Suspected Community Acquired Pneumonia

Emergency Department/Urgent Care

Nationwide Children's — When your child needs a hospital, everything matters.

Center for Clinical Excellence

Inclusion & Exclusion Criteria

Definition & Diagnosis

Differential Diagnosis

Red Flags & Complications

Consider **etiology** based on
- Organism prevalence
- Patient age
- Clinical appearance

Signs and Symptoms of Community Acquired Pneumonia (CAP)

Fever, tachypnea, and cough that can progress to hypoxemia, respiratory distress, respiratory failure and sepsis

Meets any **admission criteria**? — Yes →

If in Urgent Care, consider direct admission versus transfer to the Main Campus ED
See ED Management Algorithm for Patients Requiring Admission

No ↓

Testing to Consider
- Rapid influenza test if:
  In season (typically October thru April)
  AND
  Child with risk for complications **or** likely to benefit from treatment
- COVID testing
- *CBC, CRP, ESR and CXR are **NOT** routinely recommended*

Deciding to Treat

More Likely Viral
- Pre-school age child
- Close contacts with similar symptoms
- Cold-like URI symptoms
- Gradual onset

More Likely Bacterial
- Longer duration of fever
- Tachypnea
- Focal auscultatory findings
- Absence of wheezing on auscultation
- Concern for mycoplasma infection

Is treatment indicated? — Yes → **Outpatient Antimicrobials**

No ↓

Discharge Home
Follow up with PCP in 48h

Inclusion & Exclusion Criteria

Inclusion Criteria:

- Patients ≥ 3 months of age with suspected community acquired pneumonia (CAP)

Exclusion Criteria:

- Suspected sepsis
- Immunodeficiency
- Suspected aspiration pneumonia
- Chronic lung disease other than asthma
- Prior/current tracheostomy
- Significant chronic condition including sickle cell disease, oncologic or neuromuscular condition

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Definition & Diagnosis

Is this community acquired pneumonia?

Community acquired pneumonia (CAP) is an infection of the lung parenchyma that has been acquired outside of the hospital, in a previously healthy child.

Common presentation:

- Can start with fever, tachypnea, cough
- Can progress to hypoxemia, increased work of breathing, respiratory failure and sepsis

Diagnostic Considerations:

- Pneumonia is typically a **clinical diagnosis**, made in children with fever and historical or physical examination evidence of an infectious process with symptoms or signs of respiratory distress.
- CAP is acquired outside of the health care settings

Signs and Symptoms based on pathogen

Consider other alternate clinical problem and diagnosis when:

- Afebrile
- Wheezing, especially if risk factors for asthma, bronchiolitis or foreign body aspiration
- Risk factors or suspicion for anatomical abnormality, aspiration, chronic respiratory symptoms, drug/chemical exposure, vasculitic/rheumatologic process, blood clotting disorder, cardiac condition, metabolic acidosis, malignancy

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Red Flags & Complications

Red Flags

- Rapid progression of respiratory distress
- Altered mental status
- Incomplete pneumococcal and Hib vaccination increases the risk for ampicillin-resistant infection. Given low resistance rates at NCH, vaccination status does not typically impact initial antibiotic choice but should be considered in patients not responding to therapy.
- Adolescent with fever, odynophagia/pharyngitis can be concerning for Lemierre syndrome (septic thrombophlebitis of the internal jugular vein). (Carius et al 2022, Galbraith et al. 2022)

Complications

Pulmonary:

- Acute respiratory failure
- Pleural effusion /empyema
- Pneumothorax
- Lung abscess
- Bronchopleural fistula
- Necrotizing pneumonia
- Pneumatocele

Metastatic:

- Meningitis
- CNS abscess
- Pericarditis
- Endocarditis
- Osteomyelitis
- Septic arthritis

Systemic:

- Systemic inflammatory response syndrome or sepsis
- Hemolytic uremic syndrome associated with S. Pneumoniae infection

(Bradley et al. 2011)

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Pneumonia Etiology

No clinical signs or symptoms can definitively distinguish between bacterial or viral pneumonia.
This table illustrates the *most common* signs and symptoms for each etiology.

Pathogen	*Epidemiology*	*Clinical*	*CXR*
Bacterial In order of prevalence: • *Streptococcus pneumoniae* • *Staphylococcus aureus* including MRSA (if coinfection with measles or influenza) • *Streptococcus pyogenes* (group A Streptococcus) • *Haemophilus influenzae* type b (if unimmunized)	Prevalence: 2-50% with higher rate in hospitalized children with more severe disease Usual age: any	Fever, ill appearance, cough, tachypnea* Focal, crackles or decreased breath sounds, bronchial breath sounds, egophony, (absence of wheezing)	Alveolar infiltrate; lobar or segmental consolidation, complication includes pleural effusion
Viral or viral/bacterial co-infection • Respiratory syncytial virus (RSV), Rhinovirus (RV) • Human metapneumovirus (hMPV) • Adenovirus • Influenza • Enterovirus D68	Prevalence: 73% Age < 2 yrs > 80% Age ≥ 2 yrs = 49%	Non-toxic, preceding congestion/rhinorrhea Diffuse crackles, wheezing	Interstitial infiltrate, patchy atelectasis, peribronchial thickening, hyperinflation
Atypical • *Mycoplasma pneumoniae* • *Chlamydia pneumoniae*	Prevalence: 9% Usual age: ≥ 5 yrs	Malaise, sore throat, low-grade fever, headache, cough, rash, mucositis developing over 3-5 days	Variable; bilateral diffuse infiltrates or focal (perihilar/peribronchial or lobar/segmental) abnormalities

***Fever, ill appearance, cough and tachypnea can be seen with any etiology of pneumonia.**

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Differential Diagnoses

- Foreign body
- Asthma
- Bronchiolitis
- Cystic Fibrosis
- Primary Ciliary Dyskinesia
- Primary Immunodeficiency
- Post-infectious Bronchiolitis Obliterans
- Chronic Aspiration
- Tuberculosis
- Malformation
- Neoplasm
- Lymphadenopathy
- Histoplasmosis
- Hypersensitivity pneumonitis
- Congestive cardiac failure
- Systemic vasculitis
- Pulmonary infarction
- E-cigarette or Vaping Associated Lung Injury (E-VALI)
- Adolescent with fever, odynophagia/pharyngitis can be concerning for Lemierre syndrome (septic thrombophlebitis of the internal jugular vein)

(Drummond et al. 2022, Principles and practice of pediatric infectious diseases / editor, Sarah S. Long 2023)

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Outpatient Antimicrobials

Antimicrobial		*Dosing*	*Duration*
Amoxicillin	First Line Therapy	90 mg/kg/day, PO, **divided** Q8 to Q12H Max: 4 g/day	5 days
Clindamycin	Preferred treatment for **Penicillin allergy**	30 to 40 mg/kg/day, PO, **divided** Q8H Max: 1.8g/day	5 days
Levofloxacin	Treatment alternative for **Penicillin allergy** when Clindamycin has failed	**≥6 months and <5 y**: 8 - 10 mg/kg/dose Q12H, PO Max: 750 mg/day	5 days
		≥5 y: 8 - 10 mg/kg/dose, Q 24 hours, PO Max: 750 mg/day	
Azithromycin	Atypical pneumonia	**Mycoplasma or Chlamydia pneumoniae:** 10mg/kg/dose once on Day1 (max dose: 500mg), followed by 5mg/kg/dose once on days 2 to 5 (max dose: 250mg)	5 days
Oseltamivir	Positive influenza testing in high-risk patient or < 48 hours of onset of symptoms	**3 to 8 months**: 3 mg/kg/dose, PO, BID	5 days
		9 to 11 months: 3.5 mg/kg/dose, BID	
		1-12y: • ≤15 kg: PO, 30 mg BID • >15 to 23 kg: PO, 45 mg, BID • >23 to 40 kg: 60 mg, PO, BID • >40 kg: 75 mg, PO, BID	
		≥13y: 75mg, PO, BID	

Oral cephalosporins are not recommended for treatment of pneumonia

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Penicillin (PCN) Allergy

PCN Allergy – Medium or High Risk

- Immediate (minutes to < 24 hrs) IgE-mediated reaction, angioedema, anaphylaxis or severe delayed reactions.
  - Do not give PCN without Allergy & Immunology input

PCN Allergy – Low Risk

- Previous allergy reaction was delayed (>24 hrs) with isolated and non-progressive symptoms (maculopapular rash or GI symptoms).
  - Trial PCN in the ED or inpatient setting and monitor for 1 hr
    - If no reaction, remove PCN allergy from chart and continue therapy
    - If hives, respiratory distress or anaphylaxis, treat as clinically indicated and consult Allergy & Immunology

No PCN allergy

- PCN avoidance based on family history alone ***or***
- Has tolerated PCN since concerning incident without reaction
  - Remove PCN allergy from chart

Powell et a. 2023; Maureen Eagan Bauer et al. 2021

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Discharge

- Follow-up with the Primary Care Provider (PCP) or other available provider in 48 hours.
- Return to medical care sooner for any of the following:
  - Difficulty breathing
  - Unable to tolerate oral antimicrobials

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Admission Criteria

Admit uncomplicated CAP to Infectious Diseases, or to Hospital Pediatrics as needed during times with high census.

Admit complicated CAP i.e. with moderate or large size effusion, to Infectious Diseases (if no PICU criteria met).

Infectious Diseases or Hospital Pediatrics Admission Criteria

Patient Factor Indications

- Age ≤6 months with suspected bacterial pneumonia
- Concern for clinical deterioration with outpatient treatment
- Inability to tolerate oral antibiotics
- Adequate follow up cannot be ensured

Respiratory Indications

- Oxygen saturation <90% on room air
- Signs of respiratory distress or toxic appearance
- Evidence of advanced disease (e.g., hemoptysis, cavitary lesion)
- Pneumonia suspected to be due to drug-resistant pathogen (MRSA)
- Complicated pleural effusion

Other Indications

- Bacteremia
- Dehydration or not tolerating PO
- Altered mental status
- Isolation indicated that cannot be performed outside of the hospital setting

PICU Admission Criteria

- HFNC, NIPPV or mechanical ventilation
- Persistent tachycardia after 3 IVF boluses
- Signs of poor perfusion
- Hypotension not resolved with IVF boluses

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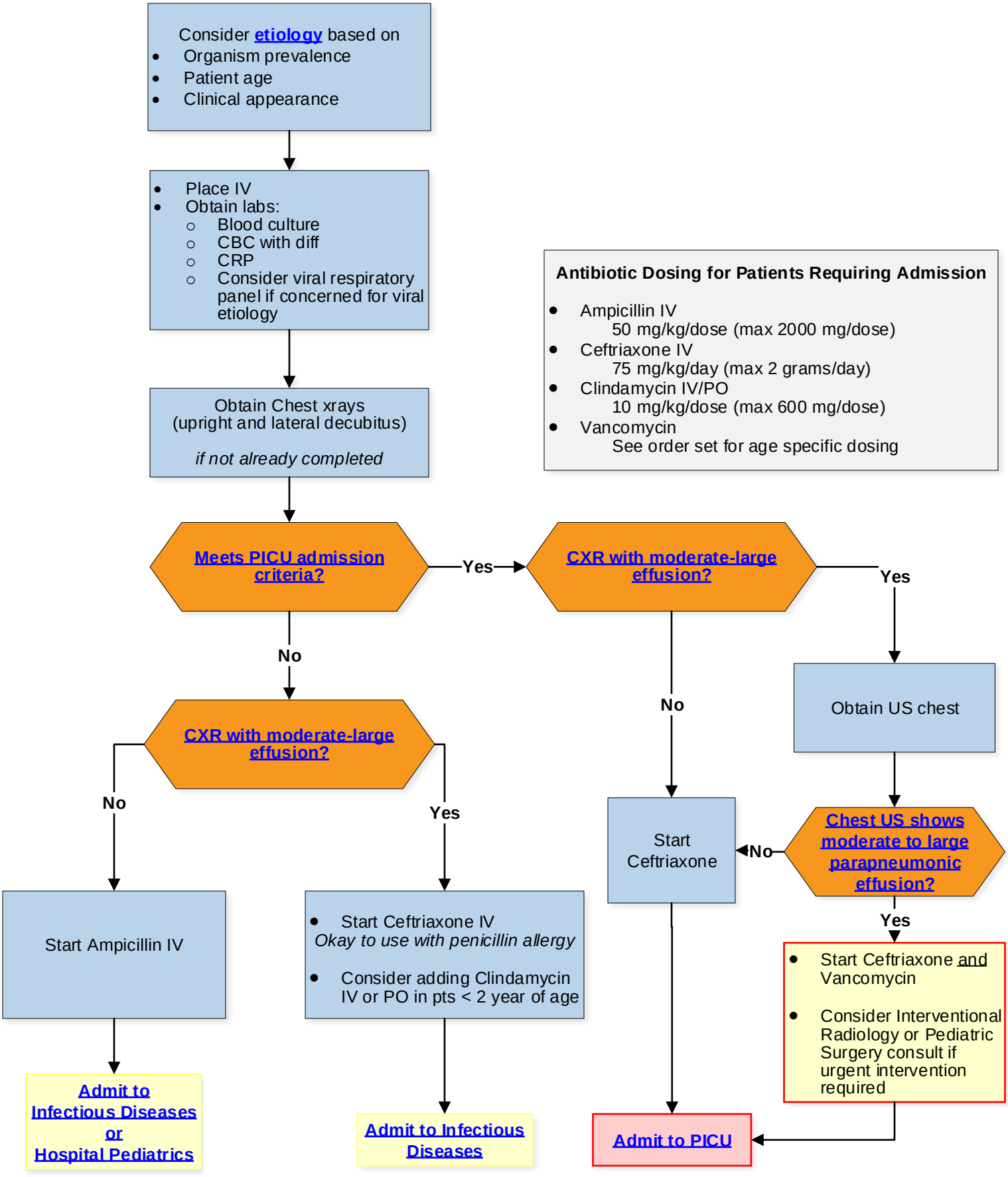
Emergency Department Management Algorithm for Patients Requiring Admission



Size & Classification of Parapneumonic Effusions

Small Effusion: Fluid occupying <10 mm on lateral decubitus radiograph or opacifying less than one-fourth of the hemithorax

Moderate Effusion: >10 mm rim of fluid but opacifies less than half of the hemithorax

Large Effusion: Opacifies more than half of the hemithorax

Stage of Effusion	*Fluid Appearance*	*Fluid Characteristics*	*Ultrasound Appearance*
Simple	Clear	Typically, no organisms seen on gram stain or culture; normal pH and glucose	No loculations or septations seen
Complicated	Clear or cloudy	Gram stain or culture MAY be positive; decreased pH and glucose, increased LDH	Loculations present
Empyema	Frank pus	Gram stain or culture MAY be positive; decreased pH and glucose, increased LDH	Loculations present

(Bradley JS, Byington CL, Shah SS, et al. 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. Clin Infect Dis 2011; 53:e25.)

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Quality Metrics

Process Measures:
- Pathway visualization
- ED/UC order set utilization

Outcome Measures:
- Frequency of ordering of blood cultures and inflammatory markers in patients discharged from the ED with a diagnosis of pneumonia
- Frequency of CXR in patients discharged with a diagnosis of pneumonia
- ED LOS
- Frequency of direct admissions from NCH urgent cares versus transfer to Main Campus ED prior to admission

Balancing Measure
- Return to ED/UC within 48 hours and admitted with diagnosis of pneumonia

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Pathway Team & Process

Content Development Team:

Leaders:

Infectious Diseases:
Rebecca Wallihan, MD
Guliz Erdem, MD
Josh Watson, MD

Members:

Emergency Medicine:
Kristol Das, MD
Berkeley Bennett, MD, MS

Pharmacy:
Jessica Tansmore, PharmD
Kimberly Jones PharmD, BCPS, BCPPS

Hospital Pediatrics:
Cara Harasaki, MD
Hilary Lin, MD
Gerd McGwire, MD
Mathew Suer, MD
Gabriella Gonzales, MD
Rachel Thompson, MD
Guillermo Yepes Junquera, MD

Infectious Diseases:
Juan D. Chaparro, MD

Pediatric Surgery:
Ihab Halaweish, MD

H9A General Pediatrics:
Lyndsay Martinelli RN

Respiratory Therapy:
Courtney Swanton, BS, RRT-NPS, AE-C

Clinical Pathways Program:

Medical Director – Emergency Medicine:
Berkeley Bennett, MD, MS

Medical Director – Clinical Informatics & Emergency Medicine:
Laura Rust, MD, MPH

Physician Informatics:
Kathy Nuss, MD
Juan D. Chaparro, MD

Business & Development Manager:
Rekha Voruganti, MBOE, LSSBB

Program Coordinators:
Tahje Brown, MBA
Tara Dinh, BS

Clinical Pathway Approved:

Medical Director – Associate Chief Quality Officer, Center for Clinical Excellence:
Ryan Bode, MD, MBOE

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Clinical Pathway Development

This clinical pathway was developed using the process described in the NCH Clinical Pathway Development Manual Version 6, 2022. Clinical Pathways at Nationwide Children's Hospital (NCH) are standards which provide general guidance to clinicians. Patient choice, clinician judgment, and other relevant factors in diagnosing and treating patients remain central to the selection of diagnostic tests and therapy. The ordering provider assumes all risks associates with care decisions. NCH assumes no responsibility for any adverse consequences, errors, or omissions that may arise from the use or reliance on these guidelines. NCH's clinical pathways are reviewed periodically for consistency with new evidence; however, new developments may not be represented, and NCH makes no guarantees, representations, or warranties with respect to the information provided in this clinical pathway.

For more information about our pathways and program please contact:
ClinicalPathways@NationwideChildrens.org

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