

Inpatient Pediatric Bacterial Community-Acquired Pneumonia (CAP) Guideline

This clinical guideline has been developed to assist with diagnosis, evaluation, and treatment of previously healthy children aged 3 months and older with suspected **bacterial**, community-acquired pneumonia requiring inpatient admission. Patients 3-6 months of age or with concerns for difficulties with initial outpatient management may require a low threshold for admission. Please direct any questions to The Pediatric Infectious Diseases Division, The Barbara Bush Children's Hospital, at 207- 662-5522.

Streptococcus pneumoniae is the most common invasive bacterial cause of CAP. Preschool-aged children are more likely to have a viral illness. **Patients with the following conditions are excluded** from this guideline: bronchiolitis, immunocompromised, underlying lung disease (excluding asthma), and risk of aspiration.

SYMPTOM SEVERITY	Mild	Moderate	Severe
	<ul style="list-style-type: none"> Minimal O2 requirement No respiratory distress Mild dehydration 	<ul style="list-style-type: none"> Significant O2 requirement Moderate respiratory distress Moderate-severe dehydration 	<ul style="list-style-type: none"> SpO2 < 90%, FiO2 > 50% Severe respiratory distress Concern for impending need for ventilatory support
EVLUATION	<ul style="list-style-type: none"> Consider chest x-ray, CBC with diff, and blood culture Depending on time of year, consider influenza testing 	<ul style="list-style-type: none"> 2-view chest x-ray Blood culture Consider CBC with diff 	<ul style="list-style-type: none"> 2-view chest x-ray Blood culture CBC with diff, BMP Sputum culture as soon as possible after intubation
		<ul style="list-style-type: none"> Depending on age and the time of year, consider influenza and RSV testing Sputum culture if tracheostomy present, as soon as possible after intubation and, if possible, in patients who can expectorate sputum 	
TREATMENT	Amoxicillin	Ampicillin	Ceftriaxone AND
	<p>Additional Considerations:</p> <ul style="list-style-type: none"> Amoxicillin/clavulanate if incomplete HiB vaccination Cefdinir if non-anaphylaxis allergy to amoxicillin Clindamycin if anaphylaxis <p>Consider treatment for atypical pneumonia*</p>	<p>Additional Considerations:</p> <ul style="list-style-type: none"> Ceftriaxone IV/IM for incomplete HiB vaccination, poor IV access, or failed adequate outpatient amoxicillin <p>Consider treatment for atypical pneumonia* or MSSA/MRSA**</p>	<p>Vancomycin, if severely ill with sepsis or impending intubation</p> <p>Additional Considerations:</p> <ul style="list-style-type: none"> Clindamycin, instead of vancomycin, if no concern for sepsis or need for ventilatory support
	TREATMENT CONSIDERATIONS		
	<ul style="list-style-type: none"> Total duration of therapy for uncomplicated CAP is typically 10 days (IV and PO). *Consider treatment with azithromycin for <i>Mycoplasma pneumoniae</i> in patients > 5 years of age, with sore throat, low-grade fever, cough and fatigue that developed over 3-5 days. The benefit of treating <i>Mycoplasma pneumoniae</i> is controversial. ** If secondary bacterial pneumonia with influenza treat for <i>Staphylococcus aureus</i>. If influenza positive and hospitalized, treat with antiviral, regardless of the duration of illness. <p style="text-align: center;">If significant worsening during treatment or if no improvement after 48-72 hours of treatment: Consider pediatric infectious diseases consultation Repeat or obtain imaging If effusion is present, follow Complicated Pneumonia pathway (attached)</p>		

Complicated Pediatric Community-Acquired Pneumonia in a patient over 3 months of age

DEFINITION

Moderate-to-large para-pneumonic effusion
Multi-lobar pneumonia
Cavitary lesion
Pneumothorax

Empyema
Abscess
Necrotizing pneumonia
Broncho-pleural fistula

Moderate effusion >10 mm rim of fluid on decubitus film, opacifies less than half of the hemithorax on upright film.

Patients with the following conditions are excluded from this guideline: immunocompromised, underlying lung disease (excluding asthma), and risk of aspiration.

EVALUATION

- **CBC with diff, CMP, CRP, ESR, blood culture** – if not previously completed or available
- **Sputum culture** if tracheostomy present, as soon as possible after intubation, and, if possible, in patients who can expectorate sputum
- Consider **chest ultrasound** versus **chest CT with contrast** (be mindful of factors that increase risk of contrast-induced acute kidney injury: dehydration, NSAIDs, vancomycin, sepsis)
- **Pleural fluid:** Culture, gram stain, cell count, pH. Consider LDH, glucose, total protein.

CONSULTS

- **Infectious diseases** consultation
- **Surgery** consultation for consideration of drainage, chest catheter management with or without fibrinolytics, and/or VATS/other surgical intervention
- **Interventional radiology** if consideration of drainage with or without chest catheter placement
- **Pulmonary consultation** if consideration of recurrent pneumonia or other concern for structural anomaly

In general, moderate para-pneumonic effusions associated with respiratory distress, large para-pneumonic effusions, or documented purulent effusions should be drained. Commonly, consultation with surgery AND with interventional radiology is optimal for simple and complex effusions and for empyema management.

TREATMENT

Moderate Illness Severity

Ceftriaxone

AND

Clindamycin PO or IV

Additional Considerations:

- **Vancomycin**, instead of clindamycin, for a known history of clindamycin-resistant MRSA

Severe Illness Severity (i.e. sepsis, need for ventilatory support, altered mental status)

Ceftriaxone

AND

Vancomycin

Total duration therapy for patients with a complicated pneumonia is typically 2-4 weeks. The antibiotic choice, route of administration, and duration of treatment depends on the clinical response, adequacy of drainage, identification and sensitivity of a pathogen (i.e., MRSA typically requires longer duration), and the patient's ability to reliably take oral antibiotics.

Medication	Dosing
Amoxicillin	90mg/kg/day PO divided q12h (max dose: 2g q12h)
Amoxicillin/clavulanate	90 mg/kg/day of AMOXICILLIN component PO divided q12h (max dose: 2g q12h) using appropriate dosage form: <ul style="list-style-type: none"> Try to use 14:1 or 17:1 ratio products
Ampicillin	200 mg/kg/day IV divided q6h (max dose: 2g q6h)
Azithromycin	10 mg/kg PO once (max dose: 500mg), followed by 5 mg/kg PO once daily for four days (max dose: 250mg)
Cefdinir	14 mg/kg/day PO divided q12h (max dose: 300 mg q12h)
Ceftriaxone	Moderate Infection: 50 mg/kg IV once daily (max dose: 2g) Severe infection: 75 mg/kg IV once daily (max dose: 2g)
Clindamycin	IV/PO: 40 mg/kg/day divided q6-q8h (max daily dose: 1800 mg)
Vancomycin	15 mg/kg/dose IV q6-8h (if normal renal function; usual max daily dose: 2 g) Suggest Pharmacokinetic Consultation after 1 st dose

- Bradley JS et al. Executive Summary: The management of community-acquired pneumonia in infants and children older than 3 months of age: Clinical practice guidelines by the Pediatric Infectious Diseases Society and the Infectious Diseases Society of America. *Clinical Infectious Diseases* 2011; 53(7): 617–630.
- Fu LY, Ruthazer R, Wilson I, et al. Brief hospitalization and pulse oximetry for predicting amoxicillin treatment failure in children with severe pneumonia. *Pediatrics* 2006; 118:e1822–30.
- Katz SE, Williams DJ. Pediatric community-acquired pneumonia in the United States: Changing epidemiology, diagnostic and therapeutic challenges, and areas for future research. *Infect Dis Clin North Am.* 2018 Mar;32(1):47-63.
- Messinger AI et al. Management of pediatric community-acquired bacterial pneumonia. *Pediatrics in Review* 2017; 38(9): 394-409.
- Myers AL et al. Prevalence of bacteremia in hospitalized pediatric patients with community-acquired pneumonia. *Pediatr Infect Dis J.* 2013 Jul;32(7):736-40.
- Neuman M et al. Utility of blood culture among children hospitalized with community-acquired pneumonia. *Pediatrics.* 2017 Sep;140(3). pii: e20171013.
- Segerer FJ et al. Therapy of 645 children with parapneumonic effusion and empyema-A German nationwide surveillance study. *Pediatr Pulmonol.* 2017 Apr;52(4):540-547.
- Stankey CT et al. Blood culture and pleural fluid culture yields in pediatric empyema patients: A retrospective review, 1996-2016. *Pediatr Infect Dis J.* 2018 Sep;37(9):952-954.

Algorithms are not intended to replace providers' clinical judgment or to establish a single protocol. Some clinical problems may not be adequately addressed in this guideline. As always, clinicians are urged to document management strategies.

Last revised January 2020.

The Barbara Bush
Children's Hospital
At Maine Medical Center

