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Online version of the handbook is available on the Children’s Mercy Antimicrobial Stewardship website

Children’s Mercy clinical practice guidelines and care process models can be accessed on the Evidence Based Practice section of childrensmercy.org
Acute otitis media (AOM) (AAP guideline 2013)\textsuperscript{1}

Disclaimer: Children’s Mercy Algorithm is under revision as of 7/2022. Refer to the evidence-based practice site for the most up to date version.

| Underlying conditions that may alter the natural course of AOM include, though are not limited to: |
| Presence of tympanostomy tubes |
| Anatomic abnormalities (including cleft palate) |
| Genetic conditions with craniofacial abnormalities (such as Down Syndrome) |
| Immune deficiencies |
| Presence of cochlear implants |

Algorithm finalized/revised: 11.2013; 6.2020
Owen R, El Feghali, MD

Criteria for diagnosis of AOM:
- Middle ear effusion
- PLUS one of the following:
  - moderate/severe bulging of TM
  - new onset otorrhea not caused by otitis externa
  - mild bulging of TM and 48 hours of otalgia
  - mild bulging of TM & intense erythema of the TM

Otorrhea OR Severe signs/symptoms:
- Moderate/Severe otalgia OR Temperature ≥ 39°C (102.2°F) OR Otalgia ≥ 48 hours

Antibiotic duration for amoxicillin, amoxicillin/clavulanate, cefuroxime, cefdinir, cefpodoxime, cefprozil, and clindamycin:
- <2 years of age OR severe AOM OR chronic AOM OR recurrent AOM OR TM perforation = 10 days
- 2-5 years of age with non-severe symptoms = 7 days
- ≥6 years of age with non-severe symptoms = 5-7 days
Acute otitis media (AOM) (AAP guideline 2013)\(^1\)

Dosing of antibiotics found in algorithm:
- Amoxicillin 40-50 mg/kg/dose PO QID (max 2000 mg/dose)
- Amoxicillin/clavulanate 40-50 mg/kg/dose (amoxicillin component) PO QID (max 2000 mg amoxicillin component/dose)
- Cefuroxime 280 mg PO QID (max 1000 mg/dose) for children able to swallow pills (only available in tablet form)
- Cefotaxime 75 mg/kg/dose PO QID (max 3000 mg/dose)
- Cefpodoxime 5 mg/kg/dose PO QID (max 200 mg/dose)
- Cefpodoxime 15 mg/kg/dose PO QID (max 500 mg/dose)
- Ceftiraxone 50 mg/kg/dose IM/IV QID x 1-3 days* (daily max 1 gram/dose)
- *Administer Ceftiraxone for 1 day when used as a first-line for patients with penicillin allergy, and 3 days if the patient has failed other antibiotics
- Clindamycin 10 mg/kg/dose PO TID (max 600 mg/dose)

Antibiotic duration for amoxicillin, amoxicillin/clavulanate, cefuroxime, cefdinir, cefpodoxime, cefpodoxim, and clindamycin:
- <2 years of age OR severe AOM OR chronic AOM OR recurrent AOM OR TM perforation = 10 days
- 2-5 years of age with moderate symptoms = 7 days
- >5 years of age with mild to severe symptoms = 5-7 days

Algorithm finalized/revised: 11.2018, 6.2020
Owner: R. El Feghal, MD
Acute otitis media (AOM) (AAP guideline 2013)\textsuperscript{1}

Refer to Children’s Mercy Evidence Based Practice Care Process Model for more information on diagnosis and management.

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

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

**NOTE:** If using WW/SNAP, please place a comment in prescription instructions to “fill only upon patient/family request”

Antibiotic Recommendations

- Duration:
  - < 2 years OR severe disease = 10 days
    **NOTE:** Shorter durations for children ≥ 2 years of age with severe disease may be appropriate based on newer data.
  - 2 – 5 years of age = 7 days
  - ≥ 6 years = 5 – 7 days

- First line:
  - Amoxicillin 40-50 mg/kg/dose PO BID (max 2000 mg/dose)

- Alternative therapies:
  - If received amoxicillin ≤ 30 days prior OR concomitant conjunctivitis:
    - Amoxicillin/clavulanate 40-50 mg/kg/dose (amoxicillin component) PO BID (max 2000 mg amoxicillin/dose)
      **NOTE:** Refer to amoxicillin/clavulanate dosing table on page 29.

- Mild/moderate penicillin allergy (e.g. rashes including hives):
  - Cefuroxime 250 mg PO BID for children able to swallow pills
    **NOTE:** Cefuroxime only available in tablet form and should not be crushed.
  - Cefdinir 7 mg/kg/dose PO BID (max 300 mg/dose)
  - Cefpodoxime 5 mg/kg/dose PO BID (max 200 mg/dose)
  - Cefprozil 15 mg/kg/dose PO BID (max 500 mg/dose)
  - Ceftriaxone 50 mg/kg IM/IV qDay x 1-3 days (max 1000 mg/dose)
    **NOTE:** Risk of penicillin/cephalosporin cross-reactivity extremely low
    **NOTE:** Some cephalosporins may have limited availability and/or may be cost-prohibitive
    **NOTE:** consider referral for penicillin allergy testing
• Severe penicillin allergy (e.g. anaphylaxis):
  o Clindamycin 10 mg/kg/dose PO TID (max 600mg/dose)

(see next page for failure to improve after initial antibiotic therapy)

• Failure to improve after 48-72 hours of initial antibiotic therapy:
  o Treatment failure with amoxicillin
    ▪ Amoxicillin/clavulanate 40-50 mg/kg/dose (amoxicillin component) PO BID (max 2000 mg amoxicillin/dose)
      NOTE: Refer to amoxicillin/clavulanate dosing table on page 29 for formulation
  o Treatment failure with amoxicillin/clavulanate:
    ▪ Ceftriaxone 50 mg/kg/dose (max 1000 mg/dose) IM or IV daily x 3 days
      OR
    ▪ Cefuroxime or cefpodoxime PLUS clindamycin

Otorrhea

• AOM with a perforated tympanic membrane (the following could be considered in addition to systemic antibiotic) OR AOM with presence of patent tympanostomy tubes:
  o Ciprodex® (Ciprofloxacin 0.3% - Dexamethasone 0.1%) otic suspension, 4 drops instilled into affected ear twice daily for 7 days for patients >6 months of age
    NOTE: If Ciprodex® on shortage or cost-prohibitive, may use ciprofloxacin ophthalmic 2 drops +/- dexamethasone ophthalmic 2 drops twice daily for 7 days in patients >6 months of age
  o Ofloxacin otic solution, 5 drops into affected ear twice daily for 10 days for children > 6 months of age

• Otitis externa with intact tympanic membrane
  o May use Ciprodex®, ciprofloxacin ophthalmic/dexamethasone ophthalmic or Ofloxacin as noted above
      OR
  o Cortisporin® otic (neomycin-polymyxin B-hydrocortisone otic), 3 drops to affected ear 3 times per day for 7 day
**Group A streptococcal pharyngitis (IDSA guidelines 2012)**

Refer to *Children’s Mercy Evidence Based Practice Clinical Practice guideline* for more information on diagnosis and management.

**NOTE:** Streptococcal pharyngitis is uncommon in children <3 years of age and children of any age with viral symptoms

- **Duration:** 10 days
- **First Line:**
  - Amoxicillin 50 mg/kg/dose PO qDay (max 1000 mg/day) x 10 days
  - Penicillin G benzathine IM
    - < 27 kg: 600,000 Units x 1 dose
    - ≥ 27 kg: 1.2 million Units x 1 dose
  - Penicillin VK
    - < 27 kg: 250 mg PO BID – TID x 10 days
    - ≥ 27 kg: 500 mg PO BID – TID x 10 days
- **Mild penicillin allergy (e.g. rashes including hives):**
  - **NOTE:** consider referral for penicillin allergy testing
  - Cephalexin 20-25 mg/kg/dose PO BID (max 500 mg/dose) x 10 days
- **Severe penicillin allergy (e.g., anaphylaxis):**
  - Clindamycin 7 mg/kg/dose PO TID (max 300 mg/dose) x 10 days
  - Azithromycin 12 mg/kg/dose PO qDay (max 500 mg/dose) x 5 days
  - **NOTE:** Azithromycin is not recommended unless patient has severe allergy to penicillin and cephalosporins. Resistance is well known, and treatment failure may occur
Uncomplicated community-acquired pneumonia
(IDSA guidelines 2011)³

Refer to Children’s Mercy Evidence Based Practice Clinical Practice guideline for more information on diagnosis and management.

- Duration: 5-7 days
- First line:
  - Amoxicillin 40-50 mg/kg/dose PO BID (max 2000 mg/dose)
    NOTE: Amoxicillin/clavulanate provides no additional coverage for Streptococcus pneumoniae and is not a recommended first line agent for community-acquired pneumonia
  - Duration: 5-7 days
  - First line:
    - Amoxicillin 40-50 mg/kg/dose PO BID (max 2000 mg/dose)
      NOTE: Amoxicillin/clavulanate provides no additional coverage for Streptococcus pneumoniae and is not a recommended first line agent for community-acquired pneumonia
    - Cefuroxime 250 - 500 mg PO BID for children able to swallow pills (only available in tablets)
    - Cefpodoxime 5 mg/kg/dose PO BID (max 200 mg/dose)
    - Cefprozil 15 mg/kg/dose PO BID (max 500 mg/dose)
      NOTE: Cefdinir is NOT recommended for empiric treatment of Community acquired pneumonia because it is less effective against Streptococcus pneumoniae. Given some cephalosporins may have limited availability and/or may be cost-prohibitive, clindamycin is preferred over cefdinir if the above antibiotics are not available
    - Clindamycin 10 mg/kg/dose PO TID (max 600 mg/dose)
  - Mild penicillin allergy (e.g. rashes including hives)
    NOTE: consider referral for penicillin allergy testing
    - Cefuroxime 250 - 500 mg PO BID for children able to swallow pills (only available in tablets)
    - Cefpodoxime 5 mg/kg/dose PO BID (max 200 mg/dose)
    - Cefprozil 15 mg/kg/dose PO BID (max 500 mg/dose)
      NOTE: Cefdinir is NOT recommended for empiric treatment of Community acquired pneumonia because it is less effective against Streptococcus pneumoniae. Given some cephalosporins may have limited availability and/or may be cost-prohibitive, clindamycin is preferred over cefdinir if the above antibiotics are not available
    - Clindamycin 10 mg/kg/dose PO TID (max 600 mg/dose)
  - Severe penicillin allergy (e.g. anaphylaxis)/ cephalosporin allergy:
    - Clindamycin 10 mg/kg/dose PO TID (max 600 mg/dose)
  - Severe penicillin allergy / cephalosporin allergy AND intolerance of clindamycin:
    - Levofoxacin 8-10 mg/kg/dose PO BID (ages 6 months – 5 years) OR qDay (≥ 5 years) (max 750 mg/day)
      (see next page for atypical pneumonia considerations and treatment)
Atypical pneumonia (consider in adolescents with bilateral disease):
  o Azithromycin 10 mg/kg/dose PO qDay on day #1 (max 500 mg/dose), then 5 mg/kg/dose PO qDay on days #2-5 (max 250 mg/dose)

**NOTE:** Resistance to azithromycin is significant among typical bacterial pathogens, especially *Streptococcus pneumoniae*. For this reason, azithromycin monotherapy for patients with CAP is not routinely recommended.

**NOTE:** Levofloxacin and doxycycline are alternatives for atypical coverage and do not require the addition of azithromycin for coverage.
Acute bacterial rhinosinusitis (ABRS) (AAP guidelines 2013)¹

Presumptive diagnosis of ABRS:
1. Persistent illness (i.e. nasal discharge, daytime cough or both lasting >10 days without improvement) OR
2. Worsening course (i.e. worsening or new onset nasal discharge, daytime cough or fever) after initial improvement OR
3. Severe onset (i.e. concurrent fever ≥39°C/102.2°F) AND purulent nasal discharge for at least 3 days

NOTE: ABRS is uncommon in children < 2 years of age

Mild/moderate symptoms AND
Does not attend daycare AND
No antibiotic treatment in past 30 days AND ≥ 2 years of age

Mild-moderate symptoms AND
Attends daycare OR Received antibiotic treatment in past 30 days OR < 2 years of age

Severe symptoms

Amoxicillin
Amoxicillin/clavulanate
Cefpodoxime OR Cefuroxime OR Cefixime plus clindamycin
Levofloxacin

Diagnosis of acute bacterial rhinosinusitis

If patient is immunocompromised, consult on-call Infectious Diseases

Allergy to beta lactams

Yes

No

Consider age, severity of symptoms, daycare attendance and recent antibiotic exposure

Mild/moderate penicillin allergy

Severe penicillin/cephalosporin allergy
Acute bacterial rhinosinusitis (ABRS) *(AAP guidelines 2013)*

Refer to algorithm on page 8 for more information on diagnosis of ABRS.

- **Treatment**
  - Duration: 10 days
    - Continue treatment for at least 7 days after symptom resolution
  - First line:
    - Mild-moderate disease AND patient ≥ 2 years of age AND does not attend daycare AND has not received antibiotics within the past 30 days
      - Amoxicillin - **High-dose**: 45-50 mg/kg PO BID (max 2000 mg/dose)
        - **NOTE**: In communities with low rates of penicillin non-susceptible *S. pneumoniae*, standard dose amoxicillin may be considered.
    - Severe disease OR mild-moderate disease with ANY of the following: <2 years of age, attends daycare, received antibiotics in the past 30 days
      - Amoxicillin-clavulanate - **High dose**: 40-50 mg/kg/dose (amoxicillin component) PO BID (max 2000 mg/dose)
        - **NOTE**: Refer to [amoxicillin/clavulanate dosing table](#) on page 29 for formulation
  - Mild penicillin allergy (e.g. rashes including hives):
    - **NOTE**: consider referral for penicillin allergy testing
      - Cefpodoxime 5 mg/kg/dose PO BID (max 200 mg/dose)
      - Cefuroxime 250 mg PO BID for children able to swallow pills (only available in tablets)
      - Cefixime 4 mg/kg/dose PO BID (max 200 mg/dose) **PLUS**
        - Clindamycin 10 mg/kg/dose PO TID (max 600 mg/dose)
          - **NOTE**: Some cephalosporins may have limited availability and/or variable insurance coverage

*(see next page for alternative therapies for severe penicillin or cephalosporin allergies)*
Severe penicillin allergy (e.g. anaphylaxis) or cephalosporin allergy:
- Levofloxacin 10 mg/kg/dose PO BID (6 months - 5 years) OR qDay (>5 years) (max 500 mg/day)
- Consider consulting Infectious Diseases physician

**NOTE:** per AAP guideline, even patients with a history of serious type 1 immediate reaction to penicillin may be safely treated with cefuroxime and cefpodoxime given low risk of cross-reactivity
Urinary Tract Infection/Pyelonephritis - Diagnosis

Acronyms (laboratory/radiology excluded):
- HIV = history of present illness
- pt = patient
- pyel = pyelonephritis
- UTI = urinary tract infection
- w/u = work up

Screening Criteria - Pos. Neg. Toilet Trained
- Female Risk Factors
  - Fever ≥ 100.4°F
  - Fever ≥ 2 days
  - No alternative source ≥ 2 months of age
- Male Risk Factors
  - Fever ≥ 100.4°F
  - Fever ≥ 2 days
  - No alternative source ≥ 6 months of age

If factors present:
- Consider screening
  - If unimmunized, consider screening
  - If unimmunized, recommend screening

If factors present:
- If unimmunized, consider screening
  - If unimmunized, recommend screening

Recurrence (antenatal, etc.)
- If recurrent, consider screening
  - If recurrent, recommend screening

Additional recommendations for adolescents
- Collect “w/u” urine for Gonococcal (GC) / Chlamydia (CT) screening
- If GC/CT positive, consider Syphilis Screen
- HIV testing: Culture viable lesions, or cervical culture as indicated
- Annual HIV testing
- For females: Consider pregnancy testing

Suspected UTI or Pyelonephritis
- Clinical signs and symptoms
  - UA w/u + urinary syndrome + nitrite (strong recommendation based on a moderate level of evidence)

UA w/u + nitrite (conditional recommendation based on a very low level of evidence)
Urinary Tract Infection/Pyelonephritis – Management

Admission Criteria
- Requires IV fluids, if aggressive volume needs to be replaced
- Outpatient follow-up cannot be arranged
- Failed outpatient therapy defined by:
  - Persistent clinical symptoms >8h on appropriate therapy
  - Failure to maintain hydration status

UTI/Pyelitis Management

Evaluate pt for RUS indications
- < 24 months of age
- > 60 days old

Pylonephritis
- Can: tenderness
- Vomiting
- Fever > 39 C
- If RUS performed, evidence of pyelitis

Does pt meet criteria? (Adult)
- Yes: administer antibiotic
  - If history of UTI, empirical therapy should be based on previous microbiology if available
  - No minimum IV duration

Imipenem Therapy
Pyelonephritis or unknown
- Oral:
  - Cefaclor (high dose) 75 to 100 mg/kg/day divided q8h (max 1900 mg/dose)
  - Cefazolin (high dose) 100 mg/kg/day divided q8h (max 6g/day)
- IV:
  - Ceftriaxone 50mg/kg/dose (1st q4h max 2000 mg/dose)

Ceftriaxone
- Oral:
  - Cefazolin 25 – 50 mg/kg/day divided q8h (max: 500 mg/dose)
- For severe cephalosporin allergy
  - For severe penicillin allergy

Imipenem
- If susceptibility is available, review for definitive therapy
  - If not available, use empirical cephalosporin with higher dosage (see Kirby Bauer method)

TOTAL IV = PO Duration = 7 to 10 days
Consider longer IV duration up to 14 days if:
- Asymptomatic or clinical course
- Non-E coli UTI
- abnormal RUS

Treat pyelonephritis
- if susceptibility is available, review for definitive therapy
- If not available, use empirical cephalosporin with higher dosage (see Kirby Bauer method)

Acronyms (laboratory, radiology excluded):
- CLV = Close to the problem
- N = significant
- RUS = renal ultrasound
- PT = patient
- UTI = urinary tract infection
- PSS = pyelonephritis
- WBC = white blood cell
- PCP = primary care provider

Follow-up
- Call family to review culture results
- Narrow coverage when sensitivities return
- If RUS is indicated, schedule or communicate need to schedule with PCP
- Follow up with PCP within 48 hours if pt not improved

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

Antibiotic Link
- Diagnosing UTI/Pyelitis
- Imaging for UTI/Pyelitis
Cystitis/uncomplicated UTI in children >2 months of age
Refer to Children’s Mercy Evidence Based Practice Clinical Practice guideline for more information on diagnosis and management.

NOTE: If history of UTIs, empiric therapy should be based on previous microbiology, if available

- Duration: 3 – 5 days
- First line:
  - Cephalexin 17 mg/kg/dose PO TID (max 500 mg/dose)
- Alternative therapies:
  - Cefixime 8 mg/kg/dose PO qDay (max 400 mg/day)
- Severe penicillin allergy (e.g. anaphylaxis) or cephalosporin allergy:
  - TMP/SMX 3-6 mg/kg/dose (trimethoprim component) PO BID (max 160 mg TMP/dose)
    - NOTE: At CMH, there are increasing rates of *E coli* resistance to TMP/SMX
  - Nitrofurantoin (treatment duration 5-7 days) – *if cystitis alone*
    - Macrocystal (Macrodantin® or Furadantin®) 1.25-1.75 mg/kg/dose PO q6h (max 100 mg/dose)
    - Macrocystal/monohydrate (Macrobid®) 100 mg PO BID (ADOLESCENTS ONLY)

NOTE: Avoid cephalexin in patients with severe penicillin allergy (e.g. anaphylaxis) due to same side chains. Other cephalosporins may be tolerated.

NOTE: Cefdinir has poor urine concentration in children compared to adults and is not recommended for pediatric UTIs
Pyelonephritis (febrile urinary tract infection) in children $\geq 2$ months of age (AAP guidelines 2011)$^5$

Refer to Children’s Mercy Evidence Based Practice Clinical Practice guideline for more information on diagnosis and management.

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

**NOTE:** If history of UTIs, empiric therapy should be based on previous microbiology if available

- Duration: 7-10 days
- First line: Cephalexin 25-33 mg/kg/dose PO TID (max 1000mg/dose)
- Alternative therapies:
  - Cefixime 8 mg/kg PO q24h (max 400mg/day)
- Severe penicillin allergy (e.g. anaphylaxis) or cephalosporin allergy:
  - TMP/SMX 3-6 mg TMP/kg/dose (trimethoprim component) PO BID (max 160 mg TMP/dose)
    - **NOTE:** At CMH, there are increasing rates of *E coli* resistance to TMP/SMX
  - Ciprofloxacin 10 - 20 mg/kg/dose PO BID (max 750mg/dose)

**NOTE:** Avoid cephalexin in patients with severe penicillin allergy (e.g. anaphylaxis) due to same side chains. Other cephalosporins may be tolerated.

**NOTE:** Cefdinir has poor urine concentration in children compared to adults and is not recommended for pediatric UTIs
Skin and soft tissue infections (IDSA guidelines 2014)
Skin and soft tissue infections (IDSA guidelines 2014)\(^6\)
Refer to Children’s Mercy Evidence Based Practice Clinical Practice guideline for more information on diagnosis and management.

- **Paronychia**
  - Incision and drainage + warm compresses + topical mupirocin TID x 5 days
  - Concurrent cellulitis, refer to cellulitis or erysipelas management

- **Folliculitis**
  - Topical mupirocin x 5 days
  - Concurrent cellulitis, refer to cellulitis or erysipelas management

- **Impetigo**
  - Mild cases with less than 5 lesions
    - Topical mupirocin TID x 5 days
  - Extensive: ≥5 lesions, lesions covering large areas of the body, or lesions near the mouth
    - Duration: 7 days
    - First line treatment:
      - Cephalexin 17 mg/kg/dose PO TID (max 500 mg/dose)
      - If risk for MRSA (i.e. personal or family history of MRSA) OR severe penicillin/cephalosporin allergy (e.g. anaphylaxis):
        - Clindamycin 10 mg/kg/dose PO TID (max 450 mg/dose)
        - TMP-SMX 4-6 mg/kg/dose (trimethoprim component) PO BID (max 160 mg TMP/dose)
  
  **NOTE:** TMP-SMX may not cover group A Streptococcus
• **Cellulitis or Erysipelas**
  o Duration: 5 days
  o First line:
    ▪ Cephalexin 17 mg/kg/dose PO TID (max 500 mg/dose)
  o Alternative:
    ▪ Amoxicillin-clavulanate 22.5 mg/kg/dose (amoxicillin component) PO BID (max 875 mg/dose)
      **NOTE**: Refer to [amoxicillin/clavulanate dosing table](#) on page 29 for formulation
  o If risk for MRSA (i.e. personal or family history of MRSA) OR severe penicillin/cephalosporin allergy (e.g. anaphylaxis):
    ▪ Clindamycin 10 mg/kg/dose PO TID (max 450 mg/dose)
      **NOTE**: Clindamycin resistance for *Staphylococcus aureus* and group A Streptococcus has been increasing. Consider selecting an alternative if patient has a history of clindamycin-resistant *Staphylococcus aureus* or changing to a narrow spectrum antibiotic if culture results show MSSA or group A Streptococcus.

• **Abscess**:
  In addition to incision and drainage with culture:
  o Duration: 5 days
  o First-line treatment with one of the following:
    ▪ Clindamycin 10 mg/kg/dose PO TID (max 450 mg/dose)
      **NOTE**: Clindamycin resistance for *Staphylococcus aureus* and group A Streptococcus has been increasing. Consider selecting an alternative if patient has a history of clindamycin-resistant *Staphylococcus aureus* or changing to a narrow spectrum antibiotic if culture results show MSSA or GAS
    ▪ TMP-SMX 4-6 mg/kg/dose (TMP component) PO BID (max 160 mg TMP/dose)
  **NOTE**: Systemic antibiotics may not be needed for abscesses < 2 cm if incision and drainage is performed.
Periorbital Cellulitis

- Due to differences in management of orbital cellulitis (i.e. postseptal 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 movements
  - Severe or persistent headache, lethargy, or fever
  - < 1 year of age
  - Unable to perform adequate eye exam

- Duration: 7 – 10 days

- First line if no concern for MRSA:
  - Cephalexin 17 mg/kg/dose PO TID (max 500 mg/dose)
  - Amoxicillin/clavulanate 22.5 mg/kg/dose (amoxicillin component) PO BID (max 875 mg/dose)
    - **NOTE**: Refer to [amoxicillin/clavulanate dosing table](#) on page 29 for formulation

- Mild/moderate penicillin allergy:
  - Cefuroxime 250 – 500 mg PO BID
    - **NOTE**: Cefuroxime only available in tablet form and should not be crushed.
  - Cefpodoxime 5 mg/kg/dose PO BID (max 400 mg/dose)

- Severe penicillin/cephalosporin allergy (e.g. anaphylaxis) and/or risk factor for MRSA:
  - Clindamycin 10 mg/kg/dose PO TID (max 450 mg/dose)
Animal/human bites

- Duration:
  - Prophylaxis (for moderate to severe wounds with edema or crush injury, puncture wounds or facial bite wounds): 3 days
  - Treatment of infected wound: 5 - 7 days

- First line:
  - Amoxicillin/clavulanate 22.5 mg/kg/dose (amoxicillin component) PO BID (max 875 mg amoxicillin/dose)
    - NOTE: Refer to amoxicillin/clavulanate dosing table on page 29 for formulation
  - Amoxicillin 17 mg/kg/dose PO TID (max 500 mg/dose) PLUS one of the following:
    - TMP-SMX 5 mg/kg (TMP component) PO BID (max 160 mg TMP/dose)
    - Doxycycline 2.2 mg/kg PO BID (max 100 mg/dose)

  - Penicillin allergy:
  - Clindamycin 10 mg/kg/dose PO TID (max 450 mg/dose)

Dental abscess

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).

- Duration: 10 days

- First line:
  - Amoxicillin 17 mg/kg/dose PO TID (max 500 mg/dose)

(see next page for alternative therapies if complicated infection, amoxicillin failure, or penicillin allergy)
• Alternative for complicated infections or amoxicillin failure
  o Amoxicillin/clavulanate 25 mg/kg/dose (amoxicillin component) PO BID (max 875 mg amoxicillin/dose)
    NOTE: Refer to amoxicillin/clavulanate dosing table on page 29 for formulation

• If buccal involvement AND/OR penicillin allergy:
  o Clindamycin 10 mg/kg/dose PO TID (max 450 mg/dose)

**Acute lymphadenitis**

• Duration: 7 – 10 days

• First line options:
  o Cephalexin 17-25 mg/kg/dose PO TID (max 1000 mg/dose)
  o Amoxicillin/clavulanate 22.5 mg/kg/dose (amoxicillin component) PO BID (max 875 mg amoxicillin/dose)
    NOTE: Consider in cases where oral anaerobes may be involved (e.g. unilateral cervical lymphadenitis in child with poor dental hygiene)
    NOTE: Refer to amoxicillin/clavulanate dosing table on page 29 for formulation

• If concern for MRSA (i.e. personal or family history of MRSA) AND/OR severe penicillin or cephalosporin allergy (e.g. anaphylaxis):
  o Clindamycin 10 mg/kg/dose PO TID (max 450 mg/dose)

• If concern for *Bartonella henselae* (treatment may shorten duration of adenopathy):
  o Azithromycin 12 mg/kg PO qDay (max 500 mg/dose) x 5 days
Acute bacterial conjunctivitis beyond neonatal period (AAO 2018)

Refer to Children’s Mercy Care Process Model for additional diagnostic and management information.
Acute bacterial conjunctivitis beyond neonatal period

(\textit{AAO 2018})\textsuperscript{7}

Refer to \textit{Children’s Mercy Evidence Based Practice Care Process Model} for more information on diagnosis and management.

Most cases of conjunctivitis, both viral and bacterial, are self-limiting and resolve without specific treatment.

Topical antibacterial therapy may result in earlier clinical and microbiological remission if given before day 6 of illness and may reduce transmissibility in children.

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 \textit{Staphylococcus aureus} infections.

- **Duration:** 5 days

- **Broad spectrum, nontoxic, inexpensive topical antibody therapy options:**
  - Infants, especially < 2 months:
    - Erythromycin 5 mg/gm ophthalmic ointment: Apply 1 cm ribbon into affected eye 4 times daily
    - Polymyxin B-bacitracin ophthalmic ointment: apply 1.25 cm ribbon to affected eye 4 times daily
  - Children and adolescents
    - Polymyxin B-trimethoprim ophthalmic solution: Instill 1 drop in affected eye 4 times daily

\textit{(See next page for alternatives)}
• Alternative topical therapies:
  o Tobramycin 3% ophthalmic solution: Instill 1-2 drops into the affected eye every 4 hours
    **NOTE:** Resistance seen with *Streptococcus* species limiting effectiveness
    **NOTE:** Risk of toxicity to the corneal epithelium and reactive keratoconjunctivitis, especially ≥ 7 days of use.
  o Azithromycin 1% ophthalmic solution: Instill 1 drop in the affected eye twice daily (8 – 12 hrs apart) on days 1-2, then 1 drop in the affected eye daily on days 3 – 7
    **NOTE:** More expensive and challenging to find than other alternatives
    **NOTE:** A different agent should be considered for patient < 1 year of age

• If corneal involvement or contact lenses wearer, consider one of the following more expensive alternatives with broader gram-negative coverage:
  o Ciprofloxacin 0.3% ophthalmic drops: instill 1 – 2 drops in affected eye 4 times daily
  o Ofloxacin 0.3% ophthalmic drops: Instill 1 – 2 drops in affected eye 4 times daily

**NOTE:** Ophthalmic ointments and solutions containing neomycin are usually avoided due to high incidence of allergic sensitization.
Influenza Treatment (AAP 2021 – 2022 Recommendations)\(^8\)

Influenza treatment recommendations are updated annually. Refer to [CDC summary for clinicians](https://www.cdc.gov/), and [AAP recommendations](https://www.aap.org/) for the 2022 – 2023 season for the most updated information.

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### High Risk of Influenza Complications
- Children < 5 years of age OR adults ≥ 50 years
- Chronic pulmonary condition (e.g., asthma, cystic fibrosis)
- Hemodynamically significant cardiovascular disease
- Renal, hepatic, hematologic, or metabolic disorder
- Immunosuppression
- Neurologic or neurodevelopmental conditions (e.g., cerebral palsy, muscular dystrophy, spinal cord injury)
- Compromised respiratory function or handling of secretions (e.g., tracheostomy)
- Pregnancy or post-partum
- <15 year old AND long-term aspirin therapy or salicylate-containing medication
- American Indian and Alaskan Native people
- Obesity (BMI ≥ 40 for adults and based on age

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**Decision Tree**

1. **Patient with confirmed or suspected influenza infection**
2. **Does the patient require hospitalization OR have severe/complicated/progressive illness OR at high risk of complications?**
   - **Yes**: Offer antiviral treatment as early as possible regardless of vaccination status
   - **No**
3. **Is patient ≤ 48 hours from symptom onset?**
   - **Yes**: Antiviral treatment may be considered
   - **No**
4. **Is there a sibling or household contact ≤ 6 months old OR have a high-risk condition for complications?**
   - **Yes**: Antiviral treatment may be considered
   - **No**: No antiviral therapy is indicated
Influenza Treatment (AAP 2021 – 2022 Recommendations)\(^8\)

Influenza treatment recommendations are updated annually. Refer to CDC summary for clinicians and AAP recommendations for the 2022 – 2023 season for the most update information.

- Antiviral treatment options
  - Oseltamivir
    - 1 – 8 months of age: 3 mg/kg/dose PO BID x 5 days
    - Infants > 9 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: 75 mg PO BID x 5 days
  - Zanamivir – only for ≥ 7 years of age AND mild-to-moderate disease
    - Two inhalations (10 mg) twice daily x 5 days
      - **NOTE:** Inhalations on first day should be separated by ≥ 2 hours. Doses spaced by ~12 hours on subsequent days.
      - **NOTE:** Not recommended in patients with chronic respiratory diseases (e.g. asthma, chronic lung disease, etc)
  - Baloxavir marboxil – only for ≥ 12 years of age
    - 40 – 80 kg: 40 mg PO one time only
    - > 80 kg: 80 mg PO one time only
Influenza Chemoprophylaxis (AAP 2021 – 2022 Recommendations)\(^8\)

Influenza chemoprophylaxis recommendations are updated annually. Refer to CDC summary for clinicians and AAP recommendations for the 2022 – 2023 season for the most update information.

- Chemoprophylaxis is recommended after known or suspected influenza exposure in the following situations
  - Child at high risk of complications from influenza AND ≥ 1 of the following
    - Contraindication to 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

- Antiviral agents for chemoprophylaxis
  - Oseltamivir
    - 3 – 8 months of age: 3 mg/kg/dose PO daily x 10 days
    - Infants ≥ 9 months: 3.5 mg/kg/dose PO daily x 10 days
    - Children < 15 kg: 30 mg PO daily x 10 days
    - Children 15 to 23 kg: 45 mg PO daily x 10 days
    - Children > 23 to 40 kg: 60 mg daily x 10 days
    - Children > 40 kg: 75 mg PO daily x 10 days
  - Zanamivir - *only for ≥ 5 years of age*
    - Two inhalations (10 mg) once daily x 10 days
      - **NOTE:** Not recommended in patients with chronic respiratory diseases
  - Baloxavir marboxil – *only for ≥ 12 years of age*
    - 40 – 80 kg: 40 mg PO one time only
    - > 80 kg: 80 mg PO one time only
### Gram Positive Antibiogram for Children’s Mercy - 2021 (All Sources)

#### 2021 Gram Positive Antibiogram (% Susceptible)

| Organism                        | # of isolates tested | Ampicillin | Ceftriaxone | Clindamycin | Erythromycin1 | Gentamicin1 | Isoniazid | Moxifloxacin | Norfloxacin* | Doxycycline | Pefloxacin | Plicillin | Plicillin (OIV) | Rosuquin* | Trimethoprim | Trimethoprim Sulfa | Metronidazole |
|---------------------------------|----------------------|------------|-------------|-------------|---------------|-------------|-----------|-------------|--------------|-------------|-----------|-----------|-----------|----------------|-----------|---------------|----------------|---------------|
| Enterococcus faecalis           | 150                  | 99         | -           | -           | -             | -           | -         | 99          | 99           | -           | -         | -         | -         | -              | -         | -             | -              | -             |
| All Staphylococcus aureus       | 1244                 | -          | 83          | 65          | 100           | 100         | 72        | 0           | 100          | 99          | 99        | 99        | 99        | 99             | 99        | 99            | 99             | 99            |
| MSSA                            | 888                  | -          | 82          | 68          | 100           | 100         | 100       | 0           | 100          | 99          | 99        | 99        | 99        | 99             | 99        | 99            | 99             | 99            |
| MRSA                            | 346                  | -          | 86          | 22          | 100           | 100         | 0         | 0           | 100          | 99          | 99        | 99        | 99        | 99             | 99        | 99            | 99             | 99            |
| Staphylococcus epidermidis      | 150                  | -          | 56          | 29          | 85            | 100         | 99        | 32          | 0            | 99          | 99        | 99        | 99        | 99             | 99        | 99            | 99             | 99            |
| S. pneumonia*                   | 58                   | -          | 93          | 48          | -             | 91          | -         | -           | -            | -           | -         | -         | -         | -              | -         | -             | -              | -             |
| Meningitis breakpoint           | *(6)                 | -          | -           | -           | -             | 91          | -         | -           | -            | -           | -         | -         | -         | -              | -         | -             | -              | -             |
| Non-meningitis breakpoint       | -                    | -          | -           | -           | -             | 91          | -         | -           | -            | -           | -         | -         | -         | -              | -         | -             | -              | -             |

1: Susceptible breakpoint for S. pneumonia in patients with meningitis is ≤ 0.5 µg/mL for cefotaxime and ≤ 0.06 µg/mL for penicillin.
2: Susceptible breakpoint for S. pneumoniae in patients with non-meningitis infections is ≤ 1 µg/mL for cefotaxime and ≤ 2 µg/mL for penicillin.
3: Susceptible breakpoint for S. pneumoniae is ≤ 0.06 µg/mL for penicillin when penicillin V is administered by the oral route.

*Used only in combination for synergy and is not adequate therapy by itself.

* Antibiotics tested on UTI isolates only: E. faecalis (139), S. aureus (30), S. epidermidis (59)

(1) = No data available
Gram Negative Antibiogram for Children’s Mercy - 2021 (All Sources)

| Organism                                      | # of isolates tested | Amoxicillin | Ampicillin | Piperacillin | Periostin | Cefazolin | Ceftriaxone | Cotrimoxazole | Ceftazolin | Pefloxacin | Gentamicin | Meropenem | Imipenem | Tobramycin | Trimethapha | Futura |
|------------------------------------------------|----------------------|-------------|------------|--------------|------------|-----------|-------------|---------------|-------------|------------|------------|------------|-----------|----------|------------|-------------|--------|
| Achromobacter baumanni complex (includes ALL sources) | 25                   | -           | -          | 100          | -          | -         | 80          | 16            | 90          | 100        | 100        | -         | 100      | 100        |             |        |
| Citrobacter freundii (includes ALL sources)     | 45                   | 100         | IR         | IR           | IR         | 90        | 89          | 96            | 96          | 96         | 100        | -         | 96       | 96         |             |        |
| Klebsiella aerogenes* (includes ALL sources)    | 20                   | 100         | IR         | IR           | IR         | 100       | 81          | 81            | 100         | 100        | 100        | -         | 100      | 96         |             |        |
| Serratia marcescens (includes ALL sources)      | 81                   | 100         | IR         | IR           | IR         | 99        | 99          | 99            | 99          | 99         | 100        | -         | 99       | 99         |             |        |
| Enterobacter cloacae (Non-Urine sources ONLY)   | 63                   | 100         | IR         | IR           | IR         | 96        | 89          | 89            | 96          | 96         | 96         | 100       | 96       | 96         |             |        |
| Pseudomonas aeruginosa (Non-Urine sources ONLY) | 181                  | 99          | -          | -            | -          | 94        | 95          | -             | 99          | 94         | 96         | 96        | 96       | 96         |             |        |
| "Escherichia coli" (Non-Urine sources ONLY)    | 166                  | 99          | 43         | 54           | 59         | 86        | 75          | 77            | 81          | 88         | 100        | 94        | 86       | 86         |             |        |
| Klebsiella oxytoca (Non-Urine sources ONLY)    | 59                   | 100         | IR         | 75           | 30         | 96        | 97          | 92            | 98          | 98         | 100        | -         | 98       | 98         |             |        |
| "Klebsiella pneumoniae" (Non-Urine sources ONLY) | 61                   | 100         | IR         | 77           | 82         | 97        | 88          | 88            | 91          | 88         | 100        | 90        | 89       | 84         |             |        |
| "Proteus mirabilis" (Non-Urine sources ONLY)   | 16                   | 100         | 88          | 94           | 97         | 100       | 94          | 88            | 88          | 88         | 100        | 80        | 88       | 81         |             |        |

ESBL positive isolates: E. coli (11), K. pneumoniae (2), P. mirabilis (1)

* Klebsiella aerogenes, formerly named Enterobacter aerogenes.

1 Antibiotics tested on Non-Urine isolates only: A. baumanni complex (22), C. freundii (20), K. aerogenes (11), S. marcescens (15).
2 Please exercise discretion when data are reviewed for species with fewer than 30 isolates.
3 Cefazolin susceptibility based off Kirby Bauer results: E. coli (129), K. oxytoca (48), K. pneumoniae (74), and P. mirabilis (16).
4 Ciprofloxacin susceptibility based off Kirby Bauer results: E. coli (47), E. coli (79), K. oxytoca (37), K. pneumoniae (59), and P. mirabilis (7)
IR = Intrinsic Resistance, (-) = No data available

*E. coli, K. pneumoniae and P. mirabilis breakpoints differ for urine culture vs. cultures from all other sources. Please contact the Microbiology laboratory for more information.
Gram Negative Antibiogram for Children’s Mercy - 2021 (URINE ONLY)

<table>
<thead>
<tr>
<th>Organism</th>
<th># of isolates tested</th>
<th>Ampicillin</th>
<th>Amoxiclav</th>
<th>Cefazolin</th>
<th>Cefepine</th>
<th>Ceftazidime</th>
<th>Ceftaroline</th>
<th>Ceftriaxone</th>
<th>Ciprofloxacin</th>
<th>Gentamicin</th>
<th>Nitrofurantoin</th>
<th>Tobramycin</th>
<th>Trimeth/Sulfa</th>
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<tbody>
<tr>
<td>Enterobacter cloacae</td>
<td>43</td>
<td>IR</td>
<td>IR</td>
<td>IR</td>
<td>-</td>
<td>88</td>
<td>84</td>
<td>98</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>93</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>52</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>95</td>
<td>95</td>
<td>-</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>-</td>
<td>-</td>
<td>98</td>
</tr>
<tr>
<td>'*Escherichia coli'</td>
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<td>87</td>
<td>94</td>
<td>-</td>
<td>97</td>
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<td>94</td>
<td>94</td>
<td>95</td>
<td>94</td>
<td>78</td>
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<tr>
<td>Klebsiella oxytoca</td>
<td>38</td>
<td>IR</td>
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<td>6</td>
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<td>95</td>
<td>100</td>
<td>97</td>
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<td>'*Klebsiella pneumoniae'</td>
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<tr>
<td>'*Proteus mirabilis'</td>
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<td>93</td>
<td>98</td>
<td>-</td>
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<td>100</td>
<td>96</td>
<td>96</td>
<td>IR</td>
<td>96</td>
<td>92</td>
<td></td>
</tr>
</tbody>
</table>

ESBL positive isolates: E. coli (44), K. pneumoniae (11), K. oxytoca (2)
IR = Intrinsic Resistance, (-) = No data available
*E. coli, K. pneumoniae and P. mirabilis breakpoints differ for urine culture vs. cultures from all other sources. Please contact the Microbiology laboratory for more information.
NOTE: 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 while maintaining clavulanate exposure to ≤ 10 mg/kg/day.

### General Guidelines for Amoxicillin-Clavulanate Dosage Formulations

<table>
<thead>
<tr>
<th>Indication</th>
<th>&lt; 40 kg</th>
<th>&gt; 40 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infection in &lt; 3 months of age</td>
<td>Suspension: 250 mg-62.5 mg/5mL OR 125 mg-31.25 mg/5mL</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Usual Dosing</td>
<td>30 mg/kg/day divided twice daily</td>
<td></td>
</tr>
<tr>
<td>“Standard Dose” Less severe infections (&gt; 3 months of age)</td>
<td>Suspension: 400 mg-57 mg/5mL</td>
<td>Tablet: 500 mg-125 mg OR 875 mg-125 mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Suspension: 400 mg-57 mg/5mL</td>
</tr>
<tr>
<td>Usual Dosing</td>
<td>25 – 45 mg/kg/day divided twice daily</td>
<td>500 – 875 mg twice daily</td>
</tr>
<tr>
<td>“High Dose” Otitis media, pneumonia, sinusitis (&gt; 3 months of age)</td>
<td>ES Suspension: 600 mg-42.9 mg/5mL</td>
<td>XR Tablet: 1000 mg-62.5 mg OR ES Suspension: 600 mg-42.9 mg/5mL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usual Dosing</td>
<td>80 – 100 mg/kg/day divided twice or three times daily</td>
<td>2000 mg twice daily</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1000 mg three times daily - <em>using oral suspension only</em></td>
</tr>
</tbody>
</table>

**Prescribing practices may deviate from these guidelines 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.**
References


Do not hesitate to reach out to infectious diseases in case of doubt!
Questions/comments, please email AntimicrobialStewards@cmh.edu

Last Updated 7/29/2022