suspected influenza exposure in the following situations
 - Child at high risk of complications AND ≥ 1 of the following:
 - Contraindication to the influenza vaccine
 - ≤ 2 weeks after influenza vaccination
 - May not respond with sufficient protective immune responses after influenza vaccination (e.g. immunocompromised)
 - Exposure is a household contact or close contact
 - Family members likely to have ongoing close exposures to vaccinated children at high risk or unvaccinated children ≤ 24 months old

- **Antimicrobial Recommendations**

Influenza Chemoprophylaxis Antimicrobial Recommendations		
Place in Therapy	Recommended Antimicrobial	Additional Considerations
Preferred Antiviral	Oseltamivir <ul style="list-style-type: none"> • 3 – 8 months: 3 mg/kg/dose PO daily x 7 days • Infants 9-11 months: 3.5 mg/kg/dose PO daily x7 days • Children ≤ 15 kg: 30 mg PO daily x 7 days • Children > 15 to 23 kg: 45 mg PO daily x 7 days • Children > 23 to 40 kg: 60 mg PO daily x 7 days • Children > 40 kg and adults: 75 mg PO daily x 7 days 	
Alternatives	Baloxivir marboxil <ul style="list-style-type: none"> • < 20 kg: 2 mg/kg PO one time only • 20 – < 80 kg: 40 mg PO one time only • ≥ 80 kg: 80 mg PO one time only 	Only for ≥ 5 years of age Refer to Children’s Mercy criteria for use
	Zanamivir <ul style="list-style-type: none"> • 10 mg (two 5 mg inhalations) twice daily x 7 days 	Only for ≥ 7 years of age Not recommended in patients with chronic respiratory diseases (e.g. asthma, chronic lung disease, etc) due to risk of bronchospasm.

Gram Positive Antibigram for Children’s Mercy – 2024 (All Sources)

Children's Mercy Hospitals & Clinics - 2024 Antibigram															
Department of Pathology & Laboratory Medicine- Microbiology Laboratory															
2024 Gram Positive Antibigram (% Susceptible)															
Organism	# of isolates tested	Ampicillin	Cefotaxime	Clindamycin	Erythromycin	Linezolid	Meropenem	Nitrofurantoin ⁴	Oxacillin	Penicillin	Penicillin (Oral)	Rifampin ^a	Tetracycline	Trim/Sulfa	Vancomycin
<i>Enterococcus faecalis</i>	213	100	-	-	-	-	-	100	-	99	-	-	-	-	100
<i>All Staphylococcus aureus</i>	1358	-	-	80	55	100	-	100	72	0	-	100	94	93	100
MSSA	981	-	-	78	67	100	-	100	100	0	-	100	95	96	100
MRSA	377	-	-	87	23	100	-	100	0	0	-	100	90	87	100
<i>Staphylococcus epidermidis</i>	150	-	-	52	24	100	-	98	33	0	-	98	92	55	100
<i>S. pneumoniae</i> [*]	89	-	-	93	60	-	84 ²	-	-	-	66 [§]	-	-	-	100 ²
Meningitis breakpoint		-	96 [†]	-	-	-	-	-	-	65 [†]	-	-	-	-	-
Non-meningitis breakpoint		-	100 [‡]	-	-	-	-	-	-	99 [‡]	-	-	-	-	-

of *S.pneumoniae* isolates tested: Penicillin=89, Cefotaxime=89, Erythromycin=68, Clindamycin=81, Meropenem=19, Vancomycin=18

[†]Susceptible breakpoint for *S. pneumoniae* in patients with meningitis is ≤ 0.5 µg/mL for cefotaxime and ≤ 0.06 µg/mL for penicillin

[‡] Susceptible breakpoint for *S. pneumoniae* in patients with non-meningitis infections is ≤ 1µg/mL for cefotaxime and ≤ 2 µg/mL for penicillin

[§] Susceptible breakpoint for *S. pneumoniae* is ≤ 0.06 µg/mL for penicillin when penicillin V is administered by the oral route

⁴ Antibiotics tested on UTI isolates only: *E. faecalis* (185), *S. aureus* (45), *S. epidermidis* (79)

(-) =No data available

Gram Negative Antibigram for Children’s Mercy – 2024 (Urine ONLY)

Children's Mercy Hospitals & Clinics - 2024 Antibigram Department of Pathology & Laboratory Medicine- Microbiology Laboratory												
2024 Gram Negative - URINE ONLY- Antibigram (% susceptible)												
Organism	# of isolates tested	Ampicillin	Amox/clav	Cefazolin	Cefepime	Ceftazidime	Ceftriaxone	Ciprofloxacin	Gentamicin	Nitrofurantoin	Tobramycin	Trimeth/Sulfa
<i>Enterobacter cloacae</i>	46	IR	IR	IR	-	-	-	100	98	36	98	80
<i>Pseudomonas aeruginosa</i>	64	-	-	-	96	98	-	95	-	-	98	-
* <i>Escherichia coli</i>	1413	54	85	91	-	95	95	91	91	97	92	73
<i>Klebsiella oxytoca</i>	47	IR	91	18	-	91	91	100	100	89	100	94
* <i>Klebsiella pneumoniae</i>	116	IR	91	90	-	92	92	94	94	18	92	84
* <i>Proteus mirabilis</i>	110	85	91	97	-	96	96	98	96	IR	96	90

ESBL positive isolates: *E. coli* (85), *K. pneumoniae* (9), *K. oxytoca* (3)

IR = Intrinsic Resistance, (-) = No data available

**E. coli*, *K. pneumoniae* and *P. mirabilis* breakpoints differ for urine vs. all other sources.

Gram Negative Antibigram for Children’s Mercy – 2024 (All Sources)

Children’s Mercy Hospitals & Clinics - 2024 Antibigram														
Department of Pathology & Laboratory Medicine- Microbiology Laboratory														
2024 Gram Negative Antibigram (% susceptible)														
Organism	# of isolates tested	Amikacin ¹	Ampicillin	Amp/sulbactam ¹	Cefazolin	Cefepime	Ceftazidime	Ceftriaxone	Ciprofloxacin	Gentamicin	Meropenem ¹	Pip/tazo	Tobramycin	Trimeth/Sulfa
<i>Acinetobacter baumannii</i> complex (includes ALL sources)	16 ²	-	-	93	-	-	54	15	77	85	80	-	85	92
<i>Citrobacter freundii</i> (includes ALL sources)	39	100	IR	IR	IR	-	-	-	93	100	100	-	96	79
<i>Klebsiella aerogenes</i> [^] (includes ALL sources)	34	100	IR	IR	IR	100	-	-	100	100	100	-	100	100
<i>Serratia marcescens</i> (includes ALL sources)	72	98	IR	IR	IR	100	100	100	100	100	100	-	93	100
<i>Enterobacter cloacae</i> (Non-urine sources ONLY)	68	100	IR	IR	IR	98 ^b	-	-	100	98	100	-	95	95
<i>Pseudomonas aeruginosa</i> (Non-Urine sources ONLY)	236	-	-	-	-	97	97	-	92	-	96	96	97	-
* <i>Escherichia coli</i> (Non-Urine sources ONLY)	94	100	49	58	66 ^a	90 ^b	84	82	78	90	100	93	89	72
<i>Klebsiella oxytoca</i> (Non-Urine sources ONLY)	16 ²	100	IR	62	33 ^a	89 ^b	89	89	100	78	100	-	86	89
* <i>Klebsiella pneumoniae</i> (Non-Urine sources ONLY)	47	100	IR	85	85 ^a	100 ^b	97	97	97	100	100	100	100	97
* <i>Proteus mirabilis</i> (Non-Urine sources ONLY)	9 ²	100	86	92	14 ^a	86 ^b	86	86	85	71	100	100	75	86

ESBL positive isolates: *E. coli* (12), *K. pneumoniae* (3), *K. oxytoca* (2)

[^] *Klebsiella aerogenes*, formerly named *Enterobacter aerogenes*.

¹ Antibiotics tested on Non-Urine isolates only: *A. baumannii* complex (14), *C. freundii* (7), *K. aerogenes* (14), *S. marcescens* (54).

² Please exercise discretion when data are reviewed for species with fewer than 30 isolates.

^a Cefazolin and Cefepime susceptibility based off Kirby Bauer disc diffusion results.

IR = Intrinsic Resistance, (-) = No data available

**E. coli*, *K. pneumoniae* and *P. mirabilis* breakpoints differ for urine vs. all other sources.

Dosing of Amoxicillin-Clavulanate

Dosing of amoxicillin-clavulanate (Augmentin) is based on amoxicillin component. “High dose” of amoxicillin-clavulanate is targeted at providing higher amoxicillin doses to overcome *Streptococcus pneumoniae* resistance without increasing clavulanate exposure. Some experts recommend maintaining clavulanate exposure to ≤ 10 mg/kg/day to minimize risk of gastrointestinal adverse effects.

The table below provides general guidance, however prescribing practices may differ depending on clinical factors (e.g. location of infection, bacterial susceptibility, patient characteristics, etc). Please consult a pharmacist or Antimicrobial Stewardship for additional assistance in selecting formulations.

General Guidance for Selecting Amoxicillin-Clavulanate (Augmentin) Dosage Formulations		
Patient Population	Formulation	Typical Dose
Standard Dose – consider for most uncomplicated infections not caused by <i>S. pneumoniae</i>		
< 3 months	Suspension: 250 mg-62.5 mg/5mL OR 125 mg-31.25mg/5mL	30 mg/kg/ <u>DAY</u> divided twice daily
≥ 3 months AND < 40 kg	Suspension: 400 mg-57mg/5mL	25 – 45 mg/kg/ <u>DAY</u> divided twice daily
Children ≥ 40 kg	Suspension: 400 mg-57mg/5mL	880 mg twice daily OR 520 mg three times daily
	Tablet: 500mg-125mg OR 875mg-125mg	875 mg twice daily OR 500 mg three times daily
High Dose – consider when covering for <i>S. pneumoniae</i> (e.g. otitis media, pneumonia, sinusitis); sometimes used for complicated or severe infections in difficult to penetrate sites of infection		
< 3 months old AND ≥ 2 kg	ES Suspension*: 600 mg-42.9mg/5mL	75 mg/kg/ <u>DAY</u> divided three times daily
≥ 3 months AND < 40 kg	ES Suspension: 600 mg-42.9mg/5mL	80 – 100 mg/kg/ <u>DAY</u> divided twice or three times daily
Children ≥ 40 kg	XR Tablet [^] : 1000 mg-62.5 mg	2000 mg twice daily
	ES Suspension: 600 mg-42.9mg/5mL (tablet preferred)	1980 mg twice daily OR 1080 - 1200 mg three times daily
*Study in neonates used the 4:1 formulation, which resulted in daily clavulanate doses of 18.75 mg/kg/day. Depending on indication, an alternative formulation may be indicated. [^] If unable to get insurance coverage of XR tablets, can consider sending two prescriptions for Amoxicillin 500 mg PO q8h <u>AND</u> Amoxicillin-clavulanate 500-125 mg PO q8h to be taken simultaneously.		

Penicillin Adverse Drug Reaction: Risk Stratification¹⁴

Refer to the [Children’s Mercy Clinical Pathway](#) for more information on risk stratification and management, including documentation in electronic medical record and referrals for de-labeling. If the reaction type is unknown or there is a vague history, refer to the pathway for more information on management.

Risk Stratification	Reaction	Clinical Pearls
High risk of severe delayed reaction with re-exposure	Any of the following at any time: <ul style="list-style-type: none"> • Blistering or pustular rash • Sloughing skin • Mucosal blistering • Hives <i>associated</i> with fever and/or joint pain • Organ damage (e.g. hepatitis, nephritis, hemolytic anemia) • Hospitalization required (not for anaphylaxis) 	<ul style="list-style-type: none"> • Avoid all beta-lactams (penicillins, cephalosporins, carbapenems, monobactams) • Alternative therapy should be based on indication • May refer to disease specific pathways or contact ID for recommendations
High risk of IgE mediated reaction with re-exposure	Any of the following: <ul style="list-style-type: none"> • Anaphylaxis • Angioedema • Rash starting < 6 hours after first dose (including hives) • Epinephrine required for treatment <p>AND</p> <ul style="list-style-type: none"> • Exclusion of severe delayed reaction symptoms 	<ul style="list-style-type: none"> • Risk of cross reactivity is low IF the penicillin and cephalosporin have no shared side chains • Any carbapenem -or- cephalosporin with no shared side chain can be given without allergy testing or additional precautions (see beta-lactam side chain chart on next page) • May refer to disease specific clinical pathways for recommendations
Low Risk of IgE mediated reaction with re-exposure	<ul style="list-style-type: none"> • Rash starting ≥ 6 hours after first dose (including hives) <p>AND</p> <ul style="list-style-type: none"> • Exclusion of severe delayed reaction symptoms 	<ul style="list-style-type: none"> • Risk of penicillin / cephalosporin cross-reactivity is low • Any cephalosporin -or- carbapenem can be given without testing or additional precautions • May refer to disease specific clinical pathways for recommendations
<p>*Note risk stratification should not be confused with documentation of allergy severity in electronic medical record. Allergy severity must be assessed separately.</p>		

Penicillin Adverse Drug Reaction: Beta-lactam Side Chain Chart¹⁴

Refer to the [Children’s Mercy Clinical Pathway](#) for more information

	Amoxicillin	Ampicillin	Cefazolin	Cefdinir	Cefepime	Cefixime	Cefoxitin	Cefpodoxime	Cefprozil	Ceftazidime	Ceftriaxone	Cefuroxime	Cephalexin	Ertapenem	Meropenem	Penicillin G
Amoxicillin		X							X				X			X
Ampicillin	X								X				X			X
Cefazolin																
Cefdinir						X										
Cefepime						X		X		X	X	X				
Cefixime				X	X			X		X	X	X				
Cefoxitin												X				X
Cefpodoxime					X	X				X	X	X				
Cefprozil	X	X											X			c
Ceftazidime					X	X		X			X	X				
Ceftriaxone					X	X		X		X		X				
Cefuroxime					X	X	X	X		X	X					
Cephalexin	X	X							X							c
Ertapenem															X	
Meropenem														X		
Penicillin G	X	X					X		c				c			

(X) Risk of cross-reactivity due to identical or similar side chains – DO NOT PRESCRIBE if patient has a high risk of IgE-mediated allergic reaction with re-exposure per clinical pathway.

(c) Caution! Before prescribing cefprozil or cephalexin to a patient with a “penicillin allergy”, confirm they are NOT allergic to amoxicillin or ampicillin.

*Adapted from Broyles AD et al. Practical Guidance for the evaluation and management of drug hypersensitivity: specific drugs. *J Allergy Clin Immunol Pract.* 2020;8(95):S16-S116. <https://doi.org/10.1016/j.jaip.2020.08.006>

Managing Infectious Diseases in Childcare and Schools (AAP)¹⁵



Most illnesses do not require exclusion from childcare or school. AAP provides [general guideline for temporary exclusion](#) for guidance as well as [disease specific guidance](#) for select infections. Children should be excluded for care while illness prevents child from participating comfortably in activities, results in need for care greater than staff members can provide without compromising health and safety of others and poses a risk of spread of harmful disease to others based on specific excludable conditions. Once reasons for exclusion resolve, then the child is eligible for return to care. The following abbreviated table focuses on any disease specific exclusion and return to care criteria for infectious included in this handbook.

Infection	Disease Specific Exclusion	Return-to-care Criteria
Acute otitis media	No	
Group A streptococcal pharyngitis	Yes	Received an appropriate antibiotic for ≥ 12 hours
Pneumonia	No	
Urinary Tract Infection	No	
Impetigo or Abscess/cellulitis	No – as long as lesions are covered, and drainage does not come through the covering to contaminant surfaces	
Bites – human/animal	No	
Dental abscess	No	
Conjunctivitis	No	Antibiotics are NOT required to return to care
Influenza	Yes	Afebrile ≥ 24 hours without fever-reducing medicine and able to participate

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